Exhibit 1

Please indicate County where your project is located here:

San Joaquin

MAIL FORM AND ATTACHMENTS TO:
State Water Resources Control Board
DIVISION OF WATER RIGHTS
P.O. Box 2000, Sacramento, CA 95812-2000
Tel: (916) 341-5300 Fax: (916) 341-5400
http://www.waterboards.ca.gov/waterrights

PETITION FOR EXTENSION OF TIME

Cal. Code Regs., tit. 23, § 842

Application 30531A Permit 21176

Separate petitions are required for each water right. Incomplete forms may not be accepted. Complete this form if the time previously allowed in your permit within which to complete construction work and/or use of water has either expired or will expire and you require additional time. Provide attachments if necessary.

Water Code section 1396 requires an applicant to exercise due diligence in developing a water supply for beneficial use. The State Water Resources Control Board (State Water Board) will review the facts presented to determine whether: (a) due diligence has been exercised, (b) failure to comply with previous time requirements has been occasioned by obstacles which could not reasonably be avoided, and (c) that satisfactory progress will be made if an extension of time is granted. (Cal. Code Regs., tit. 23, § 844.) If an extension of time is not granted, the State Water Board may initiate formal action to either: (a) issue a license for the amount of water heretofore placed to beneficial use under the terms of the permit, or (b) revoke the permit.

If this is your first extension of time, answer the questions below for the permitted construction and water use development period. If previous extensions have been approved, answer these questions for the most recently approved extension period (for example, if a ten-year extension was previously granted, list the activities completed during the ten-year period).

I (we) request a 20 year extension of time to complete construction work and/or beneficial use of water.

Construction
Estimate the date construction work will begin, list the actions taken toward commencing or completing construction, and list the reasons why construction of the project was not completed.

Construction of Phase I of the City of Stockton's Delta Water Supply Project (DWSP) is complete. Phase I includes the Drinking Water Treatment Plant (DWTP) on approximately 60 acres off of Lower Sacramento Road. The 30 million gallons per day (mgd) DWTP includes ozone pre-treatment, flocculation and sedimentation, membrane ultra-filtration processes followed by chlorine disinfection and chloramine residual for distribution. The DWSP also includes twelve miles of 54-inch RCP raw water pipeline installed along Eight Mile Road capable of conveying 60 mgd, and the 80 mgd Intake Pump Station (IPS) diversion works housing four, 250-hoursepower pumps (each rated at 6,950 gallons per minute) and state-of-the-art fish screens located on the southwest tip of Empire Tract in the Sacramento-San Joaquin River Delta. The DWSP was dedicated for operation in May 2012, three and one-half years ahead of the schedule mandated in Permit 21176. See Attachment 1 for further information.

Insert the attachment number here, if applicable: 1

Complete Use of Water
List reasons why use of water was not completed within time previously allowed.

Please see Attachment 1, Section 2, for reasons why the City of Stockton will not complete use of water by December 21, 2020.

Insert the attachment number here, if applicable: 1

Quantities Diverted
For direct diversion projects, list the cubic feet per second (cfs) or gallons per day (gpd) diverted during the maximum month of use, and the acre-feet per annum (afa) and identify the year this occurred. For storage projects, identify the maximum amount collected to storage and withdrawn for beneficial use in afa and identify the year this occurred.

	Year	Maximum Diversion Rate (cfs or gpd)	Maximum Annual Amount (afa)
Direct Diversion	2019	37.30	11,246.00
Storage			
Beneficial Use			11,246.00

Insert the attachment number here, if applicable: 21

Information on Beneficial Uses

Number of Acres Irrigated	0.00
Number of Houses or People Served	180,000
Per Capita Residential Water Use During the Maximum 30-day Period (gpd)	134.00
Extent of Past Use of Water for Any Other Purpose (identify gpd, cfs or afa)	0

Insert the attachment number here, if applicable:

Approximate Amount Spent on Project $ 223,000,000.00

Water Conservation – If water conservation is required by your permit, provide the information below.

Water Conservation Measures In Effect
List the water conservation measures that are in effect within the place of use.

Permit Term 16 states that Stockton will implement cost-effective measures identified in the UWMP. Stockton's 2015 UWMP identified several Demand Management Measures(DMM's). Current DMM's include: 1) Water Waste Prohibition (SMC 13.28); 2); Metering; 3) Tiered water rates; 4) Public Education & Outreach; 5) Distribution system loss analysis; 6) Part-time Water Conservation Coordinator; 7) Other Demand Management Measures including: a) Residential Water Survey Programs, b) Residential Plumbing Retrofit Kits, c) CII Conservation Programs, d) Landscape Conservation Programs i) Model Water Efficiency MWELO; ii) Large Landscape Water Users.

Insert the attachment number here, if applicable:

Water Conservation Measures Planned
List the water conservation measures that are feasible within the place of use and the date the measures will be implemented. Identify the quantities estimated to be conserved when the measures are implemented.

Additional Demand Management Measures in progress include (from above referenced UWMP DMM's), 6) Full-time Water Conservation Coordinator; 7e) (i) implement the MWELO and (ii) Large Landscape Water Conservation Program.

Estimates of water quantity to be conserved with these additional measures is approximately 1,300 acre-feet per year.

Insert the attachment number here, if applicable: 1

All Right Holders Must Sign This Form: I (we) declare under penalty of perjury that the above is true and correct to the best of my (our) knowledge and belief. Dated 09/14/2020 at Stockton, CA .

Right Holder or Authorized Agent Signature

Right Holder or Authorized Agent Signature

NOTE: All petitions must be accompanied by:
(1) the form Environmental Information for Petitions, available at:
http://www.waterboards.ca.gov/waterrights/publications_forms/forms/docs/pet_info.pdf
(2) Division of Water Rights fee, per the Water Rights Fee Schedule, available at:
http://www.waterboards.ca.gov/waterrights/water_issues/programs/fees/
(3) Department of Fish and Wildlife fee of $850 (Pub. Resources Code, § 10005)

ATTACHMENT 2

City of Stockton Water Right Permit 21176
Petition for Extension of Time

The City of Stockton ("Stockton" or "City") submits this Petition for Extension of Time ("Petition") to the State Water Resources Control Board ("State Board") for its consideration and approval. The Petition requests an extension of time to put water to beneficial use under Water Right Permit 21176 ("Permit 21176").

The State Board will approve a petition for extension of time when the following criteria are met:

(1) Due diligence was exercised;
(2) The failure to comply with previous time requirements can be excused because of obstacles which could not reasonably be avoided;
(3) That satisfactory progress will be made if an extension of time is granted; and
(4) Approval of the extension is in the public interest. (Cal. Code Regs., tit. 23, § 844.)

As explained below, the City has satisfied all criteria and should be granted an extension of time for Permit 21176.[1]

1. The City Has Exercised Due Diligence With the Construction and Operation of a New Drinking Water Treatment Project and Diversion of Water for Beneficial Use Under Permit 21176

The City's water right is based on Water Code section 1485 where diversions for beneficial use cannot exceed the amount of water discharged by the City's Regional Wastewater Control Tertiary Facility (RWCF). (Declaration of Robert Granberg in Support of Petition for Extension of Time to Put Water to Beneficial Use Under Permit 21176 [Granberg Decl.], ¶ 4, and Exh. A thereto.) The 15-day running average of diversions must be less than or equal to the 15-day running average of the discharges of properly treated effluent discharged by the RWCF. (*Ibid.*) In other words, the City can only divert as much water as it discharges to the San Joaquin River from the point of discharge located just downstream of the Stockton Swing Bridge on Highway 4. Under this indirect potable use strategy, the City removes only as much water as it puts into the San Joaquin River for treatment and delivery to its customers. This approach ensures the reliability of the City's surface water supply and protects downstream beneficial uses by other Delta diverters.

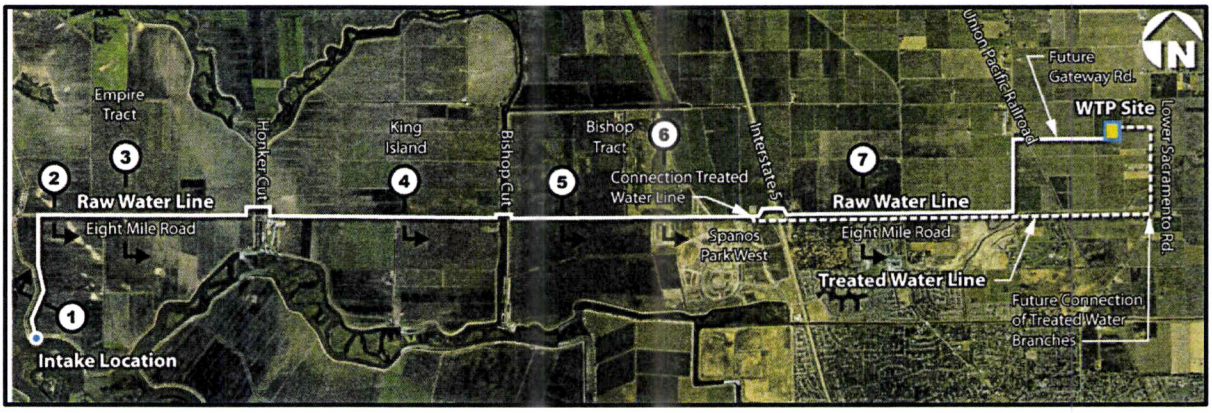
A. Delta Water Supply Project Construction and Operation

In September 2009, the City of Stockton Municipal Utilities Department (COSMUD), following years of extensive development, planning, design, and financing activities, began construction on the first phase of the Delta Water Supply Project (DWSP), which included the Drinking Water Treatment Plant

[1] In Application 30531, the City initially applied for a water right in excess of 33,600 acre-feet per year (af/yr). The State Board bifurcated the City's Application 30531 into 30531A and 30531B, and ultimately issued Permit 21176 on Application 30531A. Application 30531B is not the subject of this Petition.

(DWTP) on approximately 60 acres off Lower Sacramento Road. The 30 million gallons per day (mgd) DWTP includes ozone pre-treatment, settling basins, and membrane ultra-filtration processes, followed by chloramine disinfection and distribution. The DWSP also includes 12 miles of 54-inch RCP raw water pipeline installed along Eight Mile Road capable of conveying 60 mgd, and the 80 mgd-capacity Intake Pump Station (IPS) diversion works housing four 250-horsepower pumps (each rated at 6,950 gallons per minute) and state-of-the-art fish screens located on the southwest tip of Empire Tract (see Figure 1 – Project Area Map). The DWSP was dedicated for operation in May 2012, 3-1/2 years ahead of the schedule mandated under Permit 21176. The cost to complete the project was more than $220 million. It was the largest public works project in the City's history. (Granberg Decl., ¶ 5, and Exh. B thereto.)

FIGURE 1. Delta Water Supply Project Area Map



B. Diversions to Beneficial Use

The first phase of the DWTP is configured to treat 30 mgd, or 33,600 af/yr, which is the maximum annual diversion volume currently allowed for beneficial use under Permit 21176. (Granberg Decl., ¶ 6, and Exh. C thereto, pp. 5-7.) The City has acted with due diligence by constructing and initiating operation of the DWTP, and has consistently put to beneficial use water granted under Permit 21176, as shown in Table 1.

C. Use of Groundwater In Lieu of Surface Water

As documented in the City's Progress Reports on file with the State Board, in 2016, 2017, and 2018, the City used groundwater in lieu of surface water under Permit 21176. (Granberg Decl., ¶ 7, and Exh. D thereto.) The City met its water demand in 2016 by conjunctively using 71% of supply from surface water and 29% from groundwater. In 2017, demand was met with 87% surface water and 13% groundwater, and in 2018, with 76% surface water and 24% groundwater. In 2016, 2017, and 2018, the water available for diversion by the City, with Endangered Species Act (ESA) pumping limitations, exceeded the combined amount of water the City diverted under Permit 21176 and pumped from groundwater. (Granberg Decl., ¶ 7.) During those months, surface water was available for the City to use, but it forwent its right to use surface water in order to conjunctively use groundwater. This use of groundwater in lieu of surface water constitutes beneficial use under Permit 21176. Therefore, such groundwater use demonstrates diligence in putting Permit 21176 water to beneficial use.

TABLE 1. City of Stockton Metropolitan Area (COSMA)
Water Demand and Diversions under Permit 21176 (acre-feet)

Water Year[1]	Total COSMA Water Demand	Total RWCF Discharge	Water Available for Diversion by City Under Permit 21176 with ESA pumping restrictions	Water Diverted by City Under Permit 21176
2012-13	64,445	24,685	18,346	6,392
2013-14	63,531	25,531	18,995	6,730
2014-15	56,699	25,546	19,066	4,612
2015-16	48,793	24,387	18,144	9,756
2016-17	49,700	28,711	21,361	9,951
2017-18	53,225	27,502	20,461	10,862
2018-19	56,113	26,753	19,904	9,855

[1] Water Year is April – March.

2. The City has Experienced Obstacles That Could Not Reasonably Have Been Avoided

A. Statewide Drought

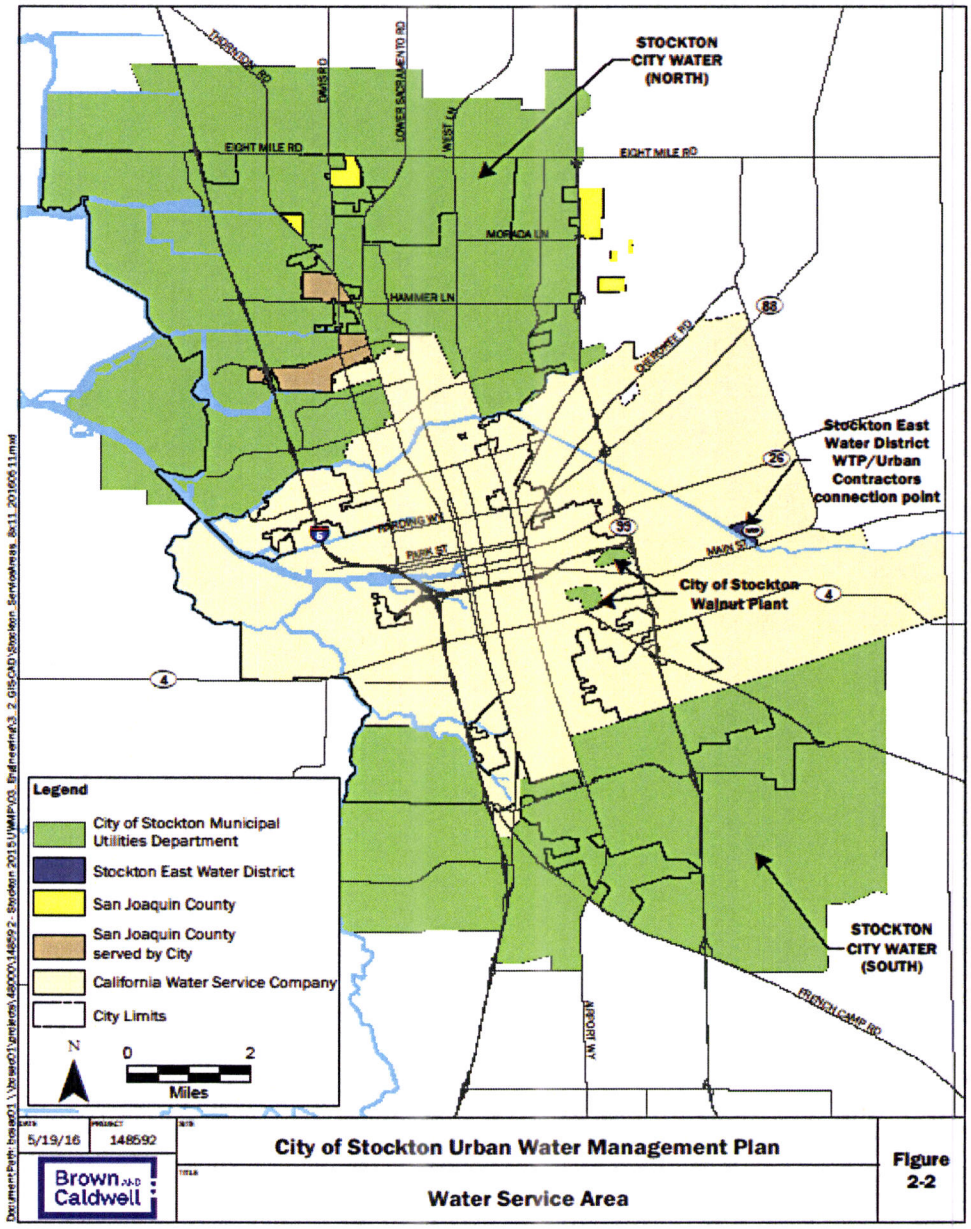
Due to the 2013-15 drought and state-mandated conservation measures, the City's overall water demand was reduced by nearly 29 percent in 2015 compared to 2013. Stockton continued to meet this demand through Permit 21176 water, and increased groundwater pumping to compensate for restricted surface supplies from the Stockton East Water District (Stockton East) and Woodbridge Irrigation District (WID). (Granberg Decl., ¶ 8, and Exh. E thereto.) The drought occurred shortly after the DWTP began operations under these reduced demands, but it allowed the City to demonstrate how its conjunctive use program, made possible by Permit 21176, could effectively manage hydrologic change during a significant drought. COSMUD experienced a significant reduction in revenue due to the historic drought and implementation of mandatory conservation measures that reduced demand for City water by nearly 29 percent. As a result, revenues declined by approximately $3 million in 2014 and 2015. Due to the budget shortfall, COSMUD was forced to curtail its capital improvement program for water projects and fund only essential maintenance projects planned for Fiscal Year 2016-2017. (Granberg Decl., ¶ 9, and Exh. F thereto.)

The City continued its water management efforts in 2016, 2017, and 2018, as evidenced by the City's progress reports filed with the State Board, which demonstrate that the City has effectively managed its water resource portfolio. (See Granberg Decl., ¶ 7, and Exh. D thereto.) Through conjunctive use, Stockton has been able to reduce reliance on groundwater resources when surface water is available, and then conjunctively use groundwater in years when surface water is curtailed. As demand for water in Stockton continues to increase, and planned distribution system improvements are completed, the City will be able to utilize more of its Permit 21176 water while maintaining flexibility to conjunctively use groundwater resources.

B. Regulatory Requirements Have Limited Distribution of Permit 21176 Water

As shown in Figure 2, the COSMA is served by three retail water providers. COSMUD serves the north and south systems; the California Water Service Company (CalWater), an investor-owned utility, serves the central area; and San Joaquin County operates two water systems within the City boundaries. The City has distribution system interconnections to County service areas and operates a water system interconnected to the CalWater system. (Granberg Decl., ¶ 10.)

FIGURE 2. COSMA Water Providers



Application 30531, submitted to the State Board on January 6, 1996, defined the place of use coincident with the 1990 General Plan Boundary, which included the COSMUD north and south service areas, the CalWater service area, and a few San Joaquin County maintenance districts. (Granberg Decl., ¶ 11, and Exh. G thereto, p. 2-2, Figure 2-1.) To meet this projected demand, the City anticipated distribution of treated water throughout the place of use, including the CalWater service area, using existing interties. (*Id.* at Exh. G, p. 2-1.) Due to restrictions brought about by changes in drinking water quality regulations and a limitation of the system pipeline network, distribution of water diverted pursuant to Permit 21176 through the DWTP has only occurred within the COSMUD north service area and San Joaquin County maintenance districts, including Lincoln Village and Colonial Heights. (Granberg Decl., ¶ 12, and Exh. H thereto.)

C. Stockton Was Impacted by the Economic Downturn

Population and corresponding water demand were projected to increase from 73,526 af/yr in 2005 to 125,066 af/yr in 2030. (Granberg Decl., ¶ 13, and Exh. G thereto, p. 2-10, Table 2-3.) In 2005, the City projected an unmet water demand of 34,000 af by 2025 within the Permit 21176 place of use. (Granberg Decl., ¶ 14, and Exh. G thereto, p. 2-11.) In order to meet that increased demand, the City determined that 33,600 af/yr from the DWSP would need to be developed in order to meet demand, replace declining contracted supply, and maintain groundwater sustainability. The Stockton City Council adopted the Final Environmental Impact Report (FEIR) for the DWSP and approved the DWSP in late 2005, and Permit 21176 was granted in early 2006. (Granberg Decl., ¶ 15.) The subprime mortgage crisis from 2007 to 2009 significantly reduced economic growth in the entire region and led to an historic recession and slowdown in the construction of dwelling units in the City, both of which slowed urban population growth and water demand. (Granberg Decl., ¶ 16, and Exh. C thereto, p. 2-6.) These unforeseen events have resulted in less demand for Permit 21176 water than the City anticipated at the time it secured Permit 21176.

Thus, water use, discussed in Petition Section 1 above, reflects only a portion of the use anticipated at the time the City secured Permit 21176. Future water distribution system pipeline network connectivity, and development activity currently planned in the City's five-year capital improvement program, will ensure more surface water will be available to customers who now are served more predominately from groundwater supplies, thereby more fully utilizing water under Permit 21176. (Granberg Decl., ¶ 17, and Exh. I thereto, pp. 264-270, 277-278.)

D. Diversion Limitations to Protect Delta and Longfin Smelt

Permit 21176 provides for diversions at Empire Tract in all months; however, subsequent conditions imposed in 2008 as part of the United States Fish and Wildlife Service Biological Opinion on the Proposed City of Stockton's Delta Water Supply Project (BiOp), and California Department of Fish and Wildlife Incidental Take Permit No. 2081-2009-005-03 (ITP), limited the diversion rate and time available for diversions at the IPS between February and June in order to protect Delta and Longfin smelt. (Granberg Decl., ¶ 18, and Exhs. J-K thereto.) Condition 6.2 of the ITP imposes a 50 percent limitation on diversions from February 15 to March 15, and May 21 to June 15, and a prohibition on diversions from March 15 to May 20. These regulatory limitations have effectively reduced the quantity of water available under

Permit 21176 and will likely limit diversions for the foreseeable future. (Granberg Decl., ¶ 19, and Exh. J thereto, p. 10.)

Further, the BiOp and ITP only provide incidental take coverage for a maximum diversion rate of 30 mgd. (Granberg Decl., ¶ 20; Exh. J thereto, pp. 2, 10; and Exh. K thereto, pp. 48, 51.) To mitigate for ESA restrictions on diversions and ensure water treatment plant operations for the entire year, the City entered into a 40-year agreement to purchase Mokelumne River water from WID under pre-1914 water rights (Statement of Diversion and Use S015557). (Granberg Decl., ¶ 21, and Exh. L thereto, Recitals d.-h. & § 3, p. 5.) The City's water purchase contract with WID provides for delivery of up 6,500 af/yr to meet demand during Delta pumping restriction periods. (Granberg Decl., ¶ 22, and Exh. L thereto, § 1, p. 2.)

In summary, the historic drought of 2013-15 and economic downturn resulted in decreased water demand. These factors, together with distribution system restrictions, diversion limitations, and utility budget shortfalls, were significant obstacles to maximizing diversions under Permit 21176 that the City could neither anticipate nor avoid.

3. Satisfactory Progress Will Be Made If the State Water Board Grants an Extension to Stockton

A. Stockton Will Increase Use of Its Water Right

In spite of regulatory and other unexpected restrictions, the City will continue to make satisfactory progress to apply its full water right to beneficial use. The City's recently adopted update to its General Plan (2040) includes a specific action item to use its Permit 21176 water supply. It states that the City will "[c]ontinue to discharge treated effluent to the Delta and reuse that water through the City's California Water Code Section 1485 water right." (Granberg Decl., ¶ 23, and Exh. M, Action SAF-3.4C, p. 5-23.)

Consistent with the General Plan, the City is currently constructing a $198 million modifications and improvements project for its RWCF that will ensure continued discharge of treated wastewater to the San Joaquin River, as the source of water permitted under Permit 21176. The modifications project will eliminate the evaporation basins used as oxidation ponds, which will reduce evaporation and increase discharges from the RWCF. By 2025, the City will have completed Phase 1 of the project, which will increase the RWCF's average annual discharges to approximately 31,420 af/yr. (Granberg Decl., ¶ 24.)

The City has revised its estimates for population growth and water demand, and while these figures are more modest than previously anticipated, the City is still on track to maximize use of its Permit 21176 water in the next 20 years. The City reevaluated its growth projections, and now anticipates that COSMUD service area population of approximately 182,000 will grow by 1.3% per year, such that the COSMUD service area population will be approximately 236,000 by 2040. (Granberg Decl., ¶ 25, and Exh. C thereto, p. 2-6, Table 2-3.) The City anticipates that its total water demand within the COSMUD service area will be approximately 44,465 af/yr by 2040. (Granberg Decl., ¶ 26, and Exh. C thereto, p. 3-5, Table 3-5.) Thus, by 2040, the City anticipates that its annual water demand within the COSMUD service area will exceed the 33,600 af total supply available under Permit 21176.

While the City anticipates annual water demand in 2040 in excess of its total Permit 21176 right, the RWCF discharge rate and associated allowable diversion rate, as well as ESA-driven pumping limits at the DWTP, create certain challenges to fully using Permit 21176 water by 2040. Table 2 presents the compilation of total COSMA potable water demand and corresponding RWCF treated wastewater discharges to the San Joaquin River, both historical and projected through 2040. Table 2 also presents anticipated water available for diversion under Permit 21176 with ESA-driven pumping restrictions. Current ESA restrictions limit diversions to 24,964 af/yr. Extending the time to license water use under this permit will allow the City additional time to fully utilize Permit 21176 water under current regulatory restrictions, evaluate potential modifications to current regulatory restrictions, and develop and implement plans to maximize use of Permit 21176 by 2040.

TABLE 2. COSMA Water Demand, RWCF Discharge, and Water Available for Diversion Under Permit 21176 Through 2040 (acre-feet)

Water Year	Total COSMA Water Demand[a]	Total RWCF Discharge	Water Available for Diversion Under Permit 21176 with ESA Pumping Restrictions
2012-13	64,445	24,685	18,346
2013-14	63,531	25,531	18,995
2014-15	56,699	25,546	19,066
2015-16	48,793	24,387	18,144
2016-17	49,700	28,711	21,361
2017-18	53,225	27,502	20,462
2018-19	56,113	26,753	19,904
2020	64,520	26,964[b]	20,062
2025	66,852	31,420[c]	23,377
2030	70,957	33,350	24,812
2035	73,810	34,691	24,964[d]
2040	76,905	36,145	24,964

[a] 2020-2040 Demand from City of Stockton and California Water Service Company 2015 Urban Water Management Plans and County Service Area historical average
[b] 2020 RWCF Discharge Equals 47% of Total COSMA Demand minus evaporative losses
[c] Water Available in 2025-2040 assumes no evaporative losses at RWCF
[d] Diversion limit under Permit 21176 with ESA pumping restrictions

As a first step to evaluating how the City might use its full entitlement under Permit 21176 during the extension period, the City has prepared a COSMA 2040 demand curve showing monthly demand assuming an annual demand of 44,465 af/yr. (See Table 3.) Given that the City's ability to meet this demand using its Permit 21176 water depends upon the 15-day running average of RWCF discharges, ESA-driven pumping restrictions, and the existing capacity of diversion infrastructure, Table 3 includes 2040 monthly RWCF discharge and diversion volumes. Table 3 also includes monthly water treatment volumes assuming existing DWTP infrastructure, which currently limits treatment capacity to 27 mgd.

Given the difference between the City's projected 2040 diversion capacity assuming existing infrastructure and regulatory limitations, and the face value of Permit 21176, Table 3 also includes potential monthly diversion volumes under the following assumed conditions:

(1) The City obtains regulatory approval for an increase in the diversion rate up to the RWCF discharge rate during periods not currently restricted to a diversion rate less than 30 mgd;
(2) The City obtains regulatory approval for an increase in the diversion rate up to the RWCF discharge rate during periods not currently restricted to a diversion rate less than 30 mgd and February and June, and
(3) The City implements a groundwater banking program during the time period of the extension.

TABLE 3. 2040 Monthly Water Demand Curve (acre-feet)

Month	2040 Monthly Demand (a)	2040 RWCF Discharges (b)	Current DWTP Treatment Capacity (at 27 mgd) (c)	2040 Diversion Capacity (1) (d)	2040 Diversion Capacity (2) (e)	2040 Diversion to Groundwater Banking (3) (f)
January	2,371	3,281	2,569	3,281	3,281	910
February	2,239	3,265	2,320	2,277	3,265	1,026
March	2,684	3,560	2,569	690	690	575
April	3,178	3,129	2,486	0	0	0
May	4,394	2,850	2,569	506	506	0
June	4,958	2,367	2,367	1,874	2,367	0
July	5,438	2,822	2,569	2,822	2,822	253
August	5,200	3,121	2,569	3,121	3,121	552
September	4,676	2,919	2,486	2,919	2,919	434
October	4,001	3,038	2,569	3,038	3,038	470
November	2,900	2,916	2,486	2,916	2,916	430
December	2,426	2,878	2,569	2,878	2,878	452
Total	44,465	36,145	30,125	26,323	27,804	5,102

(d) Permit 21176 diversion capacity, increased to RWCF discharge limit in non-ESA months.
(e) Permit 21176 diversion capacity with no ESA restrictions in February and June, increased to RWCF discharge limit in non-ESA months.
(f) Potential diversion to groundwater storage (f=e-a when c is greater than a, f=e+c-a when Permit 21176 is ESA-restricted and a is greater than c, or f=e-c when e is greater than c; all assumed under Condition 2).

B. Potential Projects to Maximize Water Diversion and Beneficial Use

The City will more fully investigate and pursue the following projects in order to maximize use of Permit 21176 by 2040.

Increasing DWTP Treatment Capacity: The ability to fully capture RWCF discharges for potable water treatment could be enhanced through an increase in the DWTP's treatment capacity from 30 mgd to 40 mgd. This increase in capacity can be readily accomplished through a combination of operational changes that would increase the volume of water passing through the plant's membrane filters to more fully utilize their rated capacity, and additional membrane units readily added to the treatment train to further accommodate the increased capacity and operational flexibility.

Increasing IPS Diversion Rate: Permit 21176 allows for a diversion rate that shall not exceed 317 cubic feet per second (cfs) up to the annual amount of 33,600 af. Subsequent to permit issuance, the ITP limited the instantaneous diversion rate to 47 cfs, or 30 mgd. The City's ability to maximize the available diversions for potable water treatment depends on further authorizations from the California Department of Fish and Wildlife and U.S. Fish and Wildlife Service. As previously mentioned, plant capacity to treat more than 30 mgd can be readily accomplished though operational changes and additional membrane units.

DWSP Phase II - Recharge Basin Improvements Project: In addition to expanding the use of Permit 21176 water throughout the City's water distribution system network, the City continues to evaluate the potential of a groundwater banking project at the DWTP site to optimize use of Permit 21176, and plans to complete an engineering feasibility and geotechnical investigation. (Granberg Decl., ¶ 27, and Exh. G thereto, pp. 2-3, 5-6.) A groundwater banking project would allow the City to divert water under Permit 21176 when potable water demand is low, and bank the water for later use when potable water demand is high or when the diversion restrictions are in place due to the BiOp and ITP. A groundwater banking project would also allow the City to recharge the Eastern San-Joaquin Subbasin to maintain or restore the groundwater gradient necessary to limit saline intrusion. (See Cal. Code Regs., tit. 23, § 670 [defining water quality beneficial use].)

Initial groundwater infiltration testing was conducted at the potential recharge pond site in 2008. With an assumed infiltration pond size of 70 acres and a wetted period of 228 days per year, an estimated 12,768 af/yr could potentially be stored to the groundwater basin. A more detailed technical analysis of the timing and quantity of water supply will be necessary. For example, if all the available water was typically available during a three-month period per year, the potential storage volume would be 5,040 af/yr (based on a 90-day application period). (Granberg Decl., ¶ 28, and Exh. N thereto, pp. 5-6.)

To complete the Recharge Basin Improvements Project, the City is planning to complete additional engineering feasibility and environmental studies in the next year. These studies will demonstrate the validity of the groundwater banking project and allow for the permitting and construction of the project, which is estimated to be completed in 2024-25, to achieve the City's water supply and drought protection goals and provide benefits to the Eastern San Joaquin Subbasin. The City would also file, and the State Board will need to issue, an Underground Storage Supplement for Permit 21176 for the City to be able to divert and store water underground for later withdrawal and application to beneficial use. At the same time, the City would also file for the addition of Water Quality Use as a beneficial use of Permit 21176 water.

Potential Use by 2040: Table 3 demonstrates that in 2040, under current assumed water demand forecasts, the City could divert between 26,323 and 27,804 af/yr if the City is able to increase the diversion rate in months not currently restricted to a diversion rate less than 30 mgd in February and June. The ability of the City to direct the diversions shown in columns (e) and (f) to the DWTP for treatment and delivery require the City to successfully increase the DWTP treatment capacity through operational changes and installation of additional membrane units discussed above. Further, Table 3 demonstrates that the City could direct as much as 5,102 af/yr to groundwater recharge and conjunctive use, assuming maintenance of the existing DWTP treatment capacity of 27 mgd.

C. Revenue for Future Infrastructure Projects

The City undertook a water rate study in 2015 in order to determine the revenue requirement and possible future rate structure that would make up the funding gaps caused by reduced demand associated with future drought and regulations mandating conservation. The City adopted the recommendations of the water rate study completed in 2016 to incrementally raise water rates by 38.5 percent through 2021 and implement drought surcharges to ensure adequate revenue for its capital improvement projects. (Granberg Decl., ¶ 29, and Exh. O thereto.)

COSMUD will reevaluate its water rate structure under a new cost of service rate study scheduled for City Council adoption in 2021. The regular review of updated water rate structures will allow the City to fund capital improvement projects, which will ultimately allow the City to expand the use of Permit 21176 water through its distribution system to meet the increased demand for water and apply its water right to beneficial use.

4. Approval of the Extension of Time Is in the Public Interest

With 318,000 residents, Stockton is the largest municipality wholly within the Sacramento-San Joaquin River Delta. It has a large environmental justice community and higher than statewide average percentage of residents who live below the poverty line. Stockton derives a substantial percentage of its water supply from Permit 21176. The well-being of the City, its residents, economy, and public interest is thus inextricably linked to the Delta, the quantity and quality of Delta water supplies, and the Delta ecosystem.

A. Continue Stockton's In-Delta Municipal Diversion for Beneficial Use

Stockton relies on a portfolio of water supply sources and supporting infrastructure to meet existing and future demands. COSMUD provides potable drinking water to a service population of more than 180,000, which is approximately 55 percent of the M&I potable water demand of the COSMA. Stockton's water supply includes Permit 21176 contract surface water supplies and groundwater. Stockton's most significant source of water is its DWSP. The DWTP treats water diverted under Permit 21176 and water purchased from the WID from the Mokelumne River. Stockton's acquisition of Permit 21176 and construction of the DWTP was key in reducing the City's historic reliance on groundwater through an active and in-lieu conjunctive use program.

As an In-Delta Municipal water user, the City's DWSP project objectives have been consistent with the Delta Reform Act's coequal goals of improving water supply reliability and protecting, restoring, and enhancing the Delta ecosystem, as well as the Legislature's directive that "coequal goals shall be achieved in a manner that protects and enhances the unique cultural, recreational, natural resource, and agricultural values of the Delta as an evolving place." (Wat. Code, § 85054.)

B. Management of Surface and Groundwater Resources Under SGMA

Stockton's DWSP was developed with three main objectives; namely to (1) manage groundwater resources for environmental benefit and to ensure long-term sustainable yield, (2) satisfy future demands by conjunctively using groundwater and surface water, and (3) provide the COSMA with a more flexible water supply portfolio to control how and from what sources water demands are met. (Granberg Decl., ¶ 30, and Exh. P thereto.)

The Eastern San Joaquin Sub-basin is an historically overdrafted groundwater basin that has been subject to saline migration and elevated chloride levels. (Granberg Decl., ¶ 31, and Exhs. Q-R thereto.) A principle objective of the DWSP, as a conjunctive use project, was to reduce groundwater pumping in favor of available surface water supply, resulting in higher groundwater levels to protect the groundwater basin from further saline water intrusion and water quality degradation. Stockton is a recognized Groundwater Sustainability Agency (GSA) pursuant to the Sustainable Groundwater Management Act (SGMA) and a member of the Eastern San Joaquin Groundwater Authority (GWA), a joint powers authority consisting of 16 GSAs that overlie the subbasin and which is responsible for the management of the 2020 Groundwater Sustainability Plan (GSP). The success of the GSP's implementation, and the region as a whole, requires that the conjunctive use of surface water and groundwater be maximized in order to relieve the demand that was historically placed on the groundwater basin. (Granberg Decl., ¶ 32, and Exh. S thereto, p. ES-9.) Stockton's DWSP is a prime example of how urban water users can reduce reliance on and sustainably manage groundwater supplies by using available surface water for beneficial uses.

Providing Stockton with an extension of time will allow the City time to maximize use of Permit 21167 so it can maintain a diverse water supply portfolio and ensure that the City's residents have a reliable water supply at a reasonable cost. In addition to groundwater and the City's surface water right, the City derives an important portion of its supply through a treated water purchase contract with Stockton East. (Granberg Decl., ¶ 33, and Exh. T thereto.) Reductions in surface water deliveries from Stockton East Water District during the last drought placed additional reliance on the DWSP to meet urban demand and further protect groundwater resources, thereby demonstrating the importance of Permit 21176 to City customers during dry periods. Beginning in 2013 and before the drought had an impact on water supply to the COSMA, Stockton East water met 67 percent of the COSMA total demand, with the DWSP contributing 22 percent. In 2014, as the drought impact on water supply was becoming more apparent, Stockton East reduced deliveries to meet approximately 53 percent of the COSMA total demand. At the peak of the drought in 2015 and 2016, Stockton East water met approximately 45 percent of COSMA demand. In response, DWSP deliveries increased to 30 percent and 39 percent, respectively, with groundwater being used conjunctively to meet overall demand that was reduced throughout the COSMA due to conservation. At the end of the

drought in 2017, COSMA demand continued to be met predominantly through available surface supply provided by SEWD (50 percent) and DWSP (40 percent), thereby reducing groundwater to only 10 percent of demand. (Granberg Decl., ¶ 34.)

C. Enable Regional Water Resilience

Extending the time under which the City may divert and use the full amount of water authorized under Permit 21176 is consistent with and will further the goals of the state's Water Resilience Portfolio (July 2020) and its directive that state government "focus on enabling regional resilience." (See Granberg Decl. Exh. U, p. 17.)

In addition to operating a conjunctive use potable water system, maintaining the City's ability to access surface water so that it may bank water diverted from the Delta when demand is low (as discussed further above) will strengthen the resilience of the City's water system by enabling it to "maintain and diversify water supplies to enable flexibility as conditions change" under a warming climate. (See Granberg Decl. Exh. U, p. 15 ["Water infrastructure and management must be updated to allow capture of water when it is available in increasingly intense bursts and to provide water supplies and protect the environment during prolonged dry periods"].)

It will also enable Stockton to "prepare for new threats," including deeper droughts and hotter temperatures and associated water quality threats, such as harmful algal blooms, which may affect the City's ability to divert and use surface water in warmer months. (See Granberg Decl. Exh. U, pp. 5 [Executive Summary], 13-14.) Finally, retaining the City's access to Permit 21176 for direct use and groundwater banking will both enable water security and "make possible opportunity and prosperity" for the City's residents. (See Granberg Decl. Exh. U, p. 5 [Executive Summary].) In these many ways, the Petition furthers the Water Resilience Portfolio goals outlined by the state.

Granting Stockton's Petition is in the public interest because it would give the City the opportunity to continue to develop its Delta surface water supply to the greatest extent possible, thereby minimizing its use of local groundwater supplies and helping maintain and enhance the sustainable yield of the groundwater basin.

For the reasons stated herein, the City of Stockton respectfully requests that the State Board approve its Petition.

State of California
State Water Resources Control Board
DIVISION OF WATER RIGHTS
P.O. Box 2000, Sacramento, CA 95812-2000
Tel: (916) 341-5300 Fax: (916) 341-5400
http://www.waterboards.ca.gov/waterrights

ENVIRONMENTAL INFORMATION FOR PETITIONS

This form is required for all petitions.

Before the State Water Resources Control Board (State Water Board) can approve a petition, the State Water Board must consider the information contained in an environmental document prepared in compliance with the California Environmental Quality Act (CEQA). This form is not a CEQA document. If a CEQA document has not yet been prepared, a determination must be made of who is responsible for its preparation. As the petitioner, you are responsible for all costs associated with the environmental evaluation and preparation of the required CEQA documents. Please answer the following questions to the best of your ability and submit any studies that have been conducted regarding the environmental evaluation of your project. If you need more space to completely answer the questions, please number and attach additional sheets.

DESCRIPTION OF PROPOSED CHANGES OR WORK REMAINING TO BE COMPLETED

For a petition for change, provide a description of the proposed changes to your project including, but not limited to, type of construction activity, structures existing or to be built, area to be graded or excavated, increase in water diversion and use (up to the amount authorized by the permit), changes in land use, and project operational changes, including changes in how the water will be used. For a petition for extension of time, provide a description of what work has been completed and what remains to be done. Include in your description any of the above elements that will occur during the requested extension period.

The City of Stockton is petitioning for an extension of time to put water to beneficial use pursuant to Permit 21176.

Construction of Phase I of the City of Stockton's Delta Water Supply Project (DWSP) is complete. Phase I includes the Drinking Water Treatment Plant (DWTP) on approximately 60 acres off of Lower Sacramento Road. The 30 million gallons per day (mgd) DWTP includes ozone pre-treatment, settling basins and membrane ultra-filtration processes followed by chloramine disinfection and distribution. The DWSP also includes twelve miles of 54-inch RCP raw water pipeline installed along Eight Mile Road capable of conveying 60 mgd, and the 80 mgd Intake Pump Station (IPS) diversion works housing four, 250-hoursepower pumps (each rated at 6,950 gallons per minute) and state-of-the-art fish screens located on the southwest tip of Empire Tract in the Sacramento-San Joaquin River Delta. The DWSP was dedicated for operation in May 2012, three and one-half years ahead of the schedule mandated in Permit 21176. During the requested extension, the City of Stockton will increase water diversion and use up to the amount authorized by Permit 21176. The City of Stockton's plans to increase water use are described in Attachment 1 to its Petition for Extension of Time.

In 2005, the City of Stockton certified the Program Environmental Impact Report for the Delta Water Supply Project (PEIR), which evaluated the construction and long-term operation of the DWSP, including diversion and treatment of up to 125,900 acre-feet per year (af/yr) from the San Joaquin River and ways in which the City of Stockton would use the water. The PEIR provides project-level evaluation of construction and operation up to 30 mgd and programmatic evaluation of operation to 160 mgd. In 2005, the City of Stockton only approved Phase I (diversion and treatment up to 30 mgd). Because the exercise of the City's approved water right was described in the PEIR, to satisfy the California Environmental Quality Act (CEQA), the City is preparing an addendum to the PEIR that would address, among other items, updated demand factors, operational limitations that have been imposed under state and federal permits, and the factors in Public Resources Code section 21166 and CEQA Guidelines section 15162.

Insert the attachment number here, if applicable: [ ]

Coordination with Regional Water Quality Control Board

For change petitions only, you must request consultation with the Regional Water Quality Control Board regarding the potential effects of your proposed change on water quality and other instream beneficial uses. (Cal. Code Regs., tit. 23, § 794.) In order to determine the appropriate office for consultation, see: http://www.waterboards.ca.gov/waterboards_map.shtml. Provide the date you submitted your request for consultation here, then provide the following information.

Date of Request: N/A

Will your project, during construction or operation, (1) generate waste or wastewater containing such things as sewage, industrial chemicals, metals, or agricultural chemicals, or (2) cause erosion, turbidity or sedimentation? ○ Yes ◉ No

Will a waste discharge permit be required for the project? ○ Yes ◉ No

If necessary, provide additional information below:

Insert the attachment number here, if applicable:

Local Permits

For temporary transfers only, you must contact the board of supervisors for the county(ies) both for where you currently store or use water and where you propose to transfer the water. (Wat. Code § 1726.) Provide the date you submitted your request for consultation here.

Date of Contact: N/A

For change petitions only, you should contact your local planning or public works department and provide the information below.

Person Contacted: Date of Contact:

Department: Phone Number:

County Zoning Designation:

Are any county permits required for your project? If yes, indicate type below. ○ Yes ◉ No

☐ Grading Permit ☐ Use Permit ☐ Watercourse ☐ Obstruction Permit

☐ Change of Zoning ☐ General Plan Change ☐ Other (explain below)

If applicable, have you obtained any of the permits listed above? If yes, provide copies. ○ Yes ○ No

If necessary, provide additional information below:

Insert the attachment number here, if applicable:

Federal and State Permits

Check any additional agencies that may require permits or other approvals for your project:

☐ Regional Water Quality Control Board ☐ Department of Fish and Game

☐ Dept of Water Resources, Division of Safety of Dams ☐ California Coastal Commission

☐ State Reclamation Board ☐ U.S. Army Corps of Engineers ☐ U.S. Forest Service

☐ Bureau of Land Management ☐ Federal Energy Regulatory Commission

☐ Natural Resources Conservation Service

Have you obtained any of the permits listed above? If yes, provide copies. ○ Yes ○ No

For each agency from which a permit is required, provide the following information:

Agency	Permit Type	Person(s) Contacted	Contact Date	Phone Number

If necessary, provide additional information below:

Insert the attachment number here, if applicable: ☐

Construction or Grading Activity

Does the project involve any construction or grading-related activity that has significantly altered or would significantly alter the bed, bank or riparian habitat of any stream or lake? ○ Yes ◉ No

If necessary, provide additional information below:

Insert the attachment number here, if applicable: ☐

Archeology

Has an archeological report been prepared for this project? If yes, provide a copy. ◯ Yes ◉ No

Will another public agency be preparing an archeological report? ◯ Yes ◉ No

Do you know of any archeological or historic sites in the area? If yes, explain below. ◯ Yes ◉ No

If necessary, provide additional information below:

Insert the attachment number here, if applicable: ☐

Photographs

For all petitions other than time extensions, attach complete sets of color photographs, clearly dated and labeled, showing the vegetation that exists at the following three locations:

☐ Along the stream channel immediately downstream from each point of diversion

☐ Along the stream channel immediately upstream from each point of diversion

☐ At the place where water subject to this water right will be used

Maps

For all petitions other than time extensions, attach maps labeled in accordance with the regulations showing all applicable features, both present and proposed, including but not limited to: point of diversion, point of rediversion, distribution of storage reservoirs, point of discharge of treated wastewater, place of use, and location of instream flow dedication reach. (Cal. Code Regs., tit. 23, §§ 715 et seq., 794.)

Pursuant to California Code of Regulations, title 23, section 794, petitions for change submitted without maps may not be accepted.

All Water Right Holders Must Sign This Form:
I (we) hereby certify that the statements I (we) have furnished above and in the attachments are complete to the best of my (our) ability and that the facts, statements, and information presented are true and correct to the best of my (our) knowledge. Dated 09/14/2020 at Stockton, CA.

Water Right Holder or Authorized Agent Signature

Water Right Holder or Authorized Agent Signature

NOTE:
- **Petitions for Change may not be accepted unless you include proof that a copy of the petition was served on the Department of Fish and Game. (Cal. Code Regs., tit. 23, § 794.)**
- **Petitions for Temporary Transfer may not be accepted unless you include proof that a copy of the petition was served on the Department of Fish and Game and the board of supervisors for the county(ies) where you currently store or use water and the county(ies) where you propose to transfer the water. (Wat. Code § 1726.)**

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Attorneys for CITY OF STOCKTON

BEFORE THE

STATE WATER RESOURCES CONTROL BOARD

IN THE MATTER OF CITY OF STOCKTON WATER RIGHT PERMIT 21176	**DECLARATION OF ROBERT GRANBERG IN SUPPORT OF CITY OF STOCKTON'S PETITION FOR EXTENSION OF TIME TO PUT WATER TO BENEFICIAL USE UNDER PERMIT 21176**

I, Robert Granberg, declare that the following matters are within my own personal knowledge, and if called upon to testify, I would competently testify thereto.

1. In 2018, I founded Granberg & Associates, Inc., and provide engineering consulting and project management services to public agencies in water and wastewater sectors.

2. I formerly served as the Assistant Director of the City of Stockton's Department of Municipal Utilities (COSMUD). In addition to assisting the Director of COSMUD, in the organizational direction of the department, I provided overall leadership and management for the Engineering Services, Wastewater Treatment Plant Operations, and Maintenance Divisions. Prior to this position, I served as Deputy Director of Water Resources Planning, in which capacity I managed all aspects of water supply planning, water treatment, and water distribution.

3. I hold a Bachelor of Science degree in Civil Engineering and am a California registered Professional Civil Engineer.

4. The City of Stockton's ("Stockton" or the "City") water right Permit 21176, based on Water Code section 1485, cannot exceed the amount of water discharged by the City's Regional Wastewater Control Facility (RWCF). The 15-day running average of diversions must be less than or equal to the 15-day running average of the discharges of properly treated effluent discharged by the RWCF. (See Permit for Diversion and Use of Water, Permit 21176 [Water Right Permit 21176], ¶ 15.a.2., a true and correct copy of which is attached as Exhibit A.[1])

5. In September 2009, COSMUD, following years of extensive development, planning, design and financing activities, began construction on the first phase of the Delta Water Supply Project (DWSP), which included the Drinking Water Treatment Plant (DWTP) on approximately 60 acres off Lower Sacramento Road. The 30 million gallons per day (mgd) DWTP includes ozone pretreatment, settling basins, and membrane ultra-filtration processes followed by chloramine disinfection and distribution. The DWSP also includes 12 miles of 54-inch RCP raw water pipeline installed along Eight Mile Road capable of conveying 60 mgd, and the 80 mgd capacity Intake Pump Station (IPS) diversion works housing four 250-horsepower pumps (each rated at 6,950 gallons per minute) and state-of-the-art fish screens located on the southwest tip of Empire Tract. The DWTP was dedicated for operation in May 2012, 3-1/2 years ahead of the schedule mandated under Permit 21176. The cost to complete the project was more than $220 million. It was the largest public works project in the City's history. (See the Delta Water Supply Project Cost Estimates and Updates (June 2013), a true and correct copy of which is attached as Exhibit B.)

6. The DWTP is currently configured to treat 30 mgd, or 33,600 acre-feet per year (af/yr), which is the maximum annual volume of water allowed to be used under Water Right Permit 21176. (See City of Stockton 2015 Urban Water Management Plan [July 2016], § 5.3, p. 5-7, a true and correct copy of which is attached as Exhibit C [2015 Urban Water Plan].)

7. As documented in the City's Progress Reports on file with the State Water Board, in 2016, 2017 and 2018, the City used groundwater in lieu of surface water under Water Right

[1] Due to the size of many of the exhibits referenced in this Declaration, the exhibits are being "attached" in electronic format only and may be accessed by means of the flash drive provided with the Declaration.

Permit 21176. (Exhibit D contains true and correct copies of Progress Reports by Permittee for the City of Stockton for the years 2012 through 2019.) In 2016, 2017 and 2018, the water available for diversion by the City, with Endangered Species Act (ESA) pumping limitations, exceeded the combined amount of water the City diverted under Water Right Permit 21176 and pumped from groundwater.

8. Due to the drought (2013-2015), and state-mandated conservation goals, Stockton's overall water demand was reduced by nearly 29 percent in 2015 compared to 2013, and Stockton met demand through its Water Right Permit 21176 supply and increased groundwater pumping to compensate for reduced surface supply from the Stockton East Water District. The City again continued its water management efforts in 2016, 2017 and 2018, as evidenced by the City's monthly reports filed with the State Water Board, which demonstrate that the City has effectively managed its water resource portfolio. (See Exhibit E, true and correct excerpts from the State Water Board June 2014 – June 2017 Urban Water Supply Monthly Reports, which are located in their entirety at https://www.waterboards.ca.gov/water_issues/programs/conservation_portal/docs/2020_reports/uw_supplier_data080420.xlsx.)

9. COSMUD experienced a significant reduction in revenue due to the historic drought and implementation of mandatory conservation measures that reduced demand for City water by nearly 29 percent. As a result, revenues declined by approximately $3 million dollars in 2014 and 2015. Due to the shortfall, the City was forced to curtail its capital improvement program for water projects, and fund only essential projects planned for fiscal year 2016-2017. (Attached as Exhibit F are true and correct copies of City of Stockton's Annual Budgets for fiscal years 2015-16 and 2016-17.)

10. The City of Stockton Metropolitan Area (COSMA) is served by three potable water systems. COSMUD serves the north and south, the California Water Service Company (CalWater), an investor-owned utility, serves the central area, and San Joaquin County operates water systems within the City boundary. The City has interconnections to County service areas, and the City operates a water system interconnected to the CalWater system.

11. Application 30531, submitted to the State Water Resources Control Board (SWRCB) on January 6, 1996, defined the place of use coincident with the 1990 General Plan Boundary, which includes the COSMUD retail area, the area served by CalWater, and a few San Joaquin County maintenance districts. (See Exhibit G, a true and correct copy of the Delta Water Supply Project Draft Program EIR [Delta EIR], p. 2-2, Figure 2-1.) To meet this projected demand, the City anticipated distribution of treated water throughout the Permit 21176 place of use, including the CalWater service area, using existing interties. (See Exhibit G, p. 2-1.)

12. Due to restrictions brought about by drinking water regulations and a limitation of the system pipeline network, distribution of water diverted pursuant to Water Right Permit 21176 has only occurred within the COSMUD north service area and San Joaquin County maintenance districts – i.e., Lincoln Village and Colonial Heights. (See Exhibit H, a true and correct copy of the CDM Delta Water Supply Project Basis of Design Report Appendix G, Water Quality Memorandum Re Water Quality and Testing – Results and Implications, dated April 24, 2009.)

13. Population and corresponding water demand were projected to increase from 73,526 af/yr in 2005 to 125,066 af/yr in 2030. (Exhibit G [Delta EIR], p. 2-10, Table 2-3.)

14. In 2005, the City projected an unmet water demand of 34,000 acre-feet by 2025 in the Permit 21172 place of use. (Exhibit G [Delta EIR], p. 2-11.)

15. In order to meet that increased demand, the City determined that 33,600 af/yr from the DWSP would need to be developed in order to meet demand, replace declining existing contracted supply and maintain groundwater sustainability. The Stockton City Council adopted the Final Environmental Impact Report (FEIR) and approved the DWSP in late 2005, and Water Right Permit 21176 was granted in early 2006.

16. The subprime mortgage crisis from 2007 to 2009 significantly reduced economic growth and led to an historic recession and slowdown in the construction of dwelling units in the City, both of which slowed urban population growth and water demand. (See Exhibit C [2015 Urban Water Plan], p. 2-6.)

17. Future water distribution system pipeline network connectivity, currently planned in the City's five-year capital improvement program, will ensure more Delta water will be

available to customers who now are served more predominately from groundwater supplies, thereby more fully utilizing water use under Water Right Permit 21176. (See Exhibit I, a true and correct copy of the City of Stockton's Proposed Capital Improvement Program [Stockton CIP], pp. 264-270, 277-278.)

18. Water Right Permit 21176 provides for diversions at Empire Tract in all months; however, subsequent conditions imposed as part of federal and state regulatory approvals in 2008 have limited the diversion rate and time available for diversions at the DWTP between February and June in order to protect Delta smelt and Longfin smelt. (See California Department of Fish and Wildlife Incidental Take Permit No. 2081-2009-005-03 [ITP], a true and correct copy of which is attached as Exhibit J; see also United States Fish and Wildlife Service Biological Opinion on the Proposed City of Stockton's Delta Water Supply Project, San Joaquin County, California [Stockton Delta BiOp], a true and correct copy of which is attached as Exhibit K.)

19. Condition 6.2 of the ITP imposes a 50 percent limitation on diversions from February 15 to March 15, and May 21 to June 15, and a prohibition on diversions from March 15 to May 20. These regulatory limitations have effectively reduced the quantity of water available under Water Right Permit 21176, and will likely limit diversions for the foreseeable future. (Exhibit J [ITP], p. 10.)

20. Further, the Stockton Delta BiOp and ITP only provide incidental take coverage for a maximum diversion rate of 30 mgd. (Exhibit J [ITP], pp. 2, 10; Exhibit K [Stockton Delta BiOp], pp. 48, 51.)

21. To mitigate for Endangered Species Act (ESA) restrictions on Delta diversions and ensure water treatment plant operations for the entire year, the City entered into a 40-year agreement to purchase Mokelumne River water from Woodbridge Irrigation District (WID) under pre-1914 water rights (Statement of Diversion and Use S015557). (See Exhibit L, a true and correct copy of the Agreement for Purchase of Water Froom the Woodbridge Irrigation District by the City of Stockton dated January 22, 2008 [Stockton-WID Contract], Recitals d.-h., and § 3, p. 5.)

22. The City's water purchase contract with WID is for delivery of up 6,500 af/yr to meet demand during Delta pumping restriction periods. (Exhibit L [Stockton-WID Contract], § 1, p. 2.)

23. The City recently adopted an update to its general plan to include a specific action item to use its Permit 21176 water supply. It states that the City will "[c]ontinue to discharge treated effluent to the Delta and reuse that water through the City's California Water Code Section 1485 water right." (Attached as Exhibit M is a true and correct copy of Envision Stockton 2040 General Plan, adopted December 4, 2018 [2040 General Plan], Action SAF-3.4C, p. 5-23.)

24. Consistent with the 2040 General Plan, the City is currently constructing a $198 million modifications and improvements project for its RWCF that will ensure continued discharge of treated wastewater to the Delta, as the source of water permitted under Permit 21176. The modifications project will eliminate the evaporation basins used as oxidation ponds, which will reduce evaporation and increase discharges from the RWCF. By 2025, the City will have completed Phase 1 of the project, which will increase the RWCF's average annual discharges to approximately 31,420 af/yr.

25. The City has reevaluated its growth projections, and now anticipates that its current COSMUD service area population of 182,000 will grow by 1.3 percent per year, such that COSMUD service area population will be approximately 236,000 by 2040. (Exhibit C [2015 Urban Water Plan], p. 2-6, Table 2-3.)

26. The City anticipates that its total water demand within the COSMUD service area will be approximately 44,465 af/yr by 2040. (Exhibit C [2015 Urban Water Plan], p. 3-5, Table 3-5.)

27. In addition to expanding the use of Delta water throughout the City's water distribution system network, the City continues to evaluate the potential of a groundwater banking project at the DWTP site to optimize use of Delta water, and plans to complete an engineering feasibility and geotechnical investigation in the coming year. (See Exhibit G, pp. 2-3, 5-6.)

28. Initial groundwater infiltration testing was conducted at the potential recharge pond site in 2008. With an assumed infiltration pond size of 70 acres and a wetted period of 228 days per year, an estimated 12,768 af/yr could potentially be stored to the groundwater basin. A more detailed technical analysis of the timing and quantity of water supply will be necessary. For example, if all the available water was typically available during a three-month period per year, the potential storage volume would be 5,040 af/yr (based on a 90-day application period). (See Exhibit N, a true and correct copy of a Draft CDM Delta Water Supply Project Memorandum re Groundwater Recharge Program Evaluation dated March 24, 2009, at pp. 5-6.)

29. The City undertook a water rate study in 2015 in order to determine the revenue requirement and possible future rate structure that would make up the funding gaps caused by reduced demand associated with future drought and regulations mandating conservation. The City adopted the recommendations of the water rate study completed in 2016 to incrementally raise water rates by 38.5 percent through 2021 and implement drought surcharges to ensure adequate revenue for its capital improvement projects. (See Exhibit O, a true and correct copy of the City Municipal Utilities Department's May 2016 Water Rate Study Final Report prepared by HDR Engineering, dated June 16, 2016.)

30. Stockton's DWSP was developed with three main objectives, namely to: (a) manage groundwater resources for environmental benefit and to ensure a long-term sustainable yield; (b) satisfy future demands by conjunctively using groundwater and surface water; and (c) provide the COSMA with the flexibility to control how and from what sources water demands are met. (See Exhibit P, a true and correct copy of the City's January 2003 Delta Water Supply Project Final Feasibility Report.)

31. The Eastern San Joaquin Basin is an historically overdrafted basin that has been subject to saline migration and elevated chloride levels. (See Exhibit Q, a true and correct copy of the State of California Department of Water Resources Bulletin 118-80 dated January 1980; see also Exhibit R, a true and correct copy of the 2014 Eastern San Joaquin Integrated Regional Water Management Plan, as downloaded from the Greater San Joaquin Regional Water Coordinating Committee Website at http://www.esjirwm.org/IRWMP/2014-IRWMP.)

32. Stockton is a recognized Groundwater Sustainability Agency (GSA) pursuant to the Sustainable Groundwater Management Act, and is a member of the Eastern San Joaquin Groundwater Authority (GWA), a joint powers authority consisting of 16 GSAs that overlie the subbasin and which is responsible for the development of the Groundwater Sustainability Plan (GSP). The success of the GSP's implementation, and the region as a whole, requires that the conjunctive use of surface water and groundwater be maximized in order to relieve the demand that was historically placed on the groundwater basin. (See Exhibit S, a true and correct copy of the Eastern San Joaquin Groundwater Subbasin, Groundwater Sustainability Plan, Executive Summary, p. ES-9.)

33. In addition to groundwater and the City's surface water right, the City derives an important portion of its supply through a treated water purchase contract with Stockton East Water District. (A true and correct copy of the Second Amended Contract Among the Stockton East Water District, … [and] the City of Stockton … Providing for the Sale of Treated Water [City of Stockton-Stockton East Water District contract] is attached as Exhibit T.)

34. Reductions in surface water deliveries during the last drought from Stockton East placed additional reliance on the DWSP to meet urban demand and further protect groundwater resources. Beginning in 2013 and before the drought had an impact on water supply to the COSMA, Stockton East water met 67 percent of the COSMA total demand, with the DWSP contributing 22 percent. In 2014, as the drought impact on water supply was becoming more apparent, Stockton East reduced deliveries to meet approximately 53 percent of the COSMA total demand. At the peak of the drought in 2015 and 2016, Stockton East water met approximately 45 percent of COSMA demand. In response, DWSP deliveries increased to 30 percent and 39 percent, respectively, with groundwater being used conjunctively to meet overall demand that was reduced throughout the COSMA due to conservation. At the end of the drought in 2017, COSMA demand continued to be met predominantly through available surface supply provided by SEWD (50 percent) and DWSP (40 percent), thereby reducing groundwater to only 10 percent of demand.

35. Exhibit U contains a true and correct copy of the State of California's Water Resilience Portfolio, July 2020.

I declare under penalty of perjury under the laws of the State of California that the foregoing is true and correct.

Executed this 30th day of September 2020, in Escalon, California.

Robert Granberg

EXHIBITS TO

DECLARATION OF ROBERT GRANBERG IN SUPPORT OF CITY OF STOCKTON'S PETITION FOR EXTENSION OF TIME TO PUT WATER TO BENEFICIAL USE UNDER PERMIT 21176

ARE IN ELECTRONIC FORMAT AND SAVED TO USB DRIVE PROVIDED

RGranberg Decl Exhibits

Name	Date modified	Type	Size
Exhibit A - Final Permit 21176(A030531A)-dated 03-08-06 (00091672xD2C75).PDF	4/26/2016 10:20 AM	Adobe Acrobat D...	443 KB
Exhibit B - DWSP Project Budget (00093006xD2C75).PDF	9/29/2020 11:03 AM	Adobe Acrobat D...	14 KB
Exhibit C - Stockton MUD 2015_Urban_Water_Management_Plan (00091697xD2C75).PDF	9/8/2020 11:46 AM	Adobe Acrobat D...	9,122 KB
Exhibit D - Progress Reports Years 2012-2019 (complete) (00091856xD2C75).PDF	9/9/2020 4:22 PM	Adobe Acrobat D...	956 KB
Exhibit E - June 2014-June2017 Urban Water Supplier Monthly Reports (00092091xD2C75).PDF	9/14/2020 1:14 PM	Adobe Acrobat D...	129 KB
Exhibit F - Stockton Adopted Budgets 2015-16 and 2016-17 (00092094xD2C75).PDF	9/14/2020 1:15 PM	Adobe Acrobat D...	59,746 KB
Exhibit G - 04012005 Draft EIR Stockton Delta Water Supply Project Volume I (00091674xD2C75).PDF	10/29/2019 9:18 AM	Adobe Acrobat D...	70,851 KB
Exhibit H - Delta Water Design Project Basis of Design Report Appendix G Water Quality Memo (00092098xD...	9/14/2020 1:15 PM	Adobe Acrobat D...	8,125 KB
Exhibit I - City of Stockton 2020-25_Proposed Capital Improvement Plan (CIP) (00092100xD2C75).PDF	9/14/2020 1:15 PM	Adobe Acrobat D...	34,316 KB
Exhibit J - City of Stockton Smelt Incidental Take Permit for Delta Water Supply Project (00091682xD2C75).PDF	9/4/2019 6:23 PM	Adobe Acrobat D...	1,460 KB
Exhibit K - City of Stockton Delta Water Supply Project BiOp, SJC dated 06272007 (00091681xD2C75).PDF	9/4/2019 6:25 PM	Adobe Acrobat D...	4,903 KB
Exhibit L - Stockton-Woodbridge ID 40-yr Agreement for Purchase of Water dated 01222008 (00092101xD2C7...	9/14/2020 2:42 PM	Adobe Acrobat D...	5,411 KB
Exhibit M - Envision Stockton 2040 General Plan Adopted 12042018 (00091706xD2C75).PDF	9/8/2020 12:39 PM	Adobe Acrobat D...	55,209 KB
Exhibit N - Draft CDM 03242009 DWSP Groundwater Recharge Program Evaluation memo (00092105xD2C75...	9/14/2020 1:15 PM	Adobe Acrobat D...	172 KB
Exhibit O - Water Rate Study May 2016 - Final (00092106xD2C75).PDF	9/14/2020 1:16 PM	Adobe Acrobat D...	1,419 KB
Exhibit P - Delta Water Supply Project Jan 2003 Final Feasibility Report (00092108xD2C75).PDF	9/14/2020 1:16 PM	Adobe Acrobat D...	39,320 KB
Exhibit Q - 1980 DWR Bulletin 118-80 Ground Water Basins in CA (00091711xD2C75).PDF	9/8/2020 1:20 PM	Adobe Acrobat D...	11,141 KB
Exhibit R - 2014 Eastern San Joaquin IRWMP (00092683xD2C75).PDF	9/23/2020 3:40 PM	Adobe Acrobat D...	27,700 KB
Exhibit S - ESJ Final GW Sustainability Plan 11052019 (00091734-1xD2C75).PDF	9/8/2020 2:29 PM	Adobe Acrobat D...	58,793 KB
Exhibit T - City of Stockton-Stockton East Water District Contract for Treated Water (00092109xD2C75).PDF	9/14/2020 1:16 PM	Adobe Acrobat D...	2,669 KB
Exhibit U - California-Water-Resilience-Portfolio-July 2020 FINAL (00091840xD2C75).PDF	9/9/2020 3:01 PM	Adobe Acrobat D...	53,746 KB

Exhibit 2

United States Department of the Interior

FISH AND WILDLIFE SERVICE

Sacramento Fish and Wildlife Office
2800 Cottage Way, Room W-2605
Sacramento, California 95825-1846

EXHIBIT 2

IN REPLY REFER TO:
1-1-05-F-0029

JUN 27 2007

Mr. Michael Finan
Chief, Delta Office
U.S. Army Corps of Engineers
1325 J Street
Sacramento, California 95814-2922

Subject: Biological Opinion on the Proposed City of Stockton's Delta Water Supply Project, San Joaquin County, California

Dear Mr. Finan:

This is in response to your November 17, 2004, request for formal consultation with the U.S. Fish and Wildlife Service (Service) on the proposed construction of a water pumping plant, raw water pipelines, water treatment plant, and treated water distribution pipelines for delivery of water to the City of Stockton in San Joaquin County, California. Your request was received in this Field Office on November 19, 2004. This document represents the Service's biological opinion on the effects of the action on the threatened delta smelt (*Hypomesus transpacificus*) and threatened giant garter snake (*Thamnophis gigas*). This document is issued pursuant to section 7 of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 *et seq.*)(Act).

This biological opinion is based on: (1) your letter with enclosures; (2) the revised February 2006 biological assessment, revised February 2006 wetland delineation report, and the October 2005 modeling technical appendix to the Draft Environmental Impact Report; (3) a letter from the Environmental Science Associates dated February 24, 2006, and received on February 28, 2006, providing some of the additional information previously requested by the Service; (4) a letter from ESA to the Service dated September 5, 2006, proposing an operation scenario for the protection of delta smelt; (5) several informal and formal meetings, phone conversations, and electronic mail between the Service and the applicant and applicants consultants; and (6) other information available to the Service.

Tiering the proposed Stockton Delta Water Supply Project to the Intra-Service Biological and Conference Opinion for adverse effects to the giant garter snake

The May 31, 2001, *Intra-Service Biological and Conference Opinion* (Service File 1-1-00-F-0231) is the opinion of the Service's Sacramento Fish and Wildlife Office (SFWO) on the issuance of an incidental take permit for implementation of the San Joaquin Multi-Species Conservation Plan (SJMSCP) pursuant to section 10(a)(1)(B) of the Act in accordance with section 7 of the Act. The Service has issued an incidental take permit for 15 federally-listed species to various entities, including the City of Stockton, under authority of this section 10(a)(1)(B) for a period of 50 years. The permit analyzed take for the giant garter snake from

urban development and infrastructure expansion occurring in the City as described in the SJMSCP; however, this take was permitted to non-Federal entities. This biological opinion utilizes the pertinent effects analysis from the *Intra-Service Biological and Conference Opinion* for impacts to giant garter snake from the construction of the (1) intake structure, (2) treated and raw water pipelines, and (3) water treatment plant. The *Intra-Service and Biological and Conference Opinion* specifically excluded "water diversion and conveyance" as a covered action, so effects to giant garter snake, delta smelt, and delta smelt critical habitat from the proposed operation of the intake are considered separately in this biological opinion.

The implementation of the SJMSCP will result in conversion and loss of a maximum of 14,202 acres of natural habitat and 57,635 acres of agricultural land within an approximately 900,000-acre planning area. Permitted activities as described in Section 8.2 of the SJMSCP include but are not limited to urban development; aggregate mining; highway construction and maintenance; culvert replacement; excavating for inspection, repair and/or replacement; maintenance of drainages along rights of ways; and maintenance of river crossings for utilities such as aqueducts. Direct and indirect effects from all of the above activities could result in killing or injury to SJMSCP-covered species, damage to covered plants and their habitat, harm to covered wildlife species resulting from habitat loss, and harassment due to noise of machinery and other activity associated with land clearing and construction.

Consultation History

November 19, 2004: The Service received a letter from the Corps, dated November 17, 2004, requesting formal consultation for the City of Stockton's Delta Water Supply Project. Enclosed with the letter were relevant reports providing a description of the proposed project, the area that would be affected by the proposed action, listed species and designated habitat present within the project area, and a description of effects on listed species.

September 9, 2005: Ryan Olah of the Service sent an electronic mail to Michael Finan of the Corps requesting additional information on fish screen design, in water footprint, and compensation for loss of shallow water habitat and giant garter snake habitat.

November 30, 2005: The Service sent a letter to the Corps requesting additional information for the City of Stockton's Delta Water Supply Project.

February 28, 2006: Chris Nagano of the Service received a letter dated February 24, 2006, from Michele S. Stern with ESA that partially provided the additional information requested in the Service's November 30, 2006, letter to the Corps. Enclosed with the letter were the February 2006 revised biological assessment, the October 2005 Modeling Technical Appendix to the Draft Environmental Impact Report developed by MWH, and the February 2006 Stockton Delta Water Supply Project Revised Wetland Delineation Report developed by ESA.

April 12, 2006: Peter Johnsen of the Service sent an electronic mail to Ms. Stern requesting clarification of the exact scope of the proposed project, information on effects from pile driving, proposed protection measures for delta smelt larvae, and growth inducement.

May 18, 2006: Representatives from the City of Stockton, ESA, Walter Yep, Inc., the National Marine Fisheries Service, and the Service met to discuss the section 7 consultation process, final Delta intake description, project related effects on listed species, need for additional information, and the schedule for completion of the biological opinion.

May 25, 2006: Mr. Johnsen informed Ms. Stern that growth inducing effects would be covered under the existing San Joaquin Habitat Conservation Plan.

August 14, 2006: The Service received a Technical Memorandum written by Chuck Hanson on the seasonal distribution of delta smelt near the proposed intake site as an attachment in an electronic mail from Ms. Stern to Mr. Johnsen.

August 21, 2006: Andrew Draper with MWH, Robert Granberg of the City of Stockton, Chuck Hanson with Hanson Environmental, Leslie Moulton with ESA, Ms. Stern, and Mr. Johnsen met to discuss effects to Delta hydrology and water quality, fish screen, measures to minimize take of delta smelt larvae, and compensation for effects to giant garter snake habitat. Mr. Hanson presented the proposed pumping reduction and curtailment period for protection of delta smelt. The City of Stockton proposed to maintain a 50 percent pumping rate from March 15 through April 15 and May 21 through June 20, and a 100 percent curtailment from April 16 through May 20. It was discussed if it would be possible to compensate for effects to giant garter snake through the existing San Joaquin Habitat Conservation Plan. Mr. Johnsen requested additional analysis of operations.

September 5, 2006: As an attachment to an electronic mail from Ms. Stern, Mr. Johnsen received an electronic copy of a September 5, 2006, letter to the Service describing the proposed operation scenario to minimize take of delta smelt.

September 8, 2006: Mr. Johnsen received an electronic mail from Ms. Stern regarding SDWP effects on the location of X2, on water exports at the state and Federal Delta water diversion facilities, and the Environmental Water Account.

September 26, 2006: Mr. Johnsen received an electronic mail from Ms. Stern with an attached letter from MWH dated September 20, 2006, containing information on annual average changes in flow in the Delta.

December 11, 2006: Representatives for the City of Stockton, and Service and HDR staff made a site visit to the SDWP project site.

February 14, 2007: The Habitat Technical Advisory Committee for the SJMSCP approved coverage for the Project for the construction of the intake structure, treated and raw water pipelines, and water treatment plant. Effects resulting from the operation of the intake were not considered in the Intra-Service Biological and Conference Opinion; thus, they will be assessed and covered separately in this biological opinion.

April 27, 2007: The Service issued a letter to Mr. Granberg requesting that the City pay the updated SJMSCP compensation fees that went into effect on April 1, 2007. The City had paid their fees on March 30, 2007, prior to the updated fee going into effect. However, the SJMSCP was amended in 2006 to require payment of the fee no greater than 30 days prior to groundbreaking. The City would not have their federal and state permits in time to begin groundbreaking within 30 days of April 1, 2007.

May 3, 2007: Mr. Steve Mayo of the San Joaquin Council of Governments (SJCOG) e-mailed Mr. Granberg explaining that they would reimburse the fees, and that fee payment would be accepted when all required state and federal permits are received.

BIOLOGICAL OPINION

Description of the Proposed Project

The City of Stockton (City) proposes to install a new water intake facility on the San Joaquin River, new pipelines to convey the raw water to a new WTP in the area north of the City of Stockton Metropolitan Area (COSMA), and new treated water pipelines to deliver water to the City's current water distribution system in San Joaquin County, California (the Stockton Delta Water Supply Project (DWSP)). The DWSP is designed as a conjunctive use water supply program for the COSMA, which will integrate surface water and ground water management under one program. The City anticipates that the DWSP would be expanded incrementally to keep pace with the COSMA's needs, based on the timing of existing supply reductions and increased demand over time.

The City's water rights application with State Water Resources Control Board (SWRCB) addresses a long-term planning horizon through 2050, requesting an ultimate diversion of 125,900 acre feet (AF) a year. However, the SWRCB bifurcated the water rights application into two separate applications, application 30531A and 30531B. Application 30531A covers only the initial phase of the DWSP up to 30 million gallon per day (mgd; 47 cubic feet per second (cfs)) (33,600 AF/year) and the place of use is confined to the current 1990 General Plan Boundary. The proposed project includes a new screened intake facility with a capacity to pump 47 cfs on the San Joaquin river, a new 54-inch diameter pipeline to convey Delta water to a new 30 mgd capacity water treatment plant (WTP) located just north of the COSMA, and new treated water pipelines to deliver water to the City's existing water distribution system.

The intake and pump station will be constructed in two 80 mgd increments. The new water intake facility will be designed to facilitate these expansion and to avoid extensive future construction in the river and sloughs. The initial capacity of the DWSP will be 30mgd, with staged incremental expansions to an ultimate capacity of 160 mgd (250 cfs). For initial construction of the intake and pump station facility, piles would be driven for the ultimate 160 mgd capacity; concrete work would support an 80 mgd capacity; and mechanical would support the initial 30 mgd capacity. The WTP will be constructed for an initial capacity to treat and deliver up to 30 mgd or 33,600 AF per year.

Two parallel pipelines will eventually be installed to convey raw water from the intake to the WTP for the treatment of 160 mgd. The proposed project, however, includes only the installation of a 54-inch diameter pipeline to convey water for the treatment of up to 60 mgd. A 72-inch diameter pipeline will be installed parallel to the 54-inch pipe when and if the WTP is expanded to a 160 mgd capacity. Because the intake screen and pipeline will not be sized to accommodate the 160 mgd diversion during the initial phase of the DWSP, additional permitting in the future would trigger section 7 consultation.

Existing interties with the California Water Service Company (Cal Water) will be used to distribute the DWSP's treated water throughout Cal Water's service area within the COSMA. The groundwater component will include coordinated groundwater and surface water management. Ultimately, groundwater levels will be injected into the groundwater basin underlying the COSMA, for later extraction during periods of limited surface supply. The construction of facilities and distribution system for injection of ground water is, however, not part of the proposed action.

The project is located north and northwest of the City of Stockton, California. The project boundary includes the pumping facility at Empire Tract; the alignment for the raw-water pipeline along Eight Mile Road to the WTP west of Sacramento Road; the WTP site located just west of Sacramento Road and approximately 0.5 mile north of Eight Mile Road; and the treated water pipe alignments along Davis Road, Sacramento Road, and West Lane south of Eight Mile Road. The UTM for the Intake Structure is NAD 83, zone 10, 631848E 4211720N and the UTM for the WTP is 647820E 4214688N. Construction is anticipated to start in 2007 with a target date for initial operation of the SDWP in 2009

Intake Structure and Pump Station Facilities

The proposed intake site is on the southwestern tip of Empire Tract adjacent to the San Joaquin River, California. The general area designated for the intake structure is on a bend of the river, which creates two shorelines (south and west banks of Empire Tract). The selected intake site is located approximately 350 feet from the edge of the dredged Stockton Deep Water Ship Channel. Water flows at the south bank location average 15,010 cfs (tidally driven), which will assist in maintaining the desired sweeping velocity of 0.4 fps across the intake fish screen. Medford Island is located to the west across from the intake site. Several smaller islands, tidal influenced wetlands, and shallow water areas are located west of the deep-water ship canal between the project site and Medford Island.

The proposed in-bank intake and pump station facility will utilize flat plate screens and will be sized to accommodate the ultimate 160 mgd intake capacity predicted for year 2050. The proposed construction of the intake and pump station will create two individual units, each sized to handle an 80 mgd capacity. The fish screen and intake channel for the pump station facility will be built into the levee bank of the existing levee. The proposed construction footprint for the in-bank facility will encompass approximately 5.7 acres (250 feet wide by 1,000 linear feet of riverbank). Of this, approximately 1.57 acres of terrestrial habitat and 0.44 acre of perennial stream habitat in the San Joaquin River, including 176 feet of river bank shoreline will be permanently removed by the finished facility.

In order to accomplish this, a setback levee on the land side of the existing levee will be constructed to provide flood protection to Empire Tract. The area between the existing levee and the setback levee will be backfilled with earthen fill (6,900 cubic yards) to provide a level area above the flood elevation for access to the pump station and ancillary facilities and structures. Preconstruction dredging will remove approximately 6,700 cubic yards of native river bank and channel bottom material. The waterside portion of the construction area will then be isolated from the main channel by permanent sheet pile wing walls and temporary cofferdam of sheet piles driven into the bottom of the channel across the mouth of the water intake channel. Approximately 833 cubic yards of rock riprap will be placed along the permanent wing walls of the intake structure. The area within the cofferdam and the existing levee will be pumped dry to allow for construction activities to occur. The void between the existing levee and the newly placed wing walls will be filled with imported material (1,300 cubic yards) and compacted to provide support for the intake structure. The dredging, cofferdam installation, removal of water from behind the cofferdam and backfilling of soil is expected to take approximately 60 days to complete.

Within the area identified as the footprint for the intake structures, a network of 14-inch diameter pre-stressed concrete piles will be driven into the soil to a depth of 75 feet. These concrete piles will provide support to the poured concrete slab foundation of the intake facility and the related concrete structural elements of the fish screen and pumping platform. The number of piles driven will be sufficient for both of the 80 mgd pumping modules. The City proposes to drive all piles during the period from July 1 through November 30. The concrete work proposed for the current consultation will allow for only one of the 80 mgd modules to be built. The second intake module, should it be built, will be permitted under a future consultation. However, to avoid redeploying the pile driving equipment a second time, all piles for both modules will be driven in one mobilization of the pile driving rig.

The proposed in-bank intake will extend into the river approximately 60 feet from the levee face and will be approximately 350 feet from the Stockton Deep Water Ship Channel. Placement of the cofferdam during construction will require approximately a 20-foot clearance for working space.

Fish Screen Design

The vertical screen height of the fish screen will be 15 feet with a nominal structure length of 120 feet (at 160 mgd build out). The fish screen may be slightly angled away from vertical to better conform to the established slope of the levee. The fish screen will be designed to meet the

current fish screen criteria established by the National Marine Fisheries Service (NMFS), the Service, and the California Department of Fish and Game (CDFG). The proposed screen will have the following structural operational characteristics:

Screen Orientation. The screen will be oriented so that the screen face will be parallel to river flow; upstream and downstream transitions will minimize eddies.

Approach Velocity. A uniform approach velocity of less than 0.2 fps as well as an adjustment for flow patterns will be provided across the face of the screen. For an ultimate capacity of 160 mgd, a minimum of 1,240 square feet of screen area will be provided, excluding the area for structural supports.

Screen Cleaning. The entire fish screen will be capable of completing an automatic cleaning cycle once every five minutes. The screen will be cleaned with either an automatic rotating brush or hydraulic screen cleaner.

Sweeping Velocity. The sweeping velocity design criteria for river intakes is at least twice the approach velocity (i.e., 0.4 fps or higher). Except during periods of tidal flow reversal, sweeping flow velocity will be at least two times the approach velocity. With a river channel cross-sectional flow area of approximately 18,000 square feet, flow rates must exceed 7,200 cfs to meet the sweeping velocity criteria of 0.4 fps. This occurs about 80 to 85 percent of the time at the intake site. The City plans to work with the Corps, NMFS, the Service, and CDFG to develop site-specific requirements for the DWSP.

Screen Openings. The opening size of the screen will not exceed 1.75 millimeters (mm); the minimum open area will be 27 percent of the screen's surface area.

Screen Materials. The screen will be fabricated of rigid, corrosion-resistant material with no sharp edges or projections (e.g., stainless-steel or copper-nickel alloy using wedge wire).

Pumping and Electrical Requirements

Electric pumps will lift water from the intake and deliver it to the proposed WTP, pumping it approximately 51 feet above sea level in the process. The transfer of this water will be through the initial installation of a 54-inch-diameter pipe to the WTP.

For the initial pump station capacity of 30 mgd, the total connected electrical load for the intake facility would be approximately 850 kilovolt-amperes (kVA). Ultimate electrical capacity for the intake pump station and interim phasing would depend on the timing for construction of the parallel 72-inch-diameter raw water pipeline. An upgrade to the electrical infrastructure would be required to efficiently meet the facility's initial and ultimate needs.

High voltage electrical transmission lines are located west and parallel to I-5. Electrical service requirements at the WTP would be even higher than at the intake pumping station, so developing primary service voltage for the WTP would provide an opportunity to coordinate service to the intake pumping station. Electrical service for the intake pump station will be routed to a new substation near the intake site from the substation located at Eight Mile Road and I-5. Overhead

poles are located in the road right-of-way from the northwest corner of I-5 and Eight Mile Road to the intake site.

Water Pipelines

Raw Water Pipelines

Approximately 67,000-foot (12.7-mile) of raw water pipelines will be constructed to connect the intake facility with the WTP. In open areas with sufficient space, an 80-foot-wide construction corridor would be used to maximize construction efficiency. In areas encumbered by existing improvements, high-volume roadways, or environmentally sensitive areas, a narrower construction corridor will be used. The minimum width for a practicable construction corridor would be 47 feet, which will provide space for the width and turning movements of equipment such as a large excavator. It is anticipated that the initial raw water pipeline could be constructed in about 12 to 13 months.

The alignment of the pipeline will follow the western edge of Empire Tract northwards from the intake facility to Eight Mile Road, paralleling the inside of the levee along Little Connection Slough for approximately 1.5 miles. At Eight Mile Road, the pipeline alignment will turn east and parallel the northern side of the road for approximately 2.1 miles before crossing under Honker Cut. The pipeline will continue east for another 2.25 miles before crossing under Bishop Cut. From this point, the pipeline will continue approximately 6 miles east to Sacramento Road before turning north to the proposed location of the WTP.

A 54-inch-diameter pipeline would be installed to provide for the initial 30 mgd WTP and future expansion to a 60 mgd capacity. When the demands for water reach the level that additional capacity in excess of the 60 mgd is needed, an additional 72-inch pipeline will be installed parallel to the existing 54-inch pipeline alignment. The applicant anticipates that this enlargement of the carrying capacity of the raw water pipelines will be considered under a future biological opinion which addresses the co-occurring enlargement of the diversion capacity at the intake structure.

The majority of the raw water pipelines would be installed using open cut trenching using conventional cut and cover construction techniques. Where minor ditch crossings (less than 15 feet in width) are required, the ditches would be temporarily dammed prior to open cut trenching. In areas where open cut trenching is not possible due to limited construction area, geotechnical conditions, or sensitive areas (i.e., at the intersection of Empire Tract Road and Eight Mile Road and at Bishop Cut, Honker Cut, the Union Pacific Railroad tracks, and Interstate 5), trenchless construction techniques (e.g., jack and bore, horizontal directional drilling, or microtunneling) would be employed.

The width and depth of the trench would vary, depending on the location along the route. In agricultural areas where the pipeline would not be in a road right-of-way, it would be buried with a minimum cover of seven feet. In other areas, the pipeline will be buried at a minimum of five feet to avoid potential conflicts with existing and future adjacent utilities. The trench for the 54-inch pipeline will be approximately seven to eight feet wide. Excavated soil will be hauled to a

suitable temporary storage area with no or low biological sensitivity until it is returned to the construction site. Stored soil will be protected from wind and rain erosion, sedimentation, and runoff. Soil in excess of backfill requirements will be hauled to a suitable disposal area or made available for other uses.

In areas with shallow groundwater levels, dewatering would be required. If the groundwater seepage cannot be contained onsite, it will be pumped into holding tanks (Baker tanks or other suitable receptacles) where the sediment will be separated from the groundwater and the "clean" groundwater redistributed into surrounding upland areas or irrigation ditches. The return water will comply with the Central Valley Regional Water Quality Control Board (Regional Board) before being discharged. Surface areas disturbed by the open trenching activities will be restored to their original condition. Unpaved areas will be replanted with grasses, shrubs, and trees as required.

Trenchless construction techniques will be used when sensitive surface obstructions or otherwise difficult conditions preclude the open trench techniques previously described. Typically, trenchless construction techniques require that the bore of the tunnel pass under the sensitive surface obstruction, such as the waterways of Bishop and Honker Cuts, and resurface on the opposite side of the obstruction. Bore and jack and microtunneling boring are two of the techniques being considered for channel crossings. Typically, a bore pit would be constructed on each side of the waterway. These pits, approximately 25 to 30 feet long by 10 to 15 feet wide, would be excavated with a backhoe outside of the natural channel boundaries. Depth of the pits will depend on final pipeline depth below grade. The boring equipment is lowered into the pit and the drilling bore is advance into the substrate. Once a tunnel is constructed, the pipes are installed. Spoils from the excavation will be placed alongside the pits outside of the channel for future use as fill. Minimum buffer zones for entry and exit point on either side of the stream and a minimum vertical Clarence beneath the streambed will be maintained to avoid or minimizes the potential environmental impacts resulting from the crossing activities. At this time, the setback distance and minimum boring depths required to maintain this safety margin have not been determined.

Any groundwater encountered during drilling would be pumped out of the bore pits and discharged per Regional Board requirements. The procedure employed would be determined during final design. Upon completion of the pipeline installation, the excavated areas would be backfilled, compacted, re-contoured, and restored to natural conditions.

HDD is a specialized boring technique that can be used to drill an arc that would travel under larger waterbodies such as Honker or Bishop Cuts. Lubrication containing water and bentonite clay, referred to as drilling mud, would be used to aid the drilling and to coat the walls to maintain the opening. A wire line magnetic guidance system would be used to ensure that the angle, depth, and exit point abide by the detailed engineering plans drawn up for the crossing. Once the hole is approximately 12 inches larger than the pipe, the pipeline is pulled through the drilled hole from the point of entry to the point of exit. The workspace requirements for the HDDs extend to an area 200 feet wide by 200 feet long. It may be needed to excavate mud pits to retain the drilling mud exiting from the bore opening at either end of the crossing.

Treated Water Pipelines

At the initial plant capacity of 30 mgd, a 54-inch diameter pipeline would connect the process area of the WTP to the existing distribution system. Approximately 38,730 feet (7.3 miles) of piping would be required. The treated water pipeline would parallel the east side of Lower Sacramento Road south to the south side of Eight Mile Road. A minimum 10-foot horizontal separation would be provided between the raw water and treated water pipelines to meet California Department of Health Services standards and to facilitate construction.

From the intersection of Lower Sacramento and Eight Mile Roads, the pipeline would connect with the existing distribution system as follows:

- From the intersection of Lower Sacramento and Eight Mile Roads, south along Lower Sacramento Road to Wakefield Road
- From the intersection of Lower Sacramento and Eight Mile Roads, east along Eight Mile Road to West Lane, then south on West Lane to Wakefield Road
- From the intersection of Lower Sacramento and Eight Mile Roads, west along Eight Mile Road to Davis Road, then south on Davis Road to about Whistler Way
- From the intersection of Eight Mile and Davis Roads, west along Eight Mile Road to Trinity Parkway

The minimum width of the construction corridor would be between 37 and 47 feet, depending on pipe diameter and construction means and methods. Thus, the total footprint will be approximately 42 acres (47-foot wide corridor X 38,730 feet). Two staging areas for storing equipment and materials and for parking a construction office trailer would be required along the pipeline alignment.

The majority of the treated water pipelines would be installed using open cut trenching as described for the raw water pipelines. In developed areas, a vertical or near-vertical trench would be constructed to limit replacement of the structural road and reduce the width of the construction corridor. Trench depth will range from five to 12 feet, depending on pipe diameter and depth of cover. All excavation is expected to be above groundwater; however, limited perched groundwater may be encountered near slough crossings. Typical open cut installation rates would vary from 300 to 400 feet per day, depending on the number of utilities encountered during excavation, required traffic control, and hours of work.

In areas where open cut trenching is impossible due to a limited construction area, geotechnical conditions, or sensitive areas (i.e., Interstate 5 at Eight Mile Road; Pixley Slough at Davis Road, Eight Mile Road, and Lower Sacramento Road; Union Pacific Railroad tracks at Eight Mile Road; and Bear Creek at West Lane), trenchless construction techniques would be employed as described for raw water pipelines.

Water Treatment Plant

The WTP will be located approximately three miles east of Interstate 5 and 0.5 mile north of Eight Mile Road along Lower Sacramento Road. The facility will be constructed on a 126-acre parcel, with 56 acres devoted to the plant development and 86 acres left as farmland. The City anticipates that it will take approximately two years to complete the construction of the WTP.

Raw water will enter the plant via the proposed 54-inch-diameter pipeline. The water will be treated either by (1) conventional treatment using ozone or deep bed granular activated charcoal or (2) a membrane filtration treatment with a pretreatment of powdered activated charcoal. Both treatment types will utilize grit basins, flash mix (coagulation), flocculation/sediment basins, and clearwell storage. The WTP will operate continuously, 24 hours per day, year round at various flow rated during the year with ongoing operation and maintenance protocols. Treated water will be distributed through existing and newly constructed delivery pipelines to supply the water needs of the COSMA. Because there is no public sewer in the vicinity of the WTP site, domestic waste from the operations and administration building will be disposed of using onsite treatment methods such as a septic tank and leach field.

Operations of the DWSP Intake

The City will manage and operate the DWSP intake to minimize entrainment of delta smelt egg and larvae during the spring by reducing or curtailing diversion. The City no longer proposes a flexible reduction or curtailment period. Instead the City proposes to each year reduce pumping by half during the periods March 15 through April 15 and May 21 through June 15, and to curtail all pumping during the period April 16 through May 20 (Stern in lit. September 5, 2006). During the reminder of the year the City will divert up to its full capacity of 47 cfs.

Conservation Measures

The City will compensate for impacts and conversion of giant garter snake and delta smelt habitat, an estimated total of 181.5 acres, as a result of construction of the facilities by paying a fee as determined by the San Joaquin Council of Governments (SJCOG) as designated in the SJMSCP and *Intra-Service Biological and Conference Opinion* prepared by the Service (Service 2001). In addition, the City will abide by the giant garter snake and delta smelt "Incidental Take Minimization Measures" issued by the SJCOG, including restricting construction to the giant garter snake active period (May 1 – October 1) for all areas within 200 feet of potential giant garter snake aquatic habitat, which includes the intake structure.

Action Area

The action area includes all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action (50 CFR 402.2). The physical location of the DWSP is on the southwestern tip of Empire Tract in the Sacramento-San Joaquin Delta, the inner portion of the Empire Tract along Eight Mile Road, and an area extending approximately three mile east of I-5. The intake will be located on the southern shore of Empire Tract, slightly east of Federal navigation marker "11" on the Stockton Deep Water Ship Channel (DWSC). The raw water pipelines will cross Honker Cut and Bishop Cut slightly north of the alignment of the

Eight Mile Road bridges over these waterways. The alignment then would turn north and parallel the west side of Lower Sacramento Road to the proposed WTP site. The proposed WTP site is located on the west side of Lower Sacramento Road, just north of Stockton and approximately three miles east of Interstate 5. The proposed treated-water pipeline would parallel the east side of Lower Sacramento Road south to the south side of Eight Mile Road. From the intersection of Lower Sacramento and Eight Mile Roads, the pipeline would go south along Lower Sacramento Road, and east and west along Eight Mile Road to connect with the existing City and California Water Service Company distribution systems. These four locations will be the sites of any direct effects from the construction phase of the project.

The operations phase of the DWSP will affect the delta smelt and critical habitat designated for the delta smelt in several locations but at variable levels. The most direct and significant effect to the delta smelt will be at the site of the intake screen itself, where water is withdrawn from the Delta. Lower levels of effects will be present within the water conveyance systems of the Central Valley (i.e. the Sacramento River below Shasta Dam, the Feather River below Oroville Dam, and the American River below Folsom Dam), and will be dependent upon the changes in water delivery required to meet water delivery obligations and water quality standards required of the state and Federal water programs as they compensate for the additional water being diverted fro the DWSP. The computer modeling (CALSIM II) run by the applicant's consultant to compare the effects of the project on the current and future water delivery operations indicates that small impacts related to the DWSP project can be measured even in the reservoir operations of Lake Shasta. However, it should be noted that these effects are relatively minor, and deemed insignificant by the applicant, as far as effects to the water delivery system operations are concerned. The scope and sensitivity of these effects will be discussed in the effects analysis section of this opinion.

One of the objectives outlined in the Final Environmental Impacts Report (ESA 2005) of the Stockton Delta Water Supply project is "to provide adequate water supply to accommodate planned growth." The initial 30 mgd intake operation is expected to meet the water supply needs of build-out anticipated in the 1990 Stockton General Plan. The action area for this biological opinion therefore includes all areas planned for build-out in the 1990 Stockton General Plan.

Status of the Species and Critical Habitat

Delta Smelt

Delta smelt was listed as a threatened species on March 5, 1993 (Service 1993a). The Sacramento-San Joaquin Delta Native Fishes Recovery Plan was completed in 1996 (Service 1996). The Five Year Status Review for the delta smelt was completed on March 31, 2004 (Service 2004). Critical habitat for delta smelt was designated on December 19, 1994 (Service 1994a). The final rule designated critical habitat for the delta smelt in the following geographic areas—areas of all water and all submerged lands below ordinary high water and the entire water column bounded by and contained in Suisun Bay (including the contiguous Grizzly and Honker Bays); the length of Goodyear, Suisun, Cutoff, First Mallard (Spring Branch), and Montezuma sloughs; and the existing contiguous waters contained within the Delta, as defined in section 12220 of the California Water Code.

Delta smelt are slender-bodied fish that typically reach 60-70 mm standard length (measured from tip of the snout to origin of the caudal fin), although a few may reach 120 mm standard length. The mouth is small, with a maxilla that does not extend past the midpoint of the eye. The eyes are relatively large; with the orbit width contained approximately 3.5-4 times in the head length. Small, pointed teeth are present on the upper and lower jaws. The first gill arch has 27-33 gill rakers and there are 7 branchiostegal rays (paired structures on either side and below the jaw that protect the gills). Counts of branchiostegal rays are used by taxonomists to identify fish. The pectoral fins reach less than two-thirds of the way to the bases of the pelvic fins. There are 9-10 dorsal fin rays, 8 pelvic fin rays, 10-12 pectoral fin rays, and 15-17 anal fin rays. The lateral line is incomplete and has 53-60 scales along it. There are 4-5 pyloric caeca. Live fish are nearly translucent and have a steely-blue sheen to their sides. Occasionally there may be one chromatophore (cellular organelle containing pigment) between the mandibles, but usually there is none. Delta smelt belong to the family Osmeridae, a more ancestral member of the order Salmoniformes which also includes the family Salmonidae (salmon, trout, whitefish, and graylings) (Moyle and Cech 1988).

Distribution

Delta smelt are endemic to the upper Sacramento-San Joaquin estuary. They occur in the Delta primarily below Isleton on the Sacramento River, below Mossdale on the San Joaquin River, and in Suisun Bay. Adult delta smelt move into freshwater in late fall to spawn (ranging from January to July). Spawning is believed to occur in the Sacramento River, San Joaquin River, and Suisun Marsh based on observations of spent females. Some spawning may also occur in Napa River. Once hatched, most juveniles move downstream into the low saline waters of the lower Delta and Suisun Bay where they maintain growth during the summer and fall. They reach adult size within one year and will move into freshwater to spawn in their first winter. The majority exhibit a one-year life cycle but a small portion of the population may survive to spawn the subsequent year. Depending on season, the delta smelt can occur in: (1) the Sacramento River as high as Sacramento, (2) the Mokelumne River system, (3) the Cache Slough region, (4) the Delta, and, (5) Montezuma Slough, (6) Suisun Bay, (7) Suisun Marsh, (8) Carquinez Strait, (9) Napa River, and (10) San Pablo Bay. It is not known if delta smelt in San Pablo Bay are a permanent population or if they are washed into the Bay during high outflow periods. Since 1982, the center of delta smelt abundance has been the northwestern Delta in the channel of the Sacramento River. In any month, two or more life stages (adult, larvae, and juveniles) of delta smelt have the potential to be present in Suisun Bay (California Department of Water Resources (DWR) and Reclamation 1994; Molye 1976; Wang 1991). Delta smelt are also captured seasonally in Suisun Marsh.

Swimming Behavior

Observations of delta smelt swimming in a swimming flume and in a large tank show that these fish are unsteady, intermittent, slow speed swimmers (Swanson and Cech 1995). At low velocities in the swimming flume (<3 body lengths per second), and during spontaneous, unrestricted swimming in a 1 m tank, smelt consistently swam with a stroke and glide behavior. This type of swimming is very efficient; Weihs (1974) predicted energy savings of about 50% for "stroke and glide" swimming compared to steady swimming. However, the maximum speed

smelt are able to achieve using this mode of swimming is less than 3 body lengths per second, and the fish did not readily or spontaneously swim at this or higher speeds (Swanson and Cech 1995). Although juvenile delta smelt appear to be stronger swimmers than adults, forced swimming at 3 body lengths per second in a swimming flume was apparently stressful; the smelt were prone to swimming failure and extremely vulnerable to impingement (Swanson and Cech 1995). Delta smelt swimming performance was limited by behavioral rather than physiological or metabolic constraints (Brett 1976).

Habitat Requirements

Delta smelt are euryhaline (a species that tolerates a wide range of salinities) fish that generally occur in water with less than 10-12 parts per thousand (ppt) salinity. However, delta smelt have been collected in the Carquinez Strait at 13.8 ppt and in San Pablo Bay at 18.5 ppt (CDFG 2000). In recent history, they have been most abundant in shallow areas where early spring salinities are around 2 ppt. However, prior to the 1800's before the construction of levees that created the Delta Islands, a vast fluvial marsh existed in the Delta and the delta smelt probably reared in these upstream areas. During the 1987-92 drought, delta smelt were concentrated in deep areas in the lower Sacramento River near Emmaton, where average salinity ranged from 0.36 to 3.6 ppt for much of the year (DWR and Reclamation 1994). During years with wet springs (such as 1993), delta smelt may continue to be abundant in Suisun Bay during summer even after the 2 ppt isohaline (an artificial line denoting changes in salinity in a body of water) has retreated upstream (Sweetnam and Stevens 1993). Fall abundance of delta smelt is generally highest in years when salinities of 2 ppt are in the shallows of Suisun Bay during the preceding spring ($p < 0.05$, $r = 0.50$) (Herbold 1994) (p is a statistical abbreviation for the probability of an analysis showing differences between variables, r is a statistical abbreviation for the correlation coefficient, a measure of the linear relationship of two variables). Herbold (1994) found a significant relationship between number of days when 2 parts per thousand was in Suisun Bay during April with subsequent delta smelt abundance ($p < 0.05$, $r = 0.49$), but noted that autocorrelations (interactions among measurements that make relationships between measurements difficult to understand) in time and space reduce the reliability of any analysis that compares parts of years or small geographical areas. It should also be noted that the point in the estuary where the 2 ppt isohaline is located (X2) does not necessarily regulate delta smelt distribution in all years. In wet years, when abundance levels are high, their distribution is normally very broad. In late 1993 and early 1994, delta smelt were found in Suisun Bay region despite the fact that X2 was located far upstream. In this case, food availability may have influenced delta smelt distribution, as evidenced by the *Eurytemora* found in this area by CDFG. In Suisun Marsh, delta smelt larvae occur in both large sloughs and small dead end sloughs. New studies are under way to test the hypothesis that adult fall abundance is dependent upon geographic distribution of juvenile delta smelt.

Critical thermal maxima for delta smelt was reached at 25.4 degrees Celsius in the laboratory (Swanson *et al.*, 2000); and at water temperatures above 25 degrees Celsius delta smelt are no longer found in the delta.

Life History

Wang (1986) reported spawning taking place in fresh water at temperatures of about 7°-15° Celsius (C). However, ripe delta smelt and recently hatched larvae have been collected in recent years at temperatures of 15°-22°C, so it is likely that spawning can take place over the entire 7°-22° C range. Temperatures that are optimal for survival of embryos and larvae have not yet been determined, although R. Mager, University of California at Davis (UCD), (unpublished data) found low hatching success and embryo survival from spawns of captive fish collected at higher temperatures. Delta smelt of all sizes are found in the main channels of the Delta and Suisun Marsh and the open waters of Suisun Bay where the waters are well oxygenated and temperatures relatively cool, usually less than 20°-22°C in summer. When not spawning, they tend to be concentrated near the zone where incoming salt water and out flowing freshwater mix (mixing zone). This area has the highest primary productivity and is where zooplankton populations (on which delta smelt feed) are usually most dense (Knutson and Orsi 1983; Orsi and Mecum 1986). At all life stages delta smelt are found in greatest abundance in the top 2 m of the water column and usually not in close association with the shoreline.

Delta smelt inhabit open, surface waters of the Delta and Suisun Bay, where they presumably school. In most years, spawning occurs in shallow water habitats in the Delta. Shortly before spawning, adult smelt migrate upstream from the brackish-water habitat associated with the mixing zone to disperse widely into river channels and tidally-influenced backwater sloughs (Radtke 1966; Moyle 1976, 2002; Wang 1991). Migrating adults with nearly mature eggs were taken at the Central Valley Projects's (CVP) Tracy Pumping Plant, located in the south Delta, from late December 1990 to April 1991 (Wang 1991). In February 2000, gravid adults were found at both CVP and the State Water Projects' (SWP) fish facilities in the south Delta. Spawning locations appear to vary widely from year to year (DWR and Reclamation 1993). Sampling of larval smelt in the Delta suggests spawning has occurred in the Sacramento River, Barker, Lindsey, Cache, Georgiana, Prospect, Beaver, Hog, and Sycamore sloughs, in the San Joaquin River off Bradford Island including Fisherman's Cut, False River along the shore zone between Frank's and Webb tracts, and possibly other areas (Wang 1991). In years of moderate to high Delta outflow, smelt larvae are often most abundant in Suisun Bay and sloughs of Suisun Marsh, but it is not clear the degree to which these larvae are produced by locally spawning fish and the degree to which they originate upstream and are transported by river currents to the bay and marsh. Some spawning probably occurs in shallow water habitats in Suisun Bay and Suisun Marsh during wetter years (Sweetnam 1999 and Wang 1991). Spawning has also been recorded in Montezuma Slough near Suisun Bay (Wang 1986) and also may occur in Suisun Slough in Suisun Marsh (P. Moyle, UCD, unpublished data).

The spawning season varies from year to year, and may occur from late winter (December) to early summer (July). Pre-spawning adults are found in Suisun Bay and the western delta as early as September (DWR and Reclamation 1994). Moyle (1976, 2002) collected gravid adults from December to April, although ripe delta smelt were common in February and March. In 1989 and 1990, Wang (1991) estimated that spawning had taken place from mid-February to late June or early July, with peak spawning occurring in late April and early May. A recent study of delta smelt eggs and larvae (Wang and Brown 1993 as cited in DWR and Reclamation 1994)

confirmed that spawning may occur from February through June, with a peak in April and May. Spawning has been reported to occur at water temperatures of about 7° to 15° C. Results from a UCD study (Swanson and Cech 1995) indicate that although delta smelt tolerate a wide range of temperatures (<8° C to >25° C), warmer water temperatures restrict their distribution more than colder water temperatures.

Delta smelt spawn in shallow, fresh, or slightly brackish water upstream of the mixing zone (Wang 1991). Most spawning occurs in tidally-influenced backwater sloughs and channel edgewaters (Moyle 1976, 2002; Wang 1986, 1991; Moyle *et al.* 1992). Although delta smelt spawning behavior has not been observed in the wild (Moyle *et al.* 1992), some researchers believe the adhesive, demersal eggs attach to substrates such as cattails, tules, tree roots, and submerged branches in shallow waters (Moyle 1976, 2002; Wang 1991).

Laboratory observations have indicated that delta smelt are broadcast spawners (DWR and Reclamation 1994) and eggs are demersal (sinks to the bottom) and adhesive, sticking to hard substrates such as: rock, gravel, tree roots or submerged branches, and submerged vegetation (Moyle 1976, 2002; Wang 1986). At 14°-16° C, embryonic development to hatching takes 9 -14 days and feeding begins 4-5 days later (R. Mager, UCD, unpublished data). Newly hatched delta smelt have a large oil globule that makes them semi-buoyant, allowing them to maintain themselves just off the bottom (R. Mager, UCD, unpublished data), where they feed on rotifers (microscopic crustaceans used by fish for food) and other microscopic prey. Once the swimbladder (a gas-filled organ that allows fish to maintain neutral buoyancy) develops, larvae become more buoyant and rise up higher into the water column. At this stage, 16-18 mm total length, most are presumably washed downstream until they reach the mixing zone or the area immediately upstream of it. Growth is rapid and juvenile fish are 40-50 mm long by early August (Erkkila *et al.* 1950; Ganssle 1966; Radtke 1966). By this time, young-of-year fish dominate trawl catches of delta smelt, and adults become rare. Delta smelt reach 55-70 mm standard length in 7-9 months (Moyle 1976, 2002). Growth during the next 3 months slows down considerably (only 3-9 mm total), presumably because most of the energy ingested is being directed towards gonadal development (Erkkila *et al.* 1950; Radtke 1966). There is no correlation between size and fecundity, and females between 59-70 mm standard lengths lay 1,200 to 2,600 eggs (Moyle *et al.* 1992). The abrupt change from a single-age, adult cohort during spawning in spring to a population dominated by juveniles in summer suggests strongly that most adults die after they spawn (Radtke 1966 and Moyle 1976, 2002). However, in El Nino years when temperatures rise above 18° C before all adults have spawned, some fraction of the unspawned population may also hold over as two-year-old fish and spawn in the subsequent year. These two-year-old adults may enhance reproductive success in years following El Nino events.

In a near-annual fish like delta smelt, a strong relationship would be expected between number of spawners present in one year and number of recruits to the population the following year. Instead, the stock-recruit relationship for delta smelt is weak, accounting for about a quarter of the variability in recruitment (Sweetnam and Stevens 1993). This relationship does indicate, however, that factors affecting numbers of spawning adults (e.g., entrainment, toxics, and predation) can have an effect on delta smelt numbers the following year.

Delta smelt feed primarily on (1) planktonic copepods (small crustaceans used by fish for food), (2) cladocerans (small crustaceans used by fish for food), (3) amphipods (small crustaceans used by fish for food) and, to a lesser extent, (4) on insect larvae. Larger fish may also feed on the opossum shrimp (*Neomysis mercedis*). The most important food organism for all sizes seems to be the euryhaline copepod (*Eurytemora affinis*), although in recent years the exotic species, *Pseudodiaptomus forbesi*, has become a major part of the diet (Moyle *et al.* 1992). Delta smelt are a minor prey item of juvenile and subadult striped bass (*Morone saxatilis*) in the Sacramento-San Joaquin Delta (Stevens 1966). They also have been reported from the stomach contents of white catfish (*Ameiurus catus*) (Turner 1966 *in* Turner and Kelley (eds) 1966) and black crappie (*Pomoxis nigromaculatus*) (Turner 1966 *in* Turner and Kelley 1966) in the Delta.

Abundance and Population Dynamics

The smelt is endemic to Suisun Bay upstream of San Francisco Bay and throughout the Delta, in Contra Costa, Sacramento, San Joaquin, Solano and Yolo counties, California. Historically, the smelt is thought to have occurred from Suisun Bay and Montezuma Slough, upstream to at least Verona on the Sacramento River, and Mossdale on the San Joaquin River (Moyle *et al.* 1992, Sweetnam and Stevens 1993).

Since the 1850s, however, the amount and extent of suitable habitat for the delta smelt has declined dramatically. The advent in 1853 of hydraulic mining in the Sacramento and San Joaquin rivers led to an increase in siltation and the alteration of the circulation patterns of the Estuary (Nichols *et al.* 1986, Monroe and Kelly 1992). The reclamation of Merritt Island for agricultural purposes, in the same year, marked the beginning of the present-day cumulative loss of 94% of the Estuary's tidal marshes (Nichols *et al.* 1986, Monroe and Kelly 1992). The extensive levee system in the Delta has led to a loss of seasonally flooded habitat and significantly changed the hydrology of the Delta ecosystem, restricting the ability of suitable habitat substrates to re-vegetate.

Delta smelt were once one of the most common pelagic (living in open water away from the bottom) fish in the upper Sacramento-San Joaquin estuary, as indicated by its abundance in CDFG trawl catches (Erkkila *et al.* 1950; Radtke 1966; Stevens and Miller 1983). Delta smelt abundance from year to year has fluctuated greatly in the past, but between 1982 and 1992 their population was consistently low. The decline became precipitous in 1982 and 1983 due to extremely high outflows and continued through the drought years 1987-1992 (Moyle *et al.* 1992). In 1993, numbers increased considerably, apparently in response to a wet winter and spring. During the period 1982-1992, most of the population was confined to the Sacramento River channel between Collinsville and Rio Vista (D. Sweetnam, CDFG unpublished data). This was still an area of high abundance in 1993, but delta smelt were also abundant in Suisun Bay. The actual size of the delta smelt population is not known. However, the pelagic life style of delta smelt, short life span, spawning habits, and relatively low fecundity indicate that a fairly substantial population probably is necessary to keep the species from becoming extinct. Recreation in the Delta has resulted in the presence and propagation of predatory non-native fish such as striped bass. Additionally, recreational boat traffic has led to a loss of habitat from the building of docks and an increase in the rate of erosion resulting from boat wakes. In addition to the loss of habitat, erosion reduces the water quality and retards the production of phytoplankton in the Delta.

In addition to the degradation and loss of estuarine habitat, delta smelt have been increasingly subject to entrainment, upstream or reverse flows of waters in the Delta and San Joaquin River, and constriction of low salinity habitat to deep-water river channels of the interior Delta (Moyle *et al.* 1992). These adverse conditions are primarily a result of the steadily increasing proportion of river flow being diverted from the Delta by the Projects, and occasional droughts (Monroe and Kelly 1992).

Reduced water quality from agricultural runoff, effluent discharge and boat effluent has the potential to harm the pelagic larvae and reduce the availability of the planktonic food source. When the mixing zone is located in Suisun Bay where there is extensive shallow water habitat within the euphotic zone (depths less than four meters), high densities of phytoplankton and zooplankton may accumulate (Arthur and Ball 1978, 1979, 1980). The introduction of the Asian clam (*Potamocorbula amurensis)*, a highly efficient filter feeder, presently reduces the concentration of phytoplankton in this area.

Population Dynamics and Trends

According to seven abundance indices which provide information on the status of the delta smelt, this species was consistently at low population levels through the 1980's (Stevens *et al.* 1990). These same indices also showed a pronounced decline from historical levels of abundance (Stevens *et al.* 1990). For a large part of its annual life span, this species is associated with the freshwater edge of the mixing zone, where the salinity is approximately 2 ppt. (also described as X2) (Ganssle 1966, Moyle *et al.* 1992, Sweetnam and Stevens 1993). The relationship between the portion of the smelt population west of the Delta as sampled in the summer townet survey and the natural logarithm of Delta outflow from 1959 to 1988, indicates the summer townet index increased dramatically when outflow was between 34,000 and 48,000 cubic feet per second, placing X2 between Chipps and Roe islands (DWR and Reclamation 1994).

Specifically, the summer townet abundance index constitutes one of the more representative indices because the data have been collected over a wide geographic area (from San Pablo Bay upstream through most of the Delta) for the longest period of time (since 1959) (CDFG 2007). The summer townet abundance index measures the abundance and distribution of juvenile delta smelt and provides data on the recruitment potential of the species (CDFG 2007). Since 1983, (except for 1986, 1993, and 1994), this index has remained at consistently lower levels than previously found (CDFG 2007)(Figure 1). These consistently lower levels correlate with the 1983 to 1992 mean location of X2 upstream of the confluence (CDFG 2001). The final summer townet index for 2000 was 8.0, a decline from the 11.9 index for the 1999 summer townet. Both of these indices represent an increase from the 1998 index of 3.3. These higher townet indices were followed by the 2001 (3.5), 2002 (4.7), 2003 (1.6), 2004 (2.9) and 2005 (0.3) indices which were well below the pre-decline average of 20.4 (1959-1981, no sampling in 1966-68) (CDFG 2007).

The second longest running survey (since 1967), the fall midwater trawl survey (FMWT), measures the abundance and distribution of late juveniles and adult delta smelt in a large geographic area from San Pablo Bay upstream to Rio Vista on the Sacramento River and Stockton on the San Joaquin River (Stevens *et al.* 1990, CDFG 1999). The FMWT indicates the abundance of the adult population just prior to upstream spawning migration (CDFG 1999). The

index calculated from the FMWT uses numbers of sampled fish multiplied by a factor related to the volume of the area sampled (CDFG 1999). Until recently, except for 1991, this index has declined irregularly over the past 20 years (CDFG 1999) (Figure 2). Since 1983, the delta smelt population has exhibited more low FMWT abundance indices, for more consecutive years, than previously recorded (CDFG 1999). The 1994 FMWT index of 101.2 was a continuation of this trend (CDFG 1999). This occurred despite the high 1994 summer townet index for reasons unknown (CDFG 1999). The low 1995 summer townet index value of 3.3 was followed by a high FMWT index of 839 reflecting the benefits of higher flows due to an extremely wet year (CDFG 1999, 2001). The 1999 FMWT index of 717, which is an increase from 1998's index (417.6), is the third highest since the start of decline of delta smelt abundance in 1982 (CDFG 1999). The FMWT abundance index (127) for 1996 represented the sixth lowest on record (CDFG 1999). The 1997 abundance index (360.8) almost tripled since the 1996 survey, despite the low summer townet index (4.0) (CDFG 1999, 2001).

Both 2001 TNS and FMWT abundance indices for delta smelt decreased from 2000 (Souza and Bryant 2002, CDFG 1999 and 2001). The 2001 TNS delta smelt index (3.5) is less than 1999 (11.9) and 2000 (8.0) but comparable to recent years (1995, 1997, and 1998) when the index ranged from 3.2 to 4.0 (Souza and Bryant 2002, CDFG 2001). The 2001 FMWT delta smelt index (603) decreased by 20% from 2000 (756) (Souza and Bryant 2002, CDFG 2001). Both surveys exhibited an overall trend of decline in the last three years, but this decline seems more pronounced in the TNS where the 2001 delta smelt index is 95% lower than the greatest index of record (62.5) in 1978 (Souza and Bryant 2002, CDFG 2001). The 2002 TNS was 4.7 and then dropped to 1.6 in 2003. The 2004 TNS index increase to 2.9 but then fell in 2005 to 0.3. The 2002 FMWT index (139) was the seventh lowest on record and the 2003 index was 210. The 2004, 2005, and 2006 FMWT abundance indices fell to their lowest levels of 74, 26, and 41, respectively. The lowest indices on record for both surveys occurred in 2005 (CDFG 2007).

The Delta Smelt Larval Survey (DSLS), an additional survey initiated in 2005 by CDFG, will help determine timing, distribution, and abundance of larvae within the upper San Francisco Estuary. The new survey will also help estimate larval delta smelt losses and determine the magnitude of entrainment of larval delta smelt at the CVP and SWP intakes.

Summary of the Five Year Review: In summary, the threats of the destruction, modification, or curtailment of its habitat or range resulting from extreme outflow conditions, the operations of the State and Federal water projects, and other water diversions as described in the original listing remain. The only new information concerning the delta smelt's population size and extinction probability indicates that the population is at risk of falling below an effective population size and therefore in danger of becoming extinct. Although the Vernalis Adaptive Management Program and Environmental Water Account have helped to ameliorate these threats, it is unclear how effective these will continue to be over time based on available funding and future demands for water. In addition, there are increased water demands outside the CVP and the SWP, which could also impact delta smelt. The increases in water demands are likely to result in less suitable rearing conditions for delta smelt, increased vulnerability to entrainment, and less water available for maintaining the position of X2. The importance of exposure to toxic chemicals on the population of delta smelt is highly uncertain. Therefore, a recommendation to delist the delta smelt is inappropriate.

In addition, many potential threats have not been sufficiently studied to determine their effects, such as predation, disease, competition, and hybridization. Therefore, a recommendation of a change in classification to endangered is premature.

In his August 24, 2003, letter, the foremost delta smelt expert, Dr. Peter B. Moyle, stated that the delta smelt should continue to be listed as a threatened species (Moyle 2003). In addition, in their January 23, 2004, letter, CDFG fully supported that the delta smelt should retain its threatened status under the Act (CDFG 2004).

Delta Smelt Critical Habitat

In determining which areas to designate as critical habitat, the Service considers those physical and biological features that are essential to a species' conservation and that may require special management considerations or protection (50 **CFR** §424.12(b)).

The Service is required to list the known primary constituent elements together with the critical habitat description. Such physical and biological features include, but are not limited to, the following:

1. space for individual and population growth, and for normal behavior;
2. food, water, air, light, minerals, or other nutritional or physiological requirements;
3. cover or shelter;
4. sites for breeding, reproduction, rearing of offspring, germination, or seed dispersal; and
5. generally, habitats that are protected from disturbance or are representative of the historic geographical and ecological distributions of a species.

In designating critical habitat for the delta smelt, the Service identified the following primary constituent elements essential to the conservation of the species: physical habitat, water, river flow, and salinity concentrations required to maintain delta smelt habitat for spawning, larval and juvenile transport, rearing, and adult migration. Specific areas that have been identified as important delta smelt spawning habitat include Barker, Lindsey, Cache, Prospect, Georgiana, Beaver, Hog, and Sycamore sloughs and the Sacramento River in the Delta, and tributaries of northern Suisun Bay.

Larval and juvenile transport. Adequate river flow is necessary to allow larvae from upstream spawning areas to move to rearing habitat in Suisun Bay and to ensure that rearing habitat is maintained in Suisun Bay. To ensure this, X2 must be located westward of the confluence of the Sacramento-San Joaquin Rivers, located near Collinsville (Confluence), during the period when larvae or juveniles are being transported, according to historical salinity conditions. X2 is important because the "entrapment zone" or zone where particles, nutrients, and plankton are "trapped," leading to an area of high productivity, is associated with its location. Habitat conditions suitable for transport of larvae and juveniles may be needed by the species as early as

February 1 and as late as August 31, because the spawning season varies from year to year and may start as early as December and extend until July.

Rearing habitat. An area extending eastward from Carquinez Strait, including Suisun, Grizzly, and Honker bays, Montezuma Slough and its tributary sloughs, up the Sacramento River to its confluence with Three Mile Slough, and south along the San Joaquin River including Big Break, defines the specific geographic area critical to the maintenance of suitable rearing habitat. Three Mile Slough represents the approximate location of the most upstream extent of historical tidal incursion. Rearing habitat is vulnerable to impacts of export pumping and salinity intrusion from the beginning of February to the end of August.

Adult migration. Adequate flow and suitable water quality is needed to attract migrating adults in the Sacramento and San Joaquin river channels and their associated tributaries, including Cache and Montezuma sloughs and their tributaries. These areas are vulnerable to physical disturbance and flow disruption during migratory periods.

The Service's 1994 and 1995 biological opinions on the operations of the CVP and SWP provided for adequate larval and juvenile transport flows, rearing habitat, and protection from entrainment for upstream migrating adults (Service 1994c, 1995). Please refer to 59 **FR** 65255 for additional information on delta smelt critical habitat.

Giant Garter Snake

The Service published a proposal to list the giant garter snake as an endangered species on December 27, 1991 (56 **FR** 67046). The Service reevaluated the status of the snake before adopting the final rule. The snake was listed as a threatened species on October 20, 1993 (58 **FR** 54053).

Description

The giant garter snake is one of the largest garter snakes species reaching a total length of approximately 64 inches (162 centimeters). Females tend to be slightly longer and proportionately heavier than males. The weight of adult female snakes is typically 1.1-1.5 pounds (500-700 grams). Dorsal background coloration varies from brown to olive with a cream, yellow, or orange dorsal stripe and two light colored lateral stripes. Some individuals have a checkered pattern of black spots between the dorsal and lateral stripes. Background coloration and prominence of the checkered pattern and three yellow stripes are geographically and individually variable; individuals in the northern Sacramento Valley tend to be darker with more pronounced mid-dorsal and lateral stripes (Hansen 1980; Rossman *et al.* 1996). Ventral coloration is variable from cream to orange to olive-brown to pale blue with or without ventral markings (Hansen 1980).

Historical and Current Range

Giant garter snakes formerly occurred throughout the wetlands that were extensive and widely distributed in the Sacramento and San Joaquin Valley floors of California (Fitch 1940; Hansen

and Brode 1980; Rossman and Stewart 1987). The historical range of the snake is thought to have extended from the vicinity of Chico, Butte County, southward to Buena Vista Lake, near Bakersfield, in Kern County (Fitch 1940; Fox 1948; Hansen and Brode 1980; Rossman and Stewart 1987). Early collecting localities of the giant garter snake coincide with the distribution of large flood basins, particularly riparian marsh or slough habitats and associated tributary streams (Hansen and Brode 1980).

Loss of habitat due to agricultural activities and flood control have extirpated the snake from the southern one third of its range in former wetlands associated with the historic Buena Vista, Tulare, and Kern lake beds (Hansen 1980; Hansen and Brode 1980). By 1971, so much wetland habitat had been reclaimed, that the California Department of Fish and Game (CDFG) classified the giant garter snake as a rare animal and conducted a series of field surveys. The results of these surveys indicate that snake populations were distributed in marsh wetlands, tributary streams, and portions of the rice productions zones of the Sacramento Valley in Butte, Glenn, Colusa, Sutter, Yolo and Sacramento Counties, in the Delta region along the eastern fringes of the Sacramento-San Joaquin River Delta in Solano, Contra Costa, Sacramento, and San Joaquin Counties, and in the San Joaquin Valley in San Joaquin, Stanislaus, Merced, Mendota, and Fresno Counties (Hansen 1988; Hansen and Brode 1980).

Upon federal listing in 1993, the Service identified 13 separate populations of giant garter snakes, with each population representing a cluster of discrete locality records (Service 1993). The 13 populations largely coincide with historical flood basins and tributary streams throughout the Central Valley: (1) Butte Basin, (2) Colusa Basin, (3) Sutter Basin, (4) American Basin, (5) Yolo Basin/Willow Slough, (6) Yolo Basin/Liberty Farms, (7) Sacramento Basin, (8) Badger Creek/Willow Creek, (9) Caldoni Marsh/White Slough, (10) East Stockton--Diverting Canal & Duck Creek, (11) North and South Grasslands, (12) Mendota, and (13) Burrel/Lanare.

A population is a group of organisms that interbreed and share a gene pool. The boundaries of a population, both in space and time, are generally not discrete and, in practice, as usually defined by the researcher (Krebbs 1994). The gene pool and breeding patterns of the 13 giant garter snake populations identified in the final rule remain unstudied and unknown. What was described as "13 populations" should therefore be described more accurately as sub-populations and occurrences that note observations of individuals about which much remains unknown (Service 2003).

Surveys over the last 25 years suggest that sub-populations of giant garter snake in the northern parts of its range (i.e., Butte, Colusa, and Sutter Counties) are relatively large and stable (Wylie *et al.* 1997; Wylie *et al.* 2003a, 2004a). Habitat corridors connecting sub-populations, however, are either not present or not protected, and urban encroachment increases as a serious threat (Service 2003). Sub-populations in Yolo, Sacramento, Solano, and San Joaquin Counties areas are small, fragmented, and threatened by urbanization (Hansen 2004; Service 2003). Those sub-populations in the San Joaquin Valley, however, are most vulnerable having suffered near-devastating declines and possible extirpations over the last two decades (including populations in Stanislaus, Merced, Madera and Fresno Counties) (Dickert 2002, 2003; Hansen 1988; Williams and Wunderlich 2003). The southern sub-populations are extremely small, distributed discontinuously in isolated patches, and therefore are highly vulnerable to extinction by random environmental, demographic, and genetic processes (Goodman 1987).

Habitat Requirements

Endemic to wetlands in the Sacramento and San Joaquin valleys, the giant garter snake inhabits marshes, sloughs, ponds, small lakes, low gradient streams, and other waterways and agricultural wetlands, such as irrigation and drainage canals, rice fields and the adjacent uplands (Service 2003). The snake feeds on small fishes, tadpoles, and frogs (Fitch 1941; Hansen 1988; Hansen and Brode 1980, 1993). Essential habitat components consist of: (1) wetlands with adequate water during the snake's active season (early-spring through mid-fall) to provide food and cover; (2) emergent, herbaceous wetland vegetation, such as cattails and bulrushes, for escape cover and foraging habitat during the active season; (3) upland habitat with grassy banks and openings in waterside vegetation for basking; and (4) higher elevation uplands for over-wintering habitat with escape cover (vegetation, burrows) and underground refugia (crevices and small mammal burrows) (Hansen 1988). Snakes are typically absent from larger rivers and other bodies of water that support introduced populations of large, predatory fish, and from wetlands with sand, gravel, or rock substrates (Hansen 1988; Hansen and Brode 1980; Rossman and Stewart 1987). Riparian woodlands do not provide suitable habitat because of excessive shade, lack of basking sites, and absence of prey populations (Hansen 1988).

Foraging Ecology

Giant garter snakes are the most aquatic garter snake species and are active foragers, feeding primarily on aquatic prey such as fish and amphibians (Fitch 1941). Historically, giant garter snake prey likely consisted of Sacramento blackfish (*Orthodon microlepidots*), thick-tailed chub (*Gila crassicauda*), and red-legged frog (*Rana aurora*) (Rossman *et al.* 1996; Service 2003). Because these prey species are no longer available (chub extinct, red-legged frog extirpated from the Central Valley, blackfish declining) the predominant food items are now introduced species such as carp (*Cyprinus carpio*), mosquito-fish (*Gambusia affinis*), larval and sub-adult bullfrogs (*Rana catesbiana*), and Pacific chorus frogs (*Pseudacris regilla*) (Fitch 1941; Hansen and Brode 1993; Rossman *et al.* 1996).

Reproductive Ecology

The giant garter snake breeding season extends through March and April, and females give birth to live young from late July through early September (Hansen and Hansen 1990). Brood size is variable, ranging from 10 to 46 individual young, with a mean of 23 individuals (Hansen and Hansen 1990). At birth, young average about 8.1 inches (20.6 centimeters) snout-to-vent length and 3 to 5 grams. Although growth rates are variable, young typically more than double in size by one year of age, and sexual maturity averages three years in males and five years for females (Service 1993).

Movements and Habitat Use

The giant garter snake is highly aquatic but also occupies a terrestrial niche (Service 2003; Wylie *et al.* 2004a). Aquatic habitat includes remnant native marshes and sloughs, restored wetlands, low gradient streams, and agricultural wetlands including rice fields and irrigation and drainage canals. Terrestrial habitat includes adjacent uplands which provide areas for basking, retreats, and over-wintering. Basking takes place in tules, cattails, saltbush, and shrubs over-hanging the

water, patches of floating vegetation including waterweed, on rice checks, and on grassy banks (Service 2003). The snake typically inhabits small mammal burrows and other soil and/or rock crevices during the colder months of winter (i.e., October to April) (Hansen and Brode 1993; Wylie *et al.* 1996; Wylie *et al.* 2003a). It also uses burrows as refuge from extreme heat during its active period (Wylie *et al.* 1997; Wylie *et al.* 2004a). While individuals usually remain in close proximity to wetland habitats, the Biological Resource Division of the U.S. Geological Survey (BRD) has documented snakes using burrows as much as 165 feet (50 meters) away from the marsh edge to escape extreme heat, and as far as 820 feet (250 meters) from the edge of marsh habitat for over-wintering habitat (Wylie *et al.* 1997). Snakes typically select burrows with sunny exposures along south and west facing slopes (Service 1993).

In studies of marked snakes in the Natomas Basin, snakes moved about 0.25 to 0.5 miles (0.4 to 0.8 kilometers) per day (Hansen and Brode 1993). Home range (area of daily activity) averages about 0.1 mile^2 (25 hectares) in both the Natomas Basin and the Colusa National Wildlife Refuge (NWR) (Wylie 1998a; Wylie *et al.* 2002). Total activity, however, varies widely between individuals; individual snakes have been documented to move up to 5 miles (8 kilometers) over a few days in response to dewatering of habitat (Wylie *et al.* 1997) and to use up to more than 8 miles (12.9 kilometers) of linear aquatic habitat over the course of a few months, and to have a home range as large as 14.5 miles^2 (3744 hectares) (Wylie and Martin 2004).

In agricultural areas, snakes were documented using rice fields in 19-20 percent of the observations, marsh habitat in 20-23 percent of observations, and canal and agricultural waterway habitats in 50-56 percent of the observations (Wylie 1998b). In the Natomas Basin, habitat used consisted almost entirely of irrigation ditches and established rice fields (Wylie 1998a; Wylie *et al.* 2004b). In the Colusa NWR, snakes were regularly found on or near edges of wetlands and ditches with vegetative cover (Wylie *et al.* 2003a). Telemetry studies also indicate that active snakes use uplands extensively; more than 31 percent of observations were in uplands (Wylie 1998b). Snakes observed in uplands during the active season were consistently near vegetative cover, particularly where cover exceeded 50 percent in the area within 1.6 feet (0.5 meter) of the snake (Wylie 1998b).

Snakes will move into restored habitat after two years. At the Colusa NWR, after two years, restoration area population estimates increased from 30 snakes per kilometer to 59-95 snakes per kilometer (Wylie *et al.* 2004a). At the Colusa Basin Drainage Canal, snakes were given three upland restoration treatments, 1) soil planted with native grasses over rock riprap, 2) soil planted with native grasses without rock, and 3) rock riprap only; snakes were most commonly found at the soil over rock riprap treatment (Wylie and Martin 2004).

Predators

Giant garter snakes are eaten by a variety of predators, including raccoons (*Procyon lotor*), striped skunks (*Mephitis mephitis*), opossums (*Didelphis virginiansa*), bull frogs (*Rana catesbiana*), hawks (*Buteo* sp.), egrets (*Casmerodius albus, Egretta thula*), and great blue herons (*Ardea herodias*) (Dickert 2003; Service 2003; Wylie *et al.* 2003c). Many areas supporting snakes have been documented to have abundant predators; however, predation does not seem to be a limiting factor in areas that provide abundant cover, high concentrations of prey items, and connectivity to a permanent water source (Hansen and Brode 1993; Wylie *et al.* 1996).

Reasons for Decline and Threats to Survival

The current distribution and abundance of the giant garter snake is much reduced from former times (Service 2003). Less than 10 percent, or approximately 319,000 acres (129,000 hectares), of the historic 4.5 million acres (1.8 million hectares) of Central Valley wetlands remain (U.S. Department of Interior 1994), of which very little provides habitat suitable for the giant garter snake. Loss of habitat due to agricultural activities and flood control have extirpated the snake from the southern one-third of its range in former wetlands associated with the historic Buena Vista, Tulare, and Kern lakebeds (Hansen 1980; Hansen and Brode 1980). These lakebeds once supported vast expanses of ideal snake habitat, consisting of cattail and bulrush dominated marshes (Service 2003). Cattail and bulrush floodplain habitat also historically typified much of the Sacramento Valley (Hinds 1952). Prior to reclamation activities beginning in the mid- to late-1800s, about 60 percent of the Sacramento Valley was subject to seasonal overflow flooding providing expansive areas of snake habitat (Hinds 1952). Valley flood wetlands are now subject to cumulative effects of upstream watershed modifications, water storage and diversion projects, as well as urban and agricultural development.

The Central Valley Project (CVP), planned by the State of California, and built and operated by the Federal Bureau of Reclamation, is the largest water management system in California. CVP and the historic water development activities that preceded it have not only resulted in the loss of all but approximately 10 percent of wetlands, they have created an ecosystem altered to such an extent that remaining wetlands, like agriculture, depend on managed water (U.S. Department of Interior 1994). The historic disturbance events associated with seasonal inundation that occur naturally in dynamic riverine, riparian, and wetland ecosystems have been largely eliminated. In addition to the highly managed water regimes, implementation of CVP has resulted in conversion of native habitats to agriculture, and has facilitated urban development through the Central Valley (Service 2003). In 1992, Congress enacted the Central Valley Project Improvement Act (CVPIA), the concerns of which include pricing and management of Central Valley water and attempting to mitigate for project impacts on fish, wildlife, and associated habitat. CVPIA, however, has been largely ineffective thus far, addressing primarily only the water needs of publicly-owned wetlands, which account for less than one-fourth of the wetlands in the Central Valley (Service 2003).

Residential and commercial growth with the Central Valley is consuming an estimated 15,000 acres of Central Valley farmland each year (American Farmland Trust 1999). In the future, this transformation is expected to accelerate. Rice fields have become important habitat for giant garter snakes, particularly associated canals and their banks for both spring and summer active behavior and winter hibernation (Hansen 2004). While within the rice fields, snakes forage in the shallow water for prey, utilizing rice plants and vegetated berms dividing rice checks for shelter and basking sites (Hansen and Brode 1993). The loss of rice land resulting from residential and commercial growth compounds the impact of direct habitat loss resulting from development itself.

Ongoing maintenance of aquatic habitats for flood control and agricultural purposes eliminates or prevents the establishment of habitat characteristics required by snakes (Hansen 1988). Such practices can fragment and isolate available habitat, prevent dispersal of snakes among habitat units, and adversely affect the availability of the snake's food items (Hansen 1988; Brode and

Hansen 1992). For example, tilling, grading, harvesting and mowing may kill or injure giant garter snakes (Service 2003; Wylie *et al.* 1997). Biocides applied to control aquatic vegetation reduce cover for the snake and may harm prey species (Wylie *et al.* 1996). Rodent control threatens the snake's upland estivation habitat (Wylie *et al.* 1996; Wylie *et al.* 2004a). Restriction of suitable habitat to water canals bordered by roadways and levee tops renders snakes vulnerable to vehicular mortality (Wylie *et al.* 1997). Materials used in construction projects (e.g., erosion control netting) can entangle and kill snakes (Stuart *et al.* 2001). Livestock grazing along the edges of water sources degrades water quality and can contribute to the elimination and reduction of available quality snake habitat (Hansen 1988). Fluctuation in rice and agricultural production affects stability and availability of habitat (Wylie and Casazza 2001; Wylie *et al.* 2003b, 2004b).

Other land use practices also currently threaten the survival of the snake. Nonnative predators, including introduced predatory game fish, bullfrogs, and domestic cats, can threaten snake populations (Dickert 2003; Wylie *et al.* 1996; Wylie *et al.* 2003c). Nonnative competitors, such as the introduced water snake (*Nerodia fasciata*) in the American River and associated tributaries near Folsom, may also threaten the giant garter snake (Stitt *et al.* 2005). Recreational activities, such as fishing, may disturb snakes and disrupt basking and foraging activities. While large areas of seemingly suitable snake habitat exist in the form of duck clubs and waterfowl management areas, water management of these areas typically does not provide the summer water needed by the species. Degraded water quality continues to be a threat to the species both on and off refuges.

The disappearance of giant garter snakes from much of the west side of the San Joaquin Valley was approximately contemporaneous with the expansion of subsurface drainage systems in this area, providing circumstantial evidence that the resulting contamination of ditches and sloughs with drainwater constituents (principally selenium) may have contributed to the demise of giant garter snake populations. Dietary uptake is the principle route of toxic exposure to selenium in wildlife, including giant garter snakes (Beckon *et al.* 2003). Many open ditches in the northern San Joaquin Valley carry subsurface drainwater with elevated concentrations of selenium. Green sunfish (*Lepomis cyanellus*) in this drainwater have been found to have concentrations of selenium ranging from 12 to 23 µp/g (Saiki 1998), within the range of concentrations associated with adverse affects on predator aquatic reptiles (Hopkins *et al.* 2002). Since 1996, subsurface drainwater has been discharged, via the Grassland Bypass Project into Mud Slough North, where selenium concentrations in small fish, including mosquito fish, frequently reach 10-15 µp/g (Beckon *et al.* 2003).

The Central Valley contains a number of endangered ecosystems due to its fertile soils, amiable climates, easy terrains, and other factors that historically have encouraged human settlement and exploitation (Noss *et al.* 2003). Environmental impacts associated with urbanization include loss of biodiversity and habitat, alternation of natural fire regimes, fragmentation of habitat from road construction, and degradation due to pollutants (Service 2003). Rapidly expanding cities within the snake's range include Chico, Yuba City, the Sacramento area, Galt, Stockton, Gustine, and Los Banos.

Status with Respect to Recovery

The revised draft recovery plan for the giant garter snake subdivides its range into three proposed recovery units (Service 2003): (1) Northern Sacramento Valley Recovery Unit; (2) Southern Sacramento Valley Recovery Unit; and (3) San Joaquin Valley Recovery Unit.

The Northern Sacramento Valley Unit at the northern end of the species' range contains sub-populations in the Butte Basin, Colusa Basin, and Sutter Basin (Service 2003). Protected snake habitat is located on State refuges and refuges of the Sacramento National Wildlife Refuge (NWR) Complex in the Colusa and Sutter Basins. Suitable snake habitat is also found in low gradient streams and along waterways associated with rice farming. This northern most recovery unit is known to support relatively large, stable sub-populations of giant garter snakes (Wylie *et al.* 1996; Wylie *et al.* 2002; Wylie *et al.* 2004a). Habitat corridors connecting subpopulations, however, are either not present or not protected.

The Southern Sacramento Valley Unit includes sub-populations in the American Basin, Yolo Basin, and Delta Basin (Service 2003). The status of Southern Sacramento Valley sub-populations is very uncertain; each is small, highly fragmented, isolated, and threatened by urbanization (Hansen 2004; Service 2003; Wylie *et al.* 2004b). The American Basin sub-population, although threatened by urban development, receives protection from the Metro Air Park and Natomas Basin Habitat Conservation Plans, which share a regional strategy to maintain a viable snake sub-population in the basin.

The San Joaquin Valley Unit includes sub-populations in the San Joaquin Basin and Tulare Basin. The San Joaquin Valley Unit formerly supported large snake populations, but numbers have severely declined, and recent survey efforts indicate numbers are extremely low compared to Sacramento Valley sub-populations (Dickert 2002, 2003; Wylie 1998a). Giant garter snakes currently occur in the northern and central San Joaquin Basin within the Grassland Wetlands, Mendota Area, and Burrel/Lanare Area. Agricultural and flood control activities are presumed to have extirpated the snake from the Tulare Basin (Hansen 1995); however, comprehensive surveys for this area are lacking and where habitat remains, the giant garter snake may be present (Service 2003).

Since 1995, BRD has been studying life history and habitat requirements of the giant garter snake within a few of the "13 populations" identified in the 1993 listing. BRD has studied snake sub-populations at the Sacramento, Delevan, and Colusa NWRs and in the Colusa Basin Drain within the Colusa Basin, at Gilsizer Slough within the Sutter Basin, at the Badger Creek area of the Cosumnes River Preserve within the Badger Creek/Willow Creek area of the Delta Basin, and in the Natomas Basin within the American Basin (Hansen 2003, 2004; Wylie 1998a, 1998b, 2003; Wylie *et al.* 1996; Wylie *et al.* 2002; Wylie *et al.* 2003a, 2004a; Wylie *et al.* 2003b, 2004b). These areas contain the largest extant giant garter snake sub-populations. Outside of protected areas, however, snakes are still subject to all threats identified in the final rule. The other sub-populations are distributed discontinuously in small, isolated patches, and are vulnerable to extirpation by stochastic environmental, demographic, and genetic processes (Goodman 1987).

Until recently, there were no post-1980 sightings of giant garter snakes from Stockton southward, and surveys of historic localities conducted in 1986 did not detect any snakes (Hansen 1988).

Since 1995, however, surveys conducted by CDFG in cooperation with BRD around Los Banos and the Volta Wildlife Area in the Grasslands, and Mendota Wildlife Area in the Mendota Area have detected snakes, but in small numbers much lower than those found in Sacramento Valley sub-populations (Dickert 2002, 2003; Williams and Wunderlich 2003; Wylie 1998a). The estimated total population size for the Volta Wildlife Area is 45 individuals, approximately only 5.6 snakes per mile (3.5 snakes per kilometer). Such low numbers are illustrative of a tenuously small snake population. Also, one-third of the giant garter snakes found had lumps on their bodies suggestive of a parasitic nematode infection (Dickert 2003); further study is underway. Ten of the 31 snakes found in 2003, however, weighed less than 40 grams indicating that giant garter snakes have been breeding at the Volta Wildlife Area. These results demonstrate that giant garter snakes are still extant in the northern San Joaquin Valley, but probably in extremely low numbers/densities. All sub-populations are isolated from each other with no protected dispersal corridors. Few opportunities for re-colonization of small sub-populations that may become extirpated exist given the isolation from larger populations and lack of dispersal corridors between them.

The revised draft recovery criteria require multiple, stable sub-populations within each of the three recovery units, with sub-populations well-connected by corridors of suitable habitat. This entails that corridors of suitable habitat between existing snake sub-populations be maintained or created to enhance sub-population interchange to offset threats to the species (Service 2003). Currently, only the Northern Sacramento Valley Recovery Unit is known to support relatively large, stable giant garter snake populations. Habitat corridors connecting sub-populations, even in the Northern Sacramento Valley Recovery Unit, are either not present or not protected. Overall, the future availability of habitat in the form of canals, ditches, and flooded fields are subject to market-driven crop choices, agricultural practices, and urban development, and are, thus, uncertain and unpredictable.

Environmental Baseline

Delta Smelt

Two annual monitoring efforts, the Spring Kodiak Trawl (SKT) and the 20-mm surveys, document the distribution of delta smelt adults and larvae, respectively, in the Central and South Delta (CDFG 2007). In addition, salvage at the SWP and CVP are used as an indicator of delta smelt presence in the South Delta. Based on the available data, the Service is reasonably certain that the delta smelt occur within the action area.

Distribution

Adult delta smelt movements upstream into the Delta from Suisun Bay starts in November/December and adults may be present through May. Salvage of adult delta smelt at the pumping facilities commonly occurs in January and occasionally in early December, showing known timing of movement of delta smelt into the South Delta. However, delta smelt likely to move into the Delta earlier than this. Salvage of adult delta smelt usually tapers off in April and rarely occurs after May. The annual SKT samples pelagic fish at several fixed stations in the Delta and usually starts in mid-January and ends in May. Stations within the Central and South Delta include stations located from the mouth of San Joaquin River through the Stockton Deep

Chip Channel south to the City of Stockton, in Middle and Old Rivers, and in Franks Tract. Of these, station 906 is located just downstream from the construction site while station 910 is located upstream (Figure 1).

The SKT surveys shows that the delta smelt can be distributed throughout the Central and South Delta, but the range and distribution of delta smelt vary widely between years. For instance, the 2007 SKT did not sample delta smelt at stations in the Central and South Delta while the 2004 SKT sampled delta smelt throughout the South Delta, including stations 906 and 910 (CDFG 2007). The factors affecting distribution may include flows in Old and Middle Rivers and flow changes in the San Joaquin River (USGS unpublished data). Further, there is a large inherent variation in the survey and the SKT may not be representative of distribution during low abundance. For instance, delta smelt were salvaged at the state and Federal pumping facilities in 2007 despite the failure to sample delta smelt in the SKT (CDFG 2007, Gartz in lit. 2007). This shows that some delta smelt had entered the South Delta in 2007. In addition, larvae may be sampled at upstream stations in the San Joaquin River even though no adult have been sampled at these stations.

Adult delta smelt is believed to spawn in the central Delta sloughs from February through August based on presence and growth rate of larvae. However, little is known of the microhabitat where spawning occurs but it has been assumed that the delta smelt spawn in shallow water areas having submersed aquatic plants and other suitable substrates and refugia. These shallow water areas have been identified in the Delta Native Fishes Recovery Plan (Recovery Plan) (Service 1996) as essential to the long-term survival and recovery of delta smelt and other resident fish. A no net loss strategy of delta smelt population and habitat is proposed in this Recovery Plan.

Once hatched, river flows and tides disperse and transport larvae throughout the Delta and eventually to the low salinity zone (2 parts per million) in the lower Delta and Suisun Bay. The CDFG annually conducts larvae and juvenile surveys, the 20-mm survey, at fixed stations throughout the Delta from March and into July (Figure 2). The survey, while collecting fish larvae less than 20 mm in size, is only fully efficient in collecting fish larvae that are of 20-mm length or longer. In early spring and summer, the delta smelt larvae and juveniles are found in the San Joaquin, Old, and Middle Rivers; by Clifton Court forebay; Franks Tract; and by the mouth of the San Joaquin River. Larvae and juveniles are commonly collected in San Joaquin River just down stream of Empire Tract (station 906) and may be collected as far upstream as the Stockton Deep Water Channel by the City of Stockton (station 912). With the exception of 2006 and 2007, when no larvae where sampled in the south Delta, the 20-mm trawl has captured larvae in the South Delta starting mid-March. Delta smelt larvae/juveniles may continue to be sampled through July. However, by mid-June, the 20-mm trawl rarely samples juveniles at stations located by or upstream of Empire Tract (CDFG 2007). Results from the 20-mm trawl shows that the juveniles continue to grow in the Central and South Delta and the majority of juvenile delta smelt sampled are 20 mm or longer by mid-June.

The summer townet abundance index is conducted during June through August throughout the Delta and measures the abundance and distribution of juvenile delta smelt. Distribution data from this survey shows that the delta smelt in summer is concentrated around Susisun Bay with no delta smelt being sampled in the south Delta (CDFG 2007).

The delta smelt is adapted to living in the highly productive Estuary where salinity varies spatially and temporally according to tidal cycles and the amount of freshwater inflow. Despite this tremendously variable environment, the historical Estuary probably offered relatively consistent spring transport flows that moved delta smelt juveniles and larvae downstream to the mixing zone (Peter Moyle, U.C. Davis pers. comm.). Since the 1850's, however, the amount and extent of suitable habitat for the delta smelt has declined dramatically. The advent in 1853 of hydraulic mining in the Sacramento and San Joaquin rivers led to increased siltation and alteration of the circulation patterns of the Estuary (Nichols *et al.* 1986, Monroe and Kelly 1992). The reclamation of Merritt Island for agricultural purposes, in the same year, marked the beginning of the present-day cumulative loss of 94 percent of the Estuary's tidal marshes (Nichols *et al.* 1986, Monroe and Kelly 1992).

Abundance

The number of adult delta smelt entering the Central and South Delta vary between years, and is likely dependent on both the overall delta smelt abundance and the proportion of the overall population that enters the San Joaquin River portion of the delta relative to the Sacramento River portion. However, it seems reasonable to assume that overall abundance also will influence central and south Delta abundance. The summer townet (STN) survey abundance index has, except for three years since 1983 (1986, 1993, and 1994), remained at consistently lower levels than experienced previously (Figure 1). Besides measuring abundance and distribution, the summer townet abundance index also provides data on the recruitment potential of the species. The fall midwater trawl (FMWT) provides an indication of the abundance of the adult population just prior to upstream spawning migration. Indicia for the delta smelt FMWT index can vary dramatically between years, e.g. the 1993 index was 1073 while the 1994 index dropped to 102 (Figure 2). Some of this variation is likely related to inherent variation in the sampling method. However, as noted in the status of the species section, peak delta smelt indicia have been consistently lower after 1983 than pre 1983. Further, delta smelt indicia from 2001 to current have consistently been among the lowest ever recorded (Figure 1 and 2). The FMWT index does not provide information on specific areas of the Delta, and how the index relates to adult delta smelt abundance in the Central and South Delta is not clear.

The distribution of delta smelt in the Delta will also affect the abundance of the fish in the Central and South Delta. For instance, in 2004 adult delta smelt seemed distributed throughout the Delta, including station 906 and 910, while in 2007 most adult delta smelt were mainly found in Montezuma Slough, Sacramento River, and Sacramento Deep Water Ship Channel of the north Delta (SKT survey: CDFG 2007). Thus, the combination of a very low overall population abundance and patchy distribution likely resulted in very low numbers of adult delta smelt in the South Delta during 2005/2006 and 2006/2007.

In addition to the degradation and loss of estuarine habitat, the delta smelt has been increasingly subject to entrainment, upstream or reverse flows of waters in the Delta and San Joaquin River, and constriction of low salinity habitat to deep-water river channels of the interior Delta (Moyle *et al.* 1992). These adverse conditions are primarily a result of drought and the steadily increasing proportion of river flow being diverted from the Delta by the CVP and SWP (Monroe and Kelly 1992). There is a relationship between the portion of the delta smelt population west of the Delta as sampled in the STN survey and the natural logarithm of Delta outflow from 1959

to 1988 (Department of Water Resources and U.S. Bureau of Reclamation 1994). This relationship indicates that the STN index increased dramatically when outflow was between 34,000 and 48,000 cfs which placed X2 between Chipps and Roe islands. Placement of X2 downstream of the Confluence, and Chipps and Roe islands provides delta smelt with low salinity and protection from entrainment, allowing for productive rearing habitat that increases both smelt abundance and distribution.

Giant Garter Snake

The proposed project is located within the Delta Basin snake population, in the Southern Sacramento Valley Recovery Unit (Service 2003). Twenty-five California Natural Diversity Database (CNDDB) (2007) records are known from the Delta Basin. These records include Laguna Creek, Morrison Creek, Snodgrass Slough, Beach Lake, creeks in the City of Elk Grove, Badger and Willow Creeks, Consumnes River Preserve, Caldoni Marsh, White Slough, Duck Creek and other locations within the Basin.

During a field reconnaissance in April 2002, a giant garter snake was observed on the southwestern levee of Webb Tract. Since then, habitat evaluations and snake surveys have been conducted on Webb Tract and Bacon Island (Patterson 2004; Patterson and Hansen 2003). Potential snake habitat in the area exists in the form of contiguous linear irrigation canals and ditches. However, although both islands possess the essential snake habitat components, two years of surveys resulted in no further sightings or capture of giant garter snakes.

Recent genetic work on giant garter snake population structure indicates three genetic entities within the species which follow the pattern of subdivision revealed by the snake's mitochondrial DNA and color pattern variants: north, central, and south (Paquin 2001). Interestingly, evidence of historical gene flow between northern and southern populations exists; however, mitochondrial DNA data reveal that the central population, analogous to the Delta Basin, is genetically isolated from both northern and southern populations. High frequencies of unique haplotypes in the central population increase the conservation value for the Delta Basin, particularly as a source for giant garter snake genetic diversity.

Laguna and Morrison Creek, Duck Creek, the Elk Grove creeks, as well as Beach Lake, Snodgrass Slough, Caldoni Marsh, White Slough and associated tributaries, are important snake habitat and movement corridors for the animal. Such waterways and associated wetlands provide vital permanent aquatic and upland habitat for snakes in areas with otherwise limited habitat. The recovery strategy for the snake includes maintenance and/or creation of habitat corridors between existing sub-populations to enhance population interchange and offset threats to the species (Service 2003).

None of the potential habitat in the Action Area has been surveyed for the presence of giant garter snakes. According to the California Natural Diversity Database (CNDDB 2007), a giant garter snake skin was found on Medford Island, approximately 1.5 miles away from the proposed intake structure. CNDDB contains records of giant garter snakes at the White Slough Wildlife Management Area and Caldoni Marsh, approximately 2.5 miles north of Eight Mile Road. These occurrences are presumed to be extant. A giant garter snake was observed in 1976 at the intersection of Eight Mile Road and the Western Pacific Railroad tracks in the immediate vicinity

of the pipeline construction area. The current status of this occurrence is unknown.

Snakes have been documented to move up to 5 miles (8 kilometers) over a few days in response to dewatering of habitat (Wylie *et al.* 1997) and to use up to more than 8 miles (12.9 kilometers) of linear aquatic habitat over the course of a few months, and to have a home range as large as 14.5 miles^2 (3744 hectares) (Wylie and Martin 2004). Although giant garter snakes are typically absent from larger rivers (R. W. Hansen 1980, Rossman and Stewart 1987, Brode 1988, G. Hansen 1988), individuals may occur in the San Joaquin River that have been washed down during heavy rainfall events from ditches and sloughs at higher elevations. The action area contains habitat components that can be used by the snake for feeding, resting, mating, and other essential behaviors, as well as for a movement corridor. Because of the biology and ecology of the snake, the presence of suitable habitat within the proposed project, and observations of the species, the Service has determined that the snake is reasonably certain to occur within the action area.

Factors Affecting the Snake within the Action Area:

The overall status of the giant garter snake has not improved since its listing. Based on scarcity of suitable habitat and limited population size, at listing, threats to the Delta Basin population were considered imminent (Service 1993). The status of the Delta Basin sub-population has been, and continues to be, impacted by past and present Federal, state, private, and other human activities.

A number of State, local, private, and unrelated Federal actions have occurred within the action area and adjacent regions affecting the environmental baseline of the species. Some of these projects have been subject to prior section 7 consultation. These actions have resulted in both direct and indirect effects to snake habitat within the region. Projects affecting the environment in and around the action area include the improvement of the Northgate Boulevard/Arden-Garden Connector Intersection, the widening of Bond Road, construction of the Interstate 5/Consumnes River Boulevard Interchange, the Freeport Regional Water Diversion project, the Rivermont Drive Bridge project, the Rio Vista Northwest Wastewater Treatment project, the widening of Calvine Road, and the Kramer Ranch North project. In the past ten years, the Service has authorized take resulting in the permanent loss of more than 21 acres (9 hectares) of aquatic and 53 acres (22 hectare) of upland snake habitat, as well as temporary alteration of over 1,700 acres (688 hectares) of aquatic and 650 acres (263 hectares) of upland snake habitat in the Delta Basin.

Numerous recent development projects have been constructed in or near snake habitat in the rapidly developing areas in and around the cities of Sacramento, Elk Grove, Galt, and Stockton. Urban and commercial development results in direct habitat loss and also may expose snakes to secondary effects including water pollution from urban run-off and increased vehicular mortality, both of which act in concert with rapid habitat loss and degradation to further threaten the snake in the Delta Basin. Also, development promotes road widening and bridge replacements, such as those authorized under section 7, which result in direct alteration of snake habitat. Most documented snake localities and/or movement corridors have been adversely impacted by development, including freeway construction, flood control projects, and commercial development. Further, several former localities are known to have been lost and/or depleted to that extent that continued viability is in question (Brode and Hansen 1992). The scarcity of

remaining suitable habitat, flooding, stochastic processes, and continued threats of habitat loss pose a severe imminent threat to giant garter snakes in the Delta Basin.

Ongoing agricultural and flood control activities in the Delta Basin may decrease and degrade the remaining snake habitat affecting the environmental baseline for the snake. Such activities are largely not subject to section 7 consultation. Although rice fields and agricultural waterways can provide valuable seasonal foraging and upland habitat for the snake, agricultural activities such as waterway maintenance, weed abatement, rodent control, and discharge of contaminants into wetlands and waterways can degrade snake habitat and increase the risk of snake mortality (Service 2003). On-going maintenance of agricultural waterways can also eliminate or prevent establishment of snake habitat, eliminate food resources for the snake, and fragment existing habitat and prevent dispersal of snakes (Service 2003).

Flood control and maintenance activities which can result in snake mortality and degradation of habitat include levee construction, stream channelization, and rip-rapping of streams and canals (Service 2003). Flood control programs are administered by the U.S. Army Corps of Engineers (Corps), and the Corps has typically consulted on previous projects and is expected to continue to do so for future projects. The ongoing nature of these activities and the administration under various programs, however, makes it difficult to determine the continuing and accumulative effects of these activities.

In addition to projects already discussed, projects affecting the environment in and around the action area include transportation projects with Federal, county, or local involvement. The Federal Highway Administration and/or the Corps have consulted with the Service on the issuance of wetland fill permits for several transportation-related projects within the Delta Basin that affected snake habitat. The direct effect of these projects is often small and localized, but the effects of transportation projects, which improve access and therefore indirectly affect snakes by facilitating further development of habitat in the area and by increasing snake mortality via vehicles, are not quantifiable.

Effects of the Proposed Project on Delta Smelt and its Critical Habitat

The effects of the proposed project will fall into two main categories: the short-term construction related effects and the persistent long-term effects of the DWSP operations. The short-term effects are related to construction of facilities and pipelines, long-term effects relates to diversion of Delta water and loss of habitat at the DWSP intake.

Construction of DWSP Facilities

Construction of the DWSP intake includes dredging of the river channel bottom and bank, installation of wing walls and a cofferdam, application of rock rip-rap to the wing walls, and dewatering of the construction zone. These construction activities could adversely affect delta smelt by entrainment, injury or death by high energy sound waves, and by mobilizing sediment. As noted above, about 6,700 cubic yards of material will be dredged and this activity could result in dredging equipment entraining delta smelt, resulting in injury or death. However, the project's in-water work is of short duration (i.e. expected to last approximately 11 weeks) and is scheduled to occur from July 1 through November 30. This will minimize effects from construction since

delta smelt is not expected to be present or be present in small numbers in the San Joaquin River during the period from August through November. However, delta smelt are commonly present in June and July and some delta smelt may be present year round. Further, if the timeline of the construction activities slip so that construction is initiated later in the work window, the risk of exposing delta smelt to adverse conditions of the construction activities increase due to the higher probability of delta smelt entering the action area during upstream spawning movements starting in early winter.

Disturbance and Loss of Habitat

Construction of the intake structure would involve the limited dredging of material in the San Joaquin River and adjacent levee and placing fill including concrete and riprap. Approximately 6,900 cubic yards of material will be dredged and about 2133 cubic yards of fill will be placed in the San Joaquin River. The maximum permanent impact to riverine and shallow water habitat is anticipated to be 0.44 acre. Approximately 761 linear feet of San Joaquin River shoreline would be affected.

The removal of shallow water edge habitat and riparian vegetation, sources of zooplankton and maroinvertebrate production, respectively, may result in the loss of foraging opportunities. It may also cause a reduction in shade that would contribute to increased water temperatures within the San Joaquin River, providing increased susceptibility to disease and introduced species competition. Increased erosion after removal of riparian vegetation would lead to sedimentation in the aquatic environment. These factors may result in reduced viability for the delta smelt. SJCOG will use the fees that the City of Stockton paid to participate in the SJMSCP to purchase similar habitat and manage this habitat for the benefit of the covered species to compensate for the effects from the construction of the intake structure.

Effects of Sediment Mobilization and Contaminants

Dredging and pile driving will mobilize sediment and this can be harmful to delta smelt, their prey species, and the habitat they depend on. In-water construction would be isolated by a cofferdam and consequently minimize effects from mobilized sediment on delta smelt. However, preconstruction dredging and cofferdam construction are expected to temporarily increase suspended sediment concentrations within a localized area of the lower San Joaquin River. The area temporarily affected would be about 5.7 acres in size (approximately 250 feet wide and 1,000 feet long, based on experience at the recently constructed fish screen in the Sacramento River). These effects would occur for about 60 days for about eight to 10 hours per day, when cofferdam construction activity may disturb sediments and increase turbidity. The proposed instream work window for the DWSP intake, July 1 to November 30, will minimize the duration that delta smelt exposure to mobilized sediments.

Increased turbidity can harm fish directly by damaging gills or indirectly by reducing a fish's ability to detect and avoid a predator. However, the activity is expected to increase turbidity level with less than ten percent of background level. Smelt species distribution is commonly associated with higher turbidity water and it is unlikely that a ten percent increase above existing background levels will adversely affect the delta smelt.

Bottom sediment may also contain toxins (Hunt *et al.* 2001) that could be mobilized during dredging. For instance, substances found in sediment from the San Joaquin River and its tributaries include polycyclic aromatic hydrocarbons (PAHs), and DDT and its degradates (Pereira *et al.* 1996). Suspended sediments contained elevated amounts of chlordane, a chemical group widely applied for control of termites and other pests until the late 1980s, while trace levels of triazine herbicides atrazine, and simazine were present in the water at most sites. Hunt *et al.* (2001) found chlordane and a variety of other compounds in sediment throughout the Delta at levels toxic to aquatic organisms, and Werner *et al.* (2000) identified significant mortality and reproductive toxicity in zooplankton that were consistent with level of pesticides in the water samples. An immense variety of substances could also be introduced during accidental spills of materials. Such spills can result from small containers falling over, or from accidents resulting in whole loads being spilled. Large spills may be partially or completely mitigated by clean-up efforts, depending on the substance.

Exposure pathways to contaminants include uptake through gills, dermal contact, direct ingestion, ingestion of contaminated soil or plants, or consumption of contaminated prey. Exposure to contaminants could cause short- or long-term morbidity, possibly resulting in reduced productivity or mortality. Carcinogenic substances could cause genetic damage resulting in sterility, reduced productivity, or reduced fitness among progeny. Contaminants also may have the same effect on prey species. This could result in reduced prey abundance and diminished local carrying capacity. The effects of contaminants may be difficult to detect. Morbidity or mortality likely would occur after the animals had left the contaminated site, and more subtle effects such as genetic damage could only be detected through intensive study and monitoring.

Based on delta smelt surveys by the CDFG, delta smelt are expected to either not be present at the construction site or be present in very low numbers during the period from August through October (CDFG 2007). Thus, delta smelt exposure to mobilized sediment from instream activities will be limited to larvae and juveniles in July and adult delta smelt in November. Even during those times only a low number of delta smelt, a fraction of the population, would be expected to be exposed to sediment mobilization related to construction activities. If the construction schedule is changed, then a considerably lager number of delta smelt could be exposed. Dredging and pile driving could result in a reduction in prey since the level of contaminants in the Delta could be toxic to zooplankton (Werner *et al.* 2000, Hunt *et al.* 2001). However, prey species such as zooplankton is expected to be replaced by upstream sources, surrounding sloughs and shallow water habitat, or be brought in from downstream areas by tidal movement by the time of delta smelt up-estuary movements in late fall/early winter. The area expected to be affected by the sediment plume is small relative to the total area of the south Delta and any effect on aquatic organisms is not expected to result in a measurable overall reduction in food available for delta smelt.

Effects of Acoustic Noise from Pile Driving

The installation of the sheet pile cofferdam and wing walls along the perimeter of the intake structure work zone will require the use of a percussion pile driver or vibratory pile driver to drive the steel sheet into the substrate of the river bottom. The wing walls will extend out 60 feet from the existing levee bank into the channel of the San Joaquin River at an angle. The

cofferdam will close off the mouth of the intake structure, allowing the workspace behind it to be dewatered. Following the installation and dewatering of the work area, concrete pilings will be driven into the excavated work area to support the intake structure and fish screen racks.

High levels of acoustic noise have been shown to have adverse effects upon fish within close proximity of the noise source. The City has indicated that the pile driving activity for the sheet pile installation will take place over a period of three weeks. Sheet and concrete piles are driven into the substrate until predetermined level of resistance is encountered by the hammer. Energy transferred to the pile by the hammer is partially redirected as acoustic energy and heat as the pile loses energy to the surrounding medium (i.e., soil or rock). The energy can be transmitted directly from the piles to the surrounding water, via air surrounding the pile to the water, or being transmitted through the soil to the water column.

As sound propagates away from the source, several factors change its amplitude (Burgess and Blackwell 2003). These factors include spreading of the sound wave over a wider area (spreading loss), sound energy waves transition from one medium to another (*e.g.* from air to water), loss to friction between the water or sediment particles that vibrate with the passing sound wave (absorption), scattering and reflection from boundaries and objects in the sound's path, and constructive and destructive interference with reflections of the sound off surfaces such as the seafloor or water surface. The sound level measured at any give point along the path or the propagated sound wave includes all of these effects and is termed the received level. Thus, variables that affect the received level include the distance from the source, the density of the media such as saltwater versus freshwater (i.e., salinity), the amount of air in the water, bottom substrate composition and texture, salinity stratification and size and number of waves on the water surface, objects in the sound waves path, and ambient noise. Because of the many variables affecting propagation and loss of sound energy, it is difficult to estimate the sound level that will be measured at any given point.

The project location has several factors which may alter the transmission of the propagated sound waves into the channel of the San Joaquin River during the pile driving activities. The channel depth varies over a wide range in the reach adjacent to the project site. Along the levee bank, the depth drops of rapidly to approximately 20 feet in depth. The dredged ship channel, which is approximately 35 feet deep at low tide, passes to the south of the project site. These changes in bottom contours will create conditions that will attenuate the propagation of sound through the channel (null spots). In addition, ambient noise from the river flow, boat traffic, and irregular surfaces such as the rip rapped surface of the levees may create additional acoustic signals that muffle or cancel out the acoustic signal from the pile driving actions (masking). Installation of the concrete support pilings for the intake structure is anticipated to take place in dewatered work area behind the cofferdam. The dewatered cofferdam is expected to provide for sound attenuation and the acoustic noise derived from the pile driving of the concrete support piles is expected to primarily be propagated through the soil to the aquatic environment, rather than through the air.

Based on previous results from pile driving, the Service believes that the source acoustic signal will be in excess of 180 decibel (dB)(re: 1 μPa) for percussion hammers. Data derived from concrete piles driven at the Pier 95 Amport facility and the Concord Naval Weapons Depot in Susisun Bay both indicated pile driving noise levels exceeded 170 to 180 dB re: 1 uPa 10 meters

from the pile at three meters depth. A report by Burgess and Blackwell (2003) indicated that vibratory installation of a sheet pile wall in upland position generated sound levels of approximately 140 dB re: 1 re: 1 μPa in the adjacent waterway at a distance of 200 feet, indicating that noise was transmitted through the soil to the water column. All underwater sound measurements discussed in this document are in reference to 1 re: 1 μPa and thus the reference to 1 re: 1 μPa will be omitted hereafter.

High underwater sound pressure levels have been known to cause swim bladder rupture, hemorrhaged eyes and internal organs, loss of hearing, temporary stunning, and alterations in behavior of fish (e.g., Yelverton *et al.* 1975; Turnpenny *et al.* 1994; Hastings *et al.* 1996a and b). However, Hastings and Popper (2005, 2006) concluded, based on an extensive literature review, that the available scientific and commercial data are inadequate for providing more than very preliminary conclusions on the effects of pile driving noise on fish.

Sound is the major form of communication underwater, so a functioning auditory system is believed to be essential for fish to survive. Damage to the auditory system may adversely affect a delta smelt's ability to orient itself, detect predators, locate prey, or sense their acoustic environment. Little is known about the effect of pile driving on the auditory system of fish and hearing damage depends on the auditory threshold, which varies from species to species. However, studies show that elevated sound can affect the hearing capabilities of fish much the same way as for other vertebrae. Experiments exposing oscar (*Astronotus ocellatus)* to continuous sound for one hour at 180 dB_{peak} at 300 Hz found destruction of sensory cells in the fish's inner ear (Hastings *et al.* 1996b). McCauley *et al.* (2003) found indication that high-energy noise sources (at approximately 180 dB_{max}) can ablate the sensory hairs on the inner ear epithelial tissue of pink snapper (*Chrysophrys auratus*).

Sound pressure waves from pile driving can result in damage and injury to organs and tissue of fish. Fishes with swimbladders (which include the delta smelt) are sensitive to underwater impulsive sounds (i.e., sounds with a sharp sound pressure peak occurring in a short interval of time) because of swimbladder resonance, which is believed to occur in the frequency band of most sensitive hearing (usually 200 to 800 Hz). Pathologies associated with very high sound levels are collectively known as barotraumas.

Barotraumas include hemorrhage and rupture of internal organs, including the swimbladder and kidneys of the fish. The injury is caused as sound waves passes through the fish, thereby resulting in the resonance of the fish swimbladder. The swimbladder is a gas-filled organ in the center of the body cavity bordered by the kidney above and the liver and other internal organs below. Because of the acoustic impedance of aquatic animal tissue nearly matches that of water, sound energy from an underwater source readily enters their body. As the sound wave passes through the fish, the swimbladder starts to resonance resulting in rhythmic expansion and retraction of the swimbladder. At relatively low sound levels the swimbladder expands and retract without causing damage. At high sound pressure levels associated with pile driving, the abrupt and repeated expansion and retraction of the swimbladder hammer internal organs, tear at adjacent connected tissue, and rupture capillaries.

Another mechanism of injury and death is "rectified diffusion," which is the formation and growth of bubbles in tissue caused by oscillation in the sound pressure as the sound wave passes

the fish. The acoustic oscillation causes bubble growth in tissue because of the rapid change in pressure much like diver's disease or bends. As the pressure wave passes though the fish, the high pressure component of the wave shifts to the low pressure component causing gases dissolved in the blood or tissue to come out of physical solution and form gas bubbles. These bubbles increase in size as pressure waves continues to pas through the fish and will eventually cause inflammation, cellular damage, and blockage or rupture of capillaries, veins, and arteries. Hastings (2002) expects little to no physical damage to aquatic animals for peak sound pressures below 190 dB, the threshold for rectified diffusion. However, much uncertainty exists as to the level of adverse effects to fish exposed to sound between 180 and 190 dB_{peak} due to species-specific variables.

Recent pile driving experiments using juvenile steelhead (*O. mykiss*) and surfperch (family Embiotocidae) found no barotraumas with exposure to peak sound pressure levels as high as 211 dB (Caltrans 2004) and no statistically significant mortality at sound exposure levels (SEL) as high as 182 dB re: $1\mu Pa^2$ s (Caltrans 2004). Interim recommendations by Popper *et al.* (2006) suggest using a combined single strike criteria for pile driving noise; a peak sound pressure of 208 dB_{peak} and an SEL of 187 dB $1\mu Pa^2$ s. However, the effects to fishes of the high sound pressure levels produced by impact driving of piles depend on several factors, including the size and species of fish. Smaller fish are commonly more vulnerable to injury from sound pressure waves than larger fish. Most studies on the effect on fish and threshold sound pressure levels in California have been centered on regulations based on protection of salmonids. Depending on the time of pile driving, delta smelt in the channel adjacent to the pile driving will range in size from about 30 mm in July to 40 to 70 mm adults in November. Thus, it is expected that the effect on the delta smelt will be higher than that on the larger juvenile salmonids. Based on this information and that more information is needed to understand the effect of pile driving on delta smelt and fish in general, the Service has established the threshold for physical harm at 180 dB_{peak} for this project. Thus, driving of sheet piles and concrete piles is expected to injure or kill any delta smelt that are present within the channel at the project location during pile driving.

In addition to direct trauma, introduction of sound into aquatic environments may mask important signals as well as elevate stress levels, thereby affecting fitness and increasing likelihood of predation (Hastings and Popper 2005). Sound pressure levels expressed as "root-mean-squared" (rms) values are commonly used in behavioral studies. Sound pressure levels in excess of 150 dB_{rms} are expected to cause temporary behavioral changes such as elicitation of a startle response or behavior associated with stress. These sound pressure levels are not expected to cause direct permanent injury, but may decrease a fish's ability to avoid predators. Observations by Feist, *et al.* (1992) suggest that sound levels in this range may disrupt normal migratory behavior of juvenile salmon. They also noted that when exposed to the sounds from pile driving, juvenile pink and chum salmon were less likely to startle and flee when approached by an observer than were those that were shielded from the sounds. Sound may similarly affect the delta smelt. Based on this information, the Service has established the threshold for behavioral disruption at 150 dB_{rms} for the proposed DWSP project.

Effects of dewatering

Once the sheet piles are established, the City proposes to dewater the work area enclosed by the cofferdam. Delta smelt may enter the work area behind the cofferdam before the cofferdam is

completed. Thus, as the cofferdam is dewatered, delta smelt enclosed by the cofferdam will succumb. To minimize loss of listed species during dewatering, the City proposes to capture and relocate fish within the cofferdam as it is dewatered. However, capture, handle, transport, and release of the delicate delta smelt may also result in some injury or mortality and expose the fish to predators as they are released back into the river. The delta smelt is also likely to be disoriented when released, thereby increasing their vulnerability to predators. Thus, even though capturing and relocating the fish will reduce loss, the proposed dewatering is still expected to result in some mortality of delta smelt if present within the cofferdam. However, delta smelt is not expected to be present at the intake site if construction activities are conducted during the proposed work window.

Operation of the DWSP Intake

Operation of the DWSP Intake facility will affect the delta smelt directly through entrainment of fish and indirectly by changes in hydrology. The former will be localized and concentrated to delta smelt in the near vicinity of the intake while the latter could affect delta smelt throughout the South and Central Delta.

Effects of Entrainment

The fish screen for the DWSP were designed utilizing the criteria recommended for protection of juvenile salmonids and delta smelt (Service 1995, CDFG 2000b). The flat plate style fish screens will be installed at a slight angle from vertical, facilitating cleaning and debris removal. It will be oriented parallel to the ambient flow in the river for both upstream and downstream directions of tidal flow (i.e., essentially parallel to the bank). Transitions from the upstream and downstream wing walls will be constructed so as to minimize the creation of eddies or turbulent flow that could concentrate delta smelt or provide a predator holding zone for ambush attacks of delta smelt passing by the screen. The screen is designed to have an approach velocity equal to or less than 0.2 fps (~ 6 cm/s). Tuning vanes behind the screen will allow for adjustment of the approach velocity to equalize flow patterns across the face of the screen and to minimize any "hot" spots which may occur. The screen will be designed to have openings no more than 1.75 mm wide.

The fish screen's 1.75 mm screen mesh is expected to exclude from the intake delta smelt that are 25-mm long or longer. Thus, operating the DSWP intake will directly affect the delta smelt by entraining delta smelt less than 25-mm long (larvae) and impinging larger delta smelt to the fish screen (juveniles and adults). To minimize impingement fish screen is designed to meet criterion for protection of delta smelt with approach velocities not exceeding 0.2 fps and sweeping velocities exceeding 0.4 fps (~ 12 cm/s) (Service 1995, CDFG 2000b).

Effects to Juvenile and Adult Delta Smelt. The degree at which 25-mm long or longer delta smelt will contact and impinging with the fish screen and consequently be injured depends on the exposure time to the screen, screen approach and sweeping velocity, and the behavior of the fish (Swanson *et al.* 2005, White *et al.* 2007). Studies of fish behavior to the flow plume in experimental chambers showed that delta smelt at 40 to 60 mm length swam against the water current in near-screen flows and that the fish increased their swimming efforts as a response to higher sweeping velocities (Swanson *et al.* 1998, 2005). The fish also swam faster (more effort)

during day than during the night. In the experiments, delta smelt were transported with the current when sweeping velocities exceeded their swimming capacity. Consequently, the time it takes for a delta smelt to pass by a screen of a finite length is related to sweeping velocity, and screen passage velocity should be higher during night than during day. However, delta smelt also swam closer to the channel bottom and farther away from the screen at higher sweeping velocities, probably seeking a velocity refuge (Swanson *et al.* 1998). Thus it seems like the fish at times are trying to hold position against the current by increasing swimming velocity and seeking areas with less water velocity.

The exposure time to the proposed DWSP intake fish screen can be estimated based on the sweeping velocity and length of the fish screen. For the 30 mgd build out, the fish screen needs to be a minimum 235 square feet large to achieve an approach velocity of 0.2 fps at the pumping rate of 47 cfs (CDFG 2000). Thus, the Service estimates the screen will be from 15- to 30-foot long. The designed sweeping velocity for the Stockton DWSP is 0.4 fps. However, due to tidal flow in the San Joaquin River at the site of the DWSP, the sweeping velocity can only be met approximately 80 to 85 percent of the time at the intake site. These departures from the necessary sweeping velocity occur during slack tide periods when the tidal flow changes from flood tide to ebb tide. The amount of time during the day when the sweeping flow does not meet the design criteria of the fish screen is equal to approximately four hours, with approximately two hours of not demonstrable sweeping velocity at all (15 minutes of slack water before and after the peak tidal oscillation, four times a day). The designed sweeping velocities are at or lower than the expected swimming velocity for delta smelt. Thus, an adult delta smelt is expected to maintain position during targeted sweeping flows or move against the flow. Estimated maximum screen passage velocity for an adult delta smelt (i.e., the distance the fish move along the screen per time unit) during the day at zero sweeping velocity is about 20 cm/s (Swanson *et al.* 2005). This relates to a minimum exposure time of two and a half minutes for an adult delta smelt swimming along a 30-meter long screen during tidal change. At night, under experimental conditions with sweeping flows of 0 cm/s, delta smelt maintained their position or moved pass the screen at an "upstream" direction at a velocity of about 10 cm/s (Swanson *et al.* 2005). At sweeping velocities of 31 and 62 cm/s, delta smelt was carried with the currents at higher screen passage velocities during night than during the day. Thus, the delta smelt is expected to be exposed to the screen for a substantially longer duration during the night than during the day.

The delta smelt is also expected to show some behavioral response to tidal fluctuations (Bennett *et al.* 2002). Adult delta smelt moving upstream to spawn are believed to use the tidal fluctuation to support upstream movement. Delta smelt are believed to move into the water column and swim with the current during flood tide and hold position by swimming against the current during ebb tide. The delta smelt may also move closer to the bottom or banks to seek velocity refuge during ebb tide. Thus, the delta smelt is expected to be briefly exposed to the DSWP intake during flood tide while they may be exposed to the intake for considerable time during ebb tide.

Fish close to the fish screen are exposed to periodic contact with the screen and may be impinged against it. Experiments in the Fish Treadmill at the University of California, Davis, exposed delta smelt to a simulated fish screen in a large annular flume (Swanson *et al.* 1998, 2005; White *et al.* 2007). Delta smelt experienced brief contact with the screen at all flow treatments and screen contact rates increased with both approach and resultant velocity (the vector sum of the

sweeping and approach velocities). However, contact duration was shorter in the absence of sweeping flow than under high-velocity flow conditions (White *et al.* 2007). Contact rates increased during night, consistent with the observed reduction in swimming velocity, but not with temperature (Swanson *et al.* 2005). Mean contact rate with a 6 cm/s approach velocity and 31 cm/s (~ 1.0 fps) sweeping velocity ranged from 0.023 to 0.047 contacts per fish per minute (White *et al.* 2007). At zero sweeping velocity the contact rate was 0.028. Most delta smelt contacted the screen broadside with the tail first. In 34 percent of recorded incidents, the fish impacted the screen head first (White *et al.* 2007).

The behavioral response to the simulated fish screen and experimental velocities was somewhat similar to what has been observed with juvenile Chinook salmon. However, the two species differed markedly in their response to flow velocities and effects of screen contact and injuries. Contact with the screen decreased with increasing flow and swimming velocity for Chinook salmon while it increased for delta smelt; delta smelt also experienced more high velocity screen contact. The difference may be a result of swimming behavior and strength between the two species. Further, while the rate of contact for Chinook salmon during night was similar to contact rate for delta smelt during day, delta smelt sustained more injuries and had a higher mortality rate. Injuries included scale loss, fin damage, abrasions, hemorrhage, and stress. The magnitude of injury to delta smelt depended on the frequency of contact and severity of contact, the former being a function of exposure time and flow and the latter mainly of approach velocity (Swanson *et al.* 1998, 2005). However, low injury rate was sustained at velocity treatments similar to design flows proposed for the DWSP and no fish were impinged. Based on results from the Fish Treadmill studies, Swanson *et al.* (2005) estimated five percent mortality at night and zero mortality during day for a 100 meter long screen with approach and sweeping velocities similar to the designed flow for the DWSP intake fish screen. The mortality rate may, however, be higher for fish smaller than those used in these experiments.

The mainstem San Joaquin River channel at the intake location is about 600 feet wide at its narrowest point and only delta smelt a few feet from the screen will be in danger of being impinged on the fish screen. The face of the intake with the screen will provide a vertical clean surface to a depth of 15 feet and therefore not provide habitat features that would attract delta smelt. Since delta smelt is expected to use the open water of the river channel, only a fraction of juvenile and adult delta smelt using the channel will be directly affected by the proposed DWSP intake.

Larvae Delta Smelt. The length of time a larvae is exposed to the fish screen is based on the sweeping velocity and the length of the fish screen. With an estimated fish screen length of 30 feet the estimated exposure time will be 75 seconds based on the 0.4 sweeping velocity. The distance a passive particle is affected by the water intake is a function of pumping capacity and the effective surface area that the particle is passing through, which determine the approach velocity of particles at different distances from the screen face under different pumping rates. The City estimates that the area of influence for a passively drifting delta smelt larvae is two feet or closer from the screen (ESA 2006b).

The number of larvae entrained at the DWSP intake location will depend on the volume of water being diverted and the average number of larvae or juveniles in a given volume of water (i.e., delta smelt density) at any given time. Larvae density near the proposed DWSP diversion will

vary from year to year according to overall numbers of delta smelt in the Delta and the proportion of females spawning in the central and south Delta. However, the proportion of the total population presented at the intake location is expected to be low. For instance, a total of 102 delta smelt were sampled in the 20-mm trawl at the station near the proposed diversion site (station 906: Figure 4) in 1999 but this represented only 10 percent of the 1,020 delta smelt sampled in the whole of the Delta the same year. Similarly in a year with low abundance, such as 2005, only 5 delta smelt were collected at station 906 by the 20-mm trawl compared to a total of 598 delta smelt larvae sampled for the whole Delta.

Number of delta smelt larvae and juveniles collected in the 20-mm trawl usually peaks late April and early May (Stern in lit. September 5, 2006). The proposed reduction in pumping between March 15 to April 15 and between May 21 and June 20 and closedown of pumps between April 16 and May 20 will significantly reduce delta smelt exposure to water diversions. For instance, in 2005 larvae were collected at stations 906 and 910 between March 14 and May 23, the period when pumping restrictions would have been in place. During the years of survey, larvae have never been collected at station 906 after June 21 (DFG 2007).

The size of larva fish vulnerable to entrainment at a fish screen is a function of the slot opening of the screen mesh and size (length and depth) of the fish. Entrainment of delta smelt larvae at fish screens has not been studied, and the relationship between fish length and the effectiveness of various mesh openings in physically excluding fish from entrainment differs for fish species with different body shapes. Hanson Environmental and ESA (Stern in lit. February 24, 2006 – Attachment B) therefore used the data developed for larval bay anchovy (*Anchoa mitchilli*) to analyze entrainment of delta smelt larvae at the DWSP intake since larvae of this species resembles the body shape of delta smelt.

Stern (in lit. February 24, 2006 – Attachment B) assumed that screens with a 2 mm screen mesh will exclude zero percent of delta smelt larvae 4 mm long or less, 56 percent of larvae 5 to 7 mm long, 78 percent of larvae 8 to 10 and 11 to 14 mm long, and 80 percent of larvae 15 mm and greater in length. Using results from the CDFG 20-mm surveys and the Delta Smelt Larvae Survey (DSLS) conducted in 2005, Hanson Environmental and ESA (2006) estimated that the highest larvae densities in the vicinity of the proposed DWSP intake occurred between mid-March to mid-June. Applying these results to delta smelt and using larvae densities recorded from CDFG's 20-mm surveys, Hanson Environmental, Inc. calculated entrainment of different size classes assuming a curtailment of pumping from April 15 to May 15 and a diversion of 100.6 AF/day for the remaining year (Stern in lit. February 24, 2006 – Attachment B)(Table 1). However, the number entrained is expected to be substantially lower because Hanson Environmental, Inc. did not include a lowered pumping rate from March 15 to April 15 and from May 16 to June 15 or the proposed 100 percent curtailment that extended to May 20. Given calculations based on the 20-mm survey data and two 50 percent curtailment periods, an average of 1,247 delta smelt would have been entrained each year from 1995 through 2006 with a range of 0 delta smelt in 1995, 1998, and 2006 to 3,690 delta smelt in 1999. The number of larvae being entrained is expected to be somewhat proportional to overall abundance of the seasons overall spawning abundance indicated by the FMWT index (Table 2). During the years 2002 to 2006, the period of reduced delta smelt abundance based on the FMWT index, the estimated number of larvae that would have been entrained range between 0 in 2006 and 2007 to a maximum of 924 in 2003 (Table 2). A delta smelt female spawn from 1,200 to 2,600 eggs and

even the larger estimate of entrained larvae would represent only a small fraction of the total population of delta smelt larvae produced during a season. The number of larvae exposed to the DWSP intake is expected to be low in the future because of the recent observed reduction in abundance of larvae at the intake location. Thus, with the proposed pumping operations, the number of larvae entrained as a consequence of the proposed action is expected to range between 0 and 200 with zero or only a few larvae being entrained during years with very low abundance.

The above calculations are based on the proposed initial 30 mgd diversion. Increases in the pumping rate will increase the estimated number of delta smelt entrained in the DWSP intake facility. However, future expansion of the DWSP in not covered in this biological opinion and the effects of diversion rates above the 30 mgd on delta smelt have not been estimated. Consequently, future expansions will require separate biological opinions to assess the effects on delta smelt.

Effects of Changes in Delta Hydrology

The applicant used CALSIM II for their hydrological modeling. Geographically, the model covers the drainage basin of the Delta and SWP exports to the water users. CALSIM II typically simulates system operations for a 73-year period using a monthly time step. The historical flow record of October 1921 to September 1994 is used to represent the possible future range of water supply conditions. Assumptions about facilities, land use, water supply contracts, etc. is kept constant over the 73-year simulation period and represent a fixed level of development (LOD). To estimate effects from the project on Delta hydrology, the model was run with and without the proposed project included. All of the assumptions except the action itself are kept the same during the two model runs. Once the model runs are completed, the results for simulations with the proposed project included can be compared with simulations without the proposed project. Model runs are best interpreted using long-term or year type average statistics. Thus, the model is limited in its use to measure effects to the delta smelt on a time scale that is relevant to the species. However, monthly results are still useful for general comparison of alternatives.

Hydrological modeling by the applicant shows that the diversion of 30 mgd at a rate of up to 47 cfs will result in small but measurable changes in Delta hydrology (MVH 2005). These changes could potentially adversely affect delta smelt through changes in water quality and increased chance of entrainment at the State and Federal intake facilities at Banks and Tracy, respectively.

QWEST is an index of the net San Joaquin River flow at Jersey Point. The flow rate and diversion are indicative of the water balance in the central and southern Delta. Net reverse flow past Jersey Point indicates that higher salinity water is being drawn into the interior Delta as a result of high depletions and exports compared to Delta inflows and cross-Delta flows. QWEST can be used as an indicator of changes in habitat conditions and delta smelt survival.

Modeled changes in QWEST are a direct consequence of DWSP diversion. Changes in annual flows are slight but measurable over all water year types and can be significant in certain months. For instance, QWEST decreases relative to baseline for the 2003 LOD by 112 cfs of the average net negative 378 cfs December flow. For the 2015 LOD cumulative condition analysis, QWEST decreased under the DWSP by 17 cfs or 4 percent of the average annual net flow. The largest change in net San Joaquin River average monthly outflow for the 2015 LOD occurs in August

with a decrease in outflow by 46 cfs from a baseline outflow of negative 2,610 cfs. The computer simulation modeling by the applicant has indicated that the DWSP diversion effect on reduction in net Delta outflow on the San Joaquin River is subtle, yet has pervasive effect on average annual flows at San Joaquin River at Anticoh, Old River at San Joaquin confluence, and Ran Joaquin River at San Andreas Landing. Effects follow consistent trends base on the projected growth trends of the future level of development forecasts.

Delta smelt distribution, especially larvae distribution, is affected by the hydrology in the delta. During the larval and juvenile phases, river flows of sufficient magnitude and duration facilitate down-estuary movement from spawning habitats in the Delta. Larvae originating in Sacramento River can be brought into the central Delta via Three Mile Slough or back up through the San Joaquin River by flood tides. Larvae in the lower San Joaquin River can be transported through the mouth of Old and Middle Rivers towards the water export facilities in the south Delta.

The tidal flow in the delta varies greatly over the tidal cycle and a passive particle will slush back and forth with the tide but water exports can result in a net movement into the south Delta. At the 30 mgd buildout, the change in QWEST of the DWSP is small compared to total annual outflow and the DWSP diversion minimal compared to total tidal flows but the change in QWEST flows will affect net particle movement in the central Delta. This will result in a slightly increased residence time during positive QWEST and an increased net movement into the central Delta during negative QWEST flows. Therefore the proposed DWSP could result in a slight increase in larvae entrainment at the CVP and SWP export facilities during some water years since delta smelt larvae are mostly transported passively with flow and tide. However, the proposed restrictions on pumping from April 15 through June 15 will avoid or minimize any effects of the DWSP on QWEST.

Adult delta smelt migrating up the Delta likely also respond to subtle changes in Delta flows and salinity. Reduction in San Joaquin River flows together with increased flow from the Sacramento River through Three Mile Slough may attract adult delta smelt into the central Delta where they are more susceptible to enter Old River and eventually being entrained in the state and Federal Delta water diversions. The small changes seen in the modeled delta flows for the 30 mgd SDWP diversion are not likely to affect delta smelt movements into the Delta. However, the full buildout to 160 mgd could have substantial effect on delta smelt distribution during spawning movements into the Delta.

Effects on Critical Habitat

Critical habitat is not likely to be adversely modified or destroyed as a result of the proposed project. The primary constituent elements essential to the conservation of the species will not be affected by the proposed project. The initial 30 mgd diversion at the SDWP pumping facility will result in an insignificant loss of physical habitat in the delta. River flows and water in the delta will continue to be adequate to provide spawning, rearing and foraging habitat for the smelt. The salinity of the delta will not be modified beyond the normal fluctuations as a result of this project, as the location of X2 during February through June will not change significantly as a result of this project. No breeding habitat will be affected by the proposed project, and the sustainability of the food base for delta smelt will not be changed by the proposed project. In addition, adequate flows and reduced exports during the delta smelt spawning and rearing

seasons will protect delta smelt.

Effects of the Proposed Action on Giant Garter Snake

Effects of the Construction

Direct effects:

No direct effects to giant garter snakes are anticipated as a result of the initial 30 mgd operation of the intake. The fish screen size and approach velocity is designed to avoid entrainment of delta smelt, which are much smaller in size, so no entrainment of giant garter snakes is expected to occur.

Direct effects to giant garter snakes as a result of the construction of the intake, pipelines, and water treatment plant will be avoided by implementation of the "Incidental Take Minimization Measures" as outlined in the SJMSCP. Restricting construction to during the species active period (May 1 – October 1) will allow for giant garter snakes to disperse out of the construction area to avoid direct mortality. SJCOG will use the fees that the City of Stockton paid to participate in the SJMSCP to purchase similar habitat and manage this habitat for the benefit of the covered species to compensate for the effects from the construction of the intake structure, the pipelines, and the water treatment plant.

Indirect effects:

One of the objectives outlined in the Final Environmental Impacts Report for the Stockton Delta Water Supply project (ESA 2005) is "to provide adequate water supply to accommodate planned growth." The initial 30 mgd intake operation is expected to meet the water supply needs of build-out anticipated in the 1990 Stockton General Plan. The pumping of water out of the Delta will result in an increased availability of drinking water, with subsequent growth-inducing effects on federally-listed species, including the giant garter snake. Incidental take that occurs as a result of the necessitated residential development may be covered under the SJMSCP, but it is possible that some of the proponents of this development will opt out of participating in the SJMSCP. In this case, giant garter snakes may be affected by habitat loss, modification, or fragmentation, or direct mortality, and any resulting take would not be covered under the SJMSCP.

Indirect effects from the construction of the intake, pipelines, and water treatment plant are analyzed in the *Intra-Service Biological and Conference Opinion* (Service 2001). Those effects applicable to the proposed action include habitat fragmentation, edge effects, changes in hydrology, displacement of individuals, and temporary harassment from the presence of people and equipment.

Effects of Interrelated and Interdependent Activities

Upgrades to the electrical infrastructure are necessary for the operation of the water treatment plant and intake pumps. Construction of these upgrades has the potential to affect the giant garter snake if poles, substations, or any other related structures are constructed in giant garter snake habitat. SJMSCP coverage can be sought when design specifications are finalized, and

will be subject to conditions of coverage, including adherence to "Incidental Take Minimization Measures" and fee payment to SJCOG. It is possible these upgrades could require permits from other federal agencies, which would necessitate section 7 consultation with that agency if these upgrades may affect the giant garter snake.

Cumulative Effects

Cumulative effects include the effects of State, Tribal, local, or private actions that are reasonably certain to occur in the action area considered for this biological opinion. Future actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the Act.

Non-Federal actions that may affect the action area include ongoing agricultural activities and increased urbanization. Agricultural activities in the Delta affect riparian and wetland habitats through upland modifications of the watershed that lead to increased siltation or reduction in water flow in stream channels flowing into the Delta. The approximately 1,800 agricultural diversions in the Delta (DWR 1993) will continue to entrain an unquantified number of delta smelt each year and agricultural drainage returns reduces water quality and contain herbicide and pesticide compounds that could affect delta smelt survival and reproductive success. Stormwater from urban areas containing toxic compound is and will continue to be discharged into the Delta.

The Delta and East Bay regions, which include portions of Contra Costa, Alameda, Sacramento, San Joaquin, Solano, Stanislaus, and Yolo counties, are expected to increase in population by nearly three million people by the year 2020. Increase in urbanization and housing developments can impact habitat by altering watershed characteristics, and changing both water uses and stormwater runoff patterns. Industrial and residential developments and expansions will also result in development of upland and riparian habitat supporting the giant garter snake. Many these activities are expected to not go through any consultation process with the Service.

Conclusion

After reviewing the current status of the delta smelt and the giant garter snake, the environmental baseline for the action area, the effects of the proposed project, and the cumulative effects, it is the Service's biological opinion that the City of Stockton's water supply project as proposed, is not likely to jeopardize the continued existence of the delta smelt or the giant garter snake. The proposed action is located in delta smelt critical habitat, but will not be adversely modified by the proposed action.

This conclusions are based on the following considerations: (1) In-water construction and its potential effects will occur at a time of year when delta smelt is unlikely to be present within the project area; (2) conservation and performance measures are in place to ensure impacts are minimized on all aspects of the project; (3) work area isolation and fish removal will occur; (4) the fish screen will prevent adult delta smelt and juveniles larger than 20 mm from being entrained at the DWSP intake; (5) entrainment of larvae and juveniles will be minimized by reduced pumping and pumping curtailment during the period of peak abundance of larvae and juveniles; (6) the proportion of the delta smelt larvae and juvenile population exposed to the pumps is expected to be low; (7) the expected survival of delta smelt larvae and juveniles in the

south Delta at baseline conditions is low and estimated loss of larvae at the DWSP intake is therefore not believed to affect larvae expected survival to maturity; (8) expected contribution to population growth by a larvae is low and the low number expected to be entrained is therefore not expected to significantly affect the delta smelt population; and (9) the effects of this action are not likely to impair currently properly functioning habitats for the delta smelt and the giant garter snake, appreciably reduce the functioning of already impaired habitats, or retard the long-term progress of impaired habitats toward proper functioning condition essential to the long-term survival and recovery of the populations of the delta smelt and the giant garter snake.

INCIDENTAL TAKE STATEMENT

Section 9 of the Act and Federal regulation pursuant to section 4(d) of the Act prohibit the take of endangered and threatened species, respectively, without special exemption. Take is defined as harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harass is defined by the Service as an intentional or negligent act or omission which creates the likelihood of injury to a listed species by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding or sheltering. Harm is defined by the Service to include significant habitat modification or degradation that results in death or injury to listed species by impairing behavioral patterns including breeding, feeding, or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking incidental to and not intended as part of the agency action is not considered to be prohibited taking under the Act, provided that such taking is in compliance with this Incidental Take Statement.

The measures described below are nondiscretionary and must be implemented by the Corps so they become binding conditions of any grant or permit issued to the applicant, as appropriate, in order for the exemption in section 7(o)(2) to apply. The Corps has a continuing duty to regulate the activity that is covered by this incidental take statement. If the Corps (1) fails to require the applicant to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the permit or grant document, and/or (2) fails to retain oversight to ensure compliance with these terms and conditions, the protective coverage of section 7(o)(2) may lapse.

Amount or Extent of Take

Delta Smelt

The Service expects that incidental take of adult delta smelt and juveniles larger than 20 mm long will be difficult to detect or quantify for the following reasons: the small size of eggs, larvae, and fish; their occurrence in aquatic habitat makes them difficult to detect; and the low likelihood of finding dead or impaired specimens. Direct take of delta smelt from the construction of the proposed water intake and fish screen activities (*e.g.* entrainment of the dredge, exposure to resuspended sediment, acoustic noise for the pile driving actions) is not expected to occur if construction actions are implemented in the middle of the construction window (i.e., August 1 through October30) and construction actions are completed by November 30. The exposure risk

to delta smelt increases should construction activities be initiated earlier than August 1 since juveniles and adults may still be in the vicinity of the water intake site or if construction activities continue after October 1 since up-estuary migration by adult delta smelt could start in November.

Incidental take from operation of the water intake is calculated for the initial proposed water diversion level of 30 mgd. The Service understands that increases in the diversion rate beyond 30 mgd will trigger new consultations with the Corps and the City of Stockton. Direct take of larvae and juveniles in the form of mortality will occur from entrainment at the water intake and of adult delta smelt in the form of injury and harassment from impingement on the fish screen. Entrainments of delta smelt do not necessarily index how facility operations affect the delta smelt population. In years when delta smelt are numerous and widely distributed, high entrainment rates may not be of great concern. Conversely, during years when there are few delta smelt and they are distributed in areas vulnerable to entrainment at the DWSP intake, even low salvage may be of great concern. Entrainment of larvae is of lesser concern than entrainment of prespawning adults as prespawning adults are individually more important to the perptuaiton of the species. No adults or juveniles larger than 20 mm are expected to be entrained at the DWSP intake. The larvae entrainment were calculated from the density of larvae captured in the biweekly DFG 20-mm trawls at stations adjacent to the proposed intake facility location during the years 1995 to 2006. These densities were then applied to calculate entrainment at the DWSP at a pumping rate of 30 mgd and pumping curtailment during April 16 through May 15. However, about half of this number is expected to be entrained at any give density during any given year since the calculation did not take into account the proposed longer curtailment period (April 16 through May 20) and the reduced pumping rate before and after this period. An upper incidental take limit is then provided based on the relationship between estimated take and the previous years FMWT index. However, with the expected efficiency of the screen similar to the similar fish screen at the Contra Costa Water District diversion in Old River, the number of larvae entrained is expected to be close to zero unless the overall delta smelt population increases substantially and the majority of spawning occurs in the South Fork Mokelumne River, by Empire Tract, and/or in the San Joaquin River upstream of Empire Tract..

The Service is quantifying take incidental to the project in terms of acres of habitat that will become unsuitable for the species as a result of the action. About 0.44 acre of shallow water habitat will become unsuitable as a result of the proposed project. The Service further estimates take of delta smelt larvae incidental to operation of the intake facility will not exceed 25 following a year with a low pre-spawn delta smelt population abundance as indicated by a FMWT index of 50 or lower. Incidental take of delta smelt larvae may increase as population abundance increase and is estimated to range from 0 to an upper limit of 200 if the previous FMWT index falls between 51 and 100, from 0 to an upper limit of 700 if the FMWT index falls between 101 and 500, and from 0 to an upper limit of 3,500 following a year with high abundance of pre-spawning delta smelt indicated by an FMWT index higher than 500. In addition, an unquantifiable but anticipated small number of delta smelt juveniles and adults within two feet of the screen may be injured or harassed as a result of impingement on the fish screen. The Service has developed the following incidental take statement based on the premise that the reasonable and prudent measures will be implemented. Upon implementation of the following reasonable and prudent measures, incidental take associated with the construction of the intake facility in the form harm of delta smelt caused by the loss of 0.44 acre of shallow water habitat will become exempt from the prohibitions described under section 9 of the Act. Upon

implementation of the following reasonable and prudent measures, the Corps and the City of Stockton will become exempt from the prohibitions described under section 9 of the Act for the above described incidental take associated with construction activities and operation of the DWSP intake facility for the 33 mgd diversion in the form of kill, injury, and harassment of delta smelt.

Giant Garter Snake

Incidental take associated with the construction of the intake structure, raw and treated water pipelines, and water treatment plant will be covered under the section 10(a)(1)(B) permit for the SJMSCP. The total amount of incidental take authorized for the SJMSCP is outlined in Table 36 of the *Intra-Service Biological and Conference Opinion*. No new circumstances as identified at 50 C.F.R. 402.16 have occurred that would alter the non-jeopardy determination for the covered species we made in the *Intra-Service Biological and Conference Opinion* and associated incidental take permit. Therefore, the biological opinion remains valid. The habitat acreage converted as a result of the proposed action will be deducted from the amount of habitat specified in Table 36.

The Service does not anticipate that the operation of the intake will incidentally take any giant garter snakes by direct mortality or injury from the operation of the intake. The Service expects that incidental take in the form of harm or harassment is unlikely to occur if all "Conservation Measures" as outlined in the *Project Description* and "Incidental Take Minimization Measures" required by the SJMSCP are correctly implemented. Therefore, no incidental take is authorized from the operation of the intake. If take of giant garter snakes or any other federally-listed species is expected to occur as a result of upgrades to the electrical infrastructure, reinitiation of this consultation will be necessary (see "Reinitiation – Closing Statement" at the end of this biological opinion).

Effect of the Take

In the accompanying biological opinion, the Service determined that this level of anticipated take is not likely to result in jeopardy to the delta smelt. The proposed project is within critical habitat designated for the delta smelt. However, the Service determined in the accompanying biological opinion that the proposed project will not result in destruction or adverse modification of critical habitat designated for the delta smelt.

In the *Intra-Service Biological and Conference Opinion*, the Service determined that this level of take is not likely to result in jeopardy to the giant garter snake. Critical habitat has not been proposed or designated for the giant garter snake; therefore none will be affected.

Reasonable and Prudent Measures

The Service believes the following reasonable and prudent measures are necessary and appropriate to minimize incidental take of listed species:

1. The City of Stockton shall implement measures to avoid or minimize adverse effects to the delta smelt and the giant garter snake.

2. The City of Stockton shall ensure their compliance with the *Project Description* of this biological opinion.

Terms and Conditions

To be exempt from the prohibitions of section 9 of the Act, the Corps must ensure compliance with the following terms and conditions, which implement the reasonable and prudent measures described above. These terms and conditions are nondiscretionary:

1. The following Terms and Conditions will implement Reasonable and Prudent Measure number one (1):

   a. The City of Stockton shall minimize the potential for take of the delta smelt and modification/loss of this species' habitat by implementing the Stockton Delta Water Supply Project, including the conservation measures as described in the biological assessment, as described in the *Project Description* section of this biological opinion with the inclusion of or modifications by Terms and Conditions of this biological opinion.

   b. The City of Stockton shall minimize the potential for take of the giant garter snake resulting from project related activities by implementation of the Stockton Delta Water Supply Project, including the conservation measures as described in the biological assessment, as describe in the *Project Description* section of this biological opinion with the inclusion of or modifications by Terms and Conditions of this biological opinion.

   c. The City of Stockton shall include Special Provisions that include the avoidance and minimization measures, and Terms and Conditions of this biological opinion in the solicitation for bid information. In addition, the City of Stockton will educate and inform contractors involved in the project as to the requirements of the biological opinion.

   d. Prior to initiation of ground breaking, the City of Stockton biologist or a Service-approved biologist will conduct an education and training session for all construction personnel. All individuals who will be involved in the site preparation or construction shall be present, including the project representative(s) responsible for reporting take to the Service and the California Department of Fish and Game. Training sessions shall be repeated for all new employees before they access the project site. Sign up sheets identifying attendees and the contractor/company they represent shall be provided to the Service with the post-construction compliance report. The training will consist of a brief

presentation by the on-site biologist who will explain endangered species concerns to all contractors, their employees, and agency personnel involved in the project. The program will include a description of the giant garter snake and delta smelt, species habitat needs, an explanation of their protection under the Act, a description of the measures being taken to reduce effects to the species during project construction and implementation, the penalties for non-compliance, and the boundaries (work area) of the project.. The applicant shall submit written proof of the training to the San Joaquin Valley Branch of Endangered Species Program at the Sacramento Fish and Wildlife Office within ten (10) working days of the completion of training. Any deviation from these and other non-discretionary measures must be approved by SJCOG and the Service prior to implementation.

e. To ensure that the incidental take limit is not exceeded and to evaluate the effectiveness of minimization measures, the City of Stockton shall develop and implement a plan to monitor and quantify entrainment of delta smelt at the DWSP intake. The monitoring shall occur over a ten year period from the start of operation of the DWSP intake. In addition to quantifying take of delta smelt larvae and juveniles, the monitoring shall assess the effectiveness of the proposed period of curtailment and reduced pumping, and evaluate if other periods would provide better protection of delta smelt. An annual report shall be sent to Ryan Olah, Branch Chief of the Coast Bay Delta Branch at the Sacramento Fish and Wildlife Office.

f. The fish screen shall be operated in accordance with criteria described in this biological opinion and in consultation with the Service as long as the diversion is in use. When and if the City of Stockton chooses to increase the design intake of the diversion over the initial nominal capacity of 30 mgd, the Corps and the City of Stockton shall enter into formal reinitiation of this consultation with the Service.

g. Pile driving shall not start before August 1 and be completed by October 30.

h. A Service-approved biologist must be on site to monitor project activities; and shall have the authority to stop project activities – when listed species are encountered, unintended direct or indirect effects to listed species habitat occurs, or if activities are not in conformance with the minimization measures as delineated in this project description – until appropriate corrective measures are taken. If a listed animal is observed within a designated work area and cannot be avoided, all work shall stop until the animal leaves the work area or until it is captured and relocated by a biologist with a valid section 10(a)(1)(A) permit issued by the Service to outside of the work area to avoid injury or mortality.

i. The City will follow all the "Incidental Take Minimization Measures" developed by SJCOG for giant garter snakes. These measures shall include, but not be limited to:

   i. conduct pre-construction surveys within 24 hours of initial ground disturbance

   ii. restrict construction, spoils, and equipment staging areas to outside of aquatic and upland habitat (within 200 feet of aquatic habitat) for giant garter snakes

iii. conduct an environmental awareness training for all construction workers which includes education on the federally-listed species in the area and the importance of their conservation

iv. restrict all work to during the active period for the giant garter snake (May 1 – October 1).

j. The City will install a barrier designed to exclude giant garter snakes around all construction or equipment staging areas designated as aquatic or upland (within 200 feet of aquatic) habitat. Temporary fencing is allowed, but the fence must have an anchored base to prevent giant garter snakes from traveling underneath it and entering the construction area.

k. All disturbed habitat must be restored or replaced consistent with the Service's *Guidelines for Restoration and/or Replacement of Giant Garter Snake Habitat and Standard Avoidance and Minimization Measures During Construction Activities in Giant Garter Snake (Thamnophis gigas) Habitat* (attached).

l. Sensitive habitat areas shall be delineated with high visibility temporary orange-colored fence at least four (4) feet in height, flagging, or other barriers. Such fencing shall be inspected by the Service-approved biologist and maintained daily until completion of the project. The fencing will be removed only when all construction equipment is removed from the site. No project activities shall occur outside the delineated project construction area.

m. A storm water management/erosion control plan shall be developed and implemented during the rainy season (or onset of rain) that include temporary onsite silt traps and/or basins with multiple discharge points to natural drainages and energy dissipaters. Stockpiles of loose material shall be covered and runoff diverted away from exposed soil material. If work stops because of to rain, a positive grading away from slopes shall be provided to carry the surface runoff to areas where the flow would be controlled, such as the temporary silt basins. Sediment basins/traps shall be located and operated to minimize the amount of sediment transported offsite. Any trapped sediment shall be removed from the basin or trap and placed at a suitable location onsite, away from concentrated flows, or removed to an approved disposal site.

n. Temporary erosion control measures shall be implemented until perennial revegetation or landscaping is established and can minimize sediment discharges into nearby waterways. For construction within 500 feet of a water body, appropriate erosion control measures shall be implemented upstream adjacent to the water body.

o. Erosion protection shall be provided on all cut-and-fill slopes. Revegetation shall be facilitated by mulching, hydroseeding, or other methods and shall begin as soon as possible after the completion of grading and before the onset of the rainy season (i.e., by October 15).

p. The BMPs selected and implemented for the project shall be operational before major earthwork begins. The construction phase facilities shall be maintained regularly and cleared of accumulated sediment as necessary. Effective mechanical and structural BMPs that will be implemented for the Proposed Action include the following:

i. Mechanical storm water filtration measures, including oil and sediment separators or absorbent filter systems such as the Stormceptor® system, can be installed within the storm drainage system to filter storm water prior to its discharge.

ii. Vegetative strips, high-infiltration substrates, and grassy swales shall be used where feasible throughout the development to reduce runoff and provide initial storm water treatment.

iii. Roof drains shall discharge to natural surfaces or swales where possible to avoid excessive concentration and channelization of storm water.

iv. Permanent energy dissipaters shall be included for drainage outlets.

v. The water quality detention basins shall be designed to provide effective water quality control measures including the following:

(a.) Maximize detention time to allow settling of fine particles

(b.) Establish maintenance schedules to periodically remove sediments, excessive vegetation, and debris that may clog basin inlets and outlets

(c.) Maximize the detention basin elevation to allow the greatest amount of infiltration and settling prior to discharge

q. Fueling and maintenance of mechanical equipment shall occur in areas where oil or other chemical cannot drain into wetlands, streams, or other aquatic landscape features. Fueling and maintenance areas shall be encircled with structures or material to contain a potential spill. The applicant will prepare a spill prevention and clean-up plan.

r. Hazardous materials such as fuels and solvents used on construction sites shall be stored in covered containers and protected from rainfall, runoff, vandalism, and accidental release to the environment. All fuels and solvents shall be stored in an area with an impervious surface and a containment capacity equal to the volume of the stored materials. A stockpile of spill cleanup materials shall be readily available at all construction sites. Employees shall be trained in spill prevention and cleanup, and individuals shall be designated as responsible for prevention and cleanup activities.

s. Equipment shall be properly maintained in designated areas with runoff and erosion control measures to minimize accidental release of pollutants.

t. The SWPPP will specify measures for removing sediment from water pumped during trench dewatering before the water is released to waterways.

2. The following Terms and Conditions will implement Reasonable and Prudent Measure number one (2):

   a. If requested, before, during, or upon completion of ground breaking and construction activities, the City of Stockton shall allow access by Service and/or California Department of Fish and Game personnel to the project site to inspect project effects to the delta smelt, giant garter snake, and their habitats.

   b. The City of Stockton shall comply with the *Reporting Requirements* in this biological opinion.

Reporting Requirements

The Service and the California Department of Fish and Game must be notified within one (1) working day of the discovery of death or injury to a delta smelt or giant garter snake that occurs due to project related activities or is observed at the project site. Injured giant garter snake must be cared for by a licensed veterinarian or other qualified person(s), such as the Service-approved biologist. Notification must include the date, time, and location of the incident or of the finding of a dead or injured animal clearly indicated on a USGS 7.5 minute quadrangle and other maps at a finer scale, as requested by the Service, and any other pertinent information. Dead individuals of any of these two listed species must be sealed in a zip-lock® plastic bag containing information on date and time when the animal was found, the location where it was found, and the name of the person who found it written on 100% rag content paper with permanent ink, and the bag containing the specimen frozen in a freezer located in a secure site. The Service contacts are Chris Nagano, Deputy Field Supervisor at the Sacramento Fish and Wildlife Office at telephone 916/414-6600, and Scott Heard, Resident Agent-in-Charge of the Service's Law Enforcement Division at telephone 916/414-6660.

The City of Stockton shall submit a post-construction compliance report prepared by the on-site biologist to the Sacramento Fish and Wildlife Office within sixty (60) calendar days of the date of the completion of construction activity. This report shall detail (i) dates that construction occurred; (ii) pertinent information concerning the success of the project in implementing avoidance and minimization measures with an explanation of failure to meet such measures, if any; (iii) known project effects on the delta smelt and/or the giant garter snake, if any; (v) occurrences of incidental take of these listed species, if any; and (vi) other pertinent information.

The City shall submit a report to the Service documenting the restoration of all impacted giant garter snake habitat in accordance with the *Guidelines for Restoration and/or Replacement of Giant Garter Snake Habitat.* This and all subsequent reports should reference the Service File No. 1-1-05-F-0029 and be submitted to the Service, Attention: San Joaquin Valley Branch immediately upon completion of restoration and/or monitoring.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of Act directs Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities that can be implemented to further the purposes of the Act, such as preservation of endangered species habitat, implementation of recovery actions, or development of information and data bases.

1. The Corps and the City of Stockton should develop and implement restoration measures in areas designated in the Delta Fishes Recovery Plan (Service 1996).

2. The City of Stockton should assist the Service in implementing recovery actions identified in the *Draft Recovery Plan for the Giant Garter Snake (Thamnopsis gigas)* (U.S. Fish and Wildlife Service 1999).

2. The Corps should develop procedures that minimize the effects of all other in-water activities on the delta smelt.

3. The Corps should support and promote aquatic and riparian restoration within the Delta region, and encourage its contractors to modify operation and maintenance procedures through the Corps' authorities so that those actions avoid or minimize negative impacts to delta smelt and giant garter snake.

4. Sightings of any listed or sensitive animal species should be reported to the California Natural Diversity Database of the California Department of Fish and Game. A copy of the reporting form and a topographic map clearly marked with the location the animals were observed also should be provided to the Service.

To be kept informed of actions minimizing or avoiding adverse effects or benefiting listed and proposed species or their habitats, the Service requests notification of the implementation of any conservation recommendations.

REINITIATION - CLOSING STATEMENT

This concludes formal consultation with the Corps on the Stockton Delta Water Project in San Joaquin, California. As provided in 50 CFR 402.16, re-initiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been maintained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the proposed action may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to listed species or critical habitat that was not considered in this opinion; or (4) a new species or critical habitat is designated that may be affected by the proposed action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending re-initiation.

If you have any questions regarding this biological opinion on the proposed Stockton Delta Water Supply Project, please contact Peter Johnsen or Ryan Olah of the Sacramento Fish and Wildlife Office at (916) 414-6625.

Sincerely,

for Cay C. Goude
Acting Field Supervisor

cc:
Jeffery Stuart, National Marine Fisheries Service, Sacramento, California
Scott Wilson, California Department of Fish and Game, Yountville, California
Steve Mayo, San Joaquin Council of Governments, Stockton, California
Robert Granberg, City of Stockton, Stockton, California
Calvin Fong, Walter Yep, Inc., Sacramento, California

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Appendix A: Tables and Figures

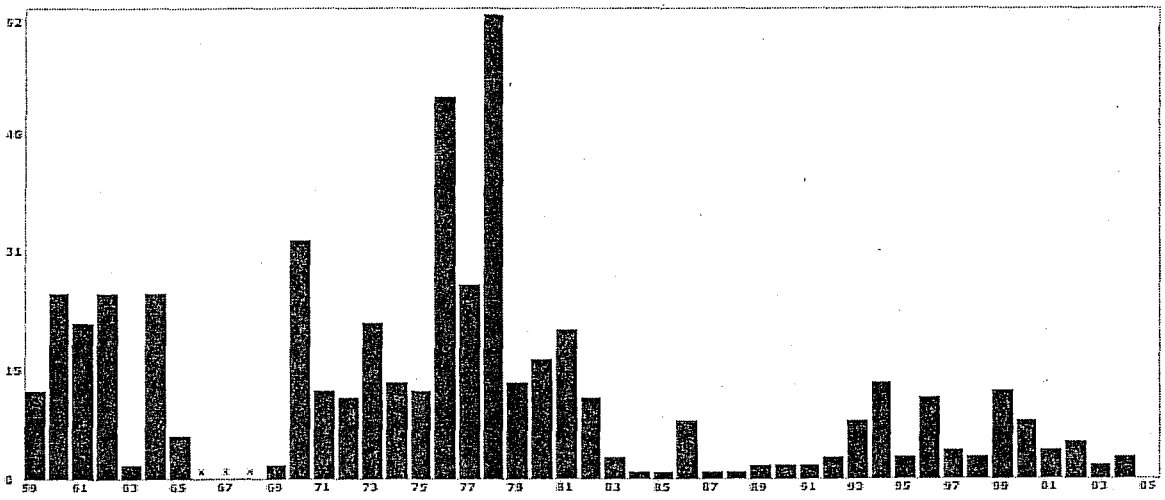

Figure 1. Summer townet (STN) indices from 1959 to 2005 (CDFG 2007).

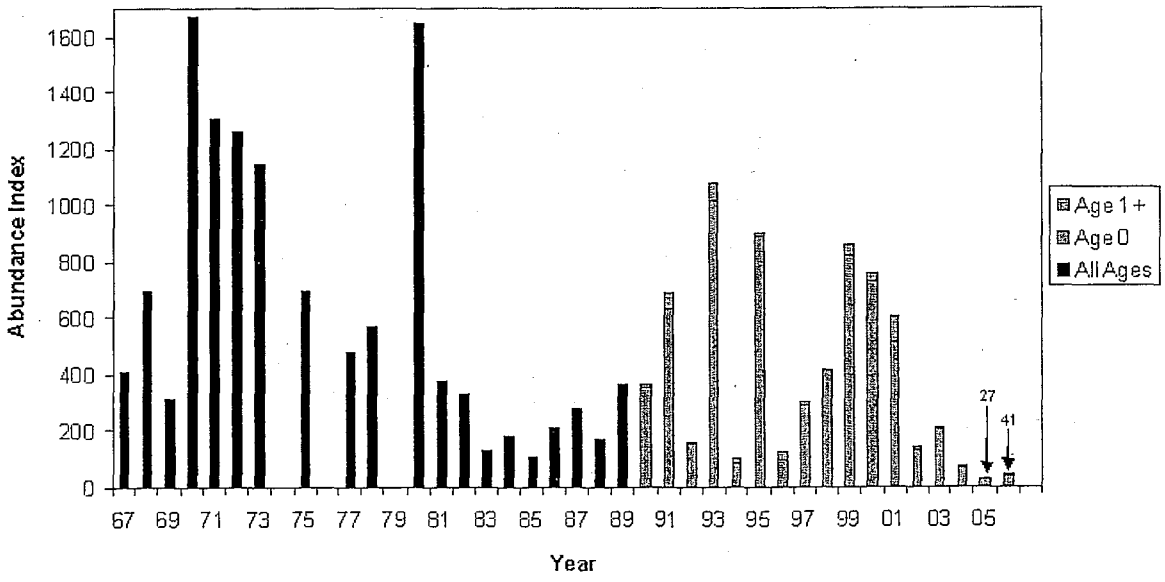

Figure 2. Fall midwater trawl (FMWT) indices from 1967 to 2006 (CDFG 2007).

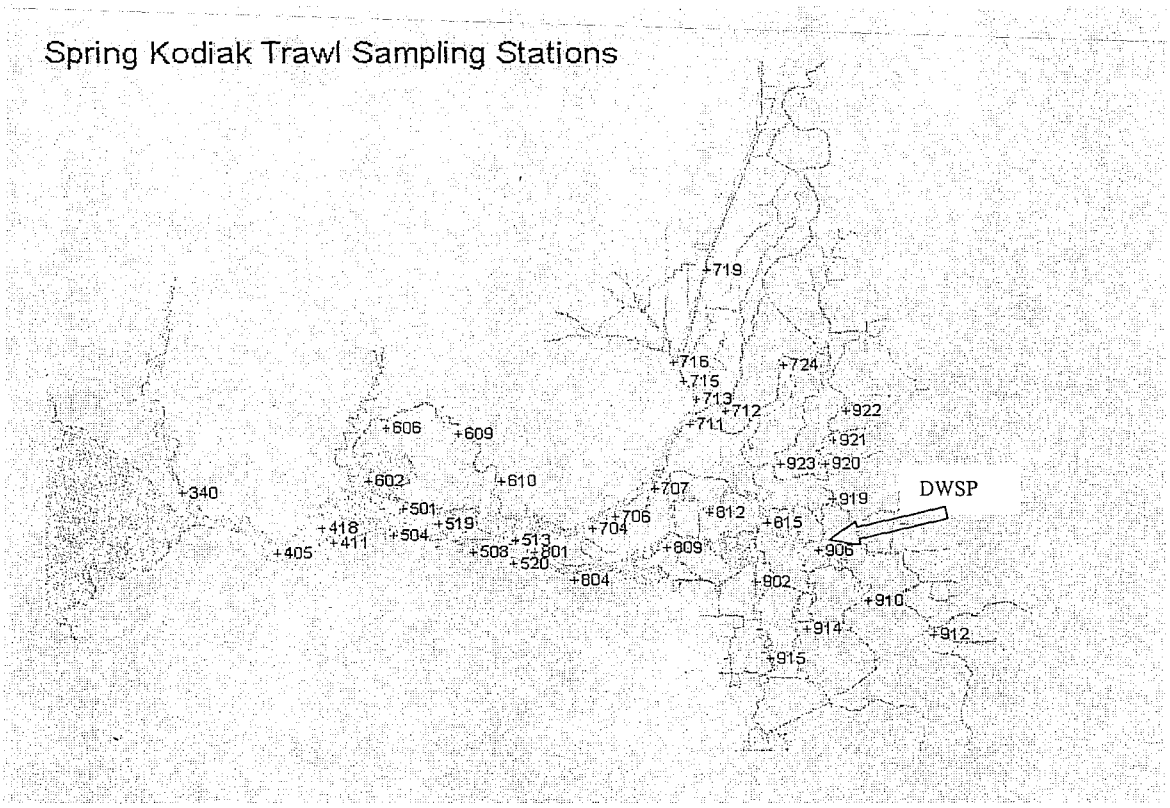

Figure 3. Map of spring kodiak trawl (SKT) stations in the Sacramento - San Joaquin Delta.

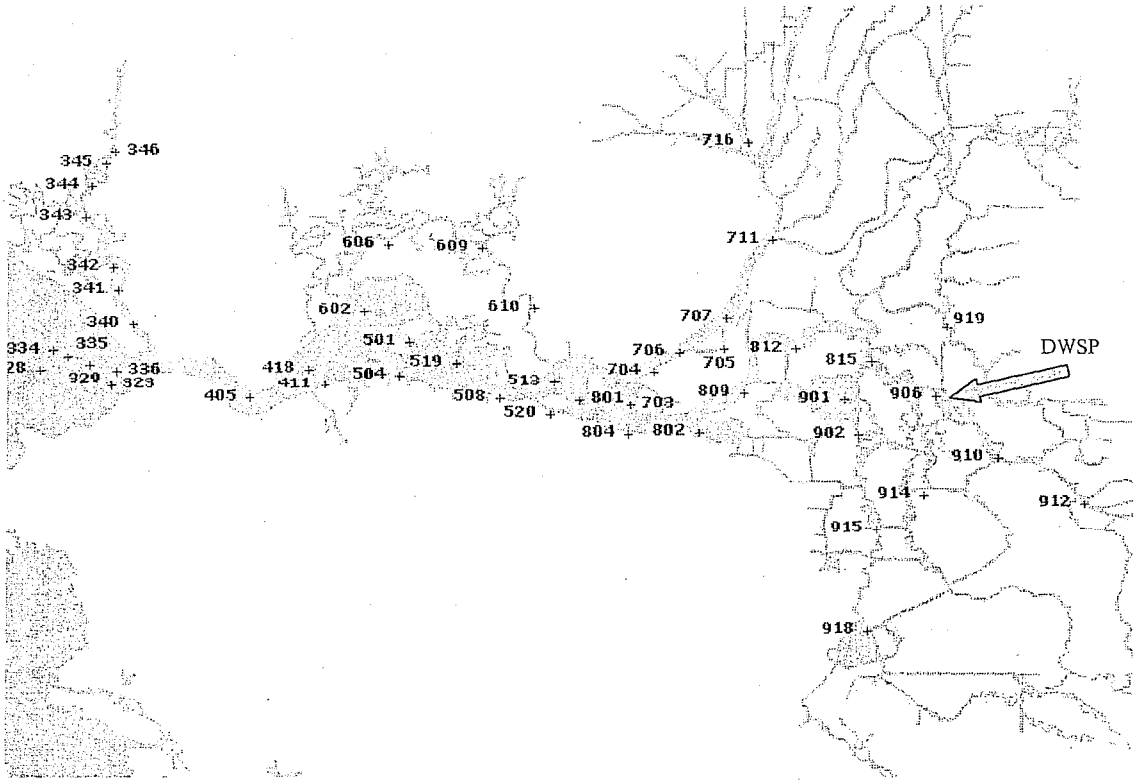

Figure 4. Map of sampling stations for the 20-mm survey in the Sacramento - San Joaquin Delta

melt larvae and juveniles that would have been entrained by the SDWP intake as estimated by Hanson Environmental (Stern in lit. ment B). The estimate is based on presence and densities of delta smelt in the San Joaquin River near the intake site as recorded by the 20- by the California Department of Fish and Game during the years 1995 to 2006. The estimates are calculated with 1) a 30 day pumping rough May 15 with a diversion of 100.6 AF per day the reminder of the year and 2) no curtailment and 92.05 AF per day.

Larvae Delta Smelt Size Classes by Length (mm)									
5 to 7		8 to 10		11 to 14		>15		Sum all size classes	
Curtailment		Curtailment		Curtailment		Curtailment		Curtailment	
Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
0	0	0		0		0		0	0
0	0	214	663	175	287	1009	972	1398	1922
0	246	158	636	0	0	0	235	158	1117
0	0	0	0	0	0	0	0	0	0
0	233	340	1462	2063	4481	4977	6235	7380	12411
299	274	902	1190	659	799	788	1964	2648	4227
255	1399	258	943	129	974	0	257	642	3573
229	227	448	778	419	773	190	203	1286	1981
256	234	313	661	654	1028	624	893	1847	2816
0	0	0	343	145	678	131	201	276	1222
270	247	70	113	95	219	0	90	435	669
0	0	0	0	0	0	0	0	0	0
1309	2860	2703	6789	4339	9239	7719	11050	16070	29938
109	238	225	617	362	840	643	1005	1339	2495

Table 2. Estimated entrainment of larvae at the DWSP intake if the facility had been in operation during the years from 1995 through 2007 compared to the previous year's pre-spawning delta smelt abundance indicated by the ascending FMWT index. The estimated take is based on 50 % curtailment during the periods March 15 through April 14 and May 16 through June 15, and 100% curtailment during the period April 15 through May 15. Note that the proposed 100% curtailment lasting from April 15 through May 20 would reduce entrainment even further.

FMWT index	Year	Estimated entrainment	Year
27	2005	0	2006
41	2006	0	2007
74	2004	218	2005
102	1994	0	1995
127	1996	79	1997
139	2002	924	2003
210	2003	138	2004
303	1997	0	1998
420	1998	3690	1999
603	2001	643	2002
756	2000	321	2001
864	1999	1324	2000
899	1995	699	1996

Appendix B: Guidelines for Restoration and/or Replacement of Giant Garter Snake Habitat.

Guidelines for Restoration and/or Replacement of Giant Garter Snake Habitat

Replacement and Restoration Guidelines are provided together, as the two conservation measures may not be mutually exclusive. Replacement of habitat may also require restoration of some areas. Preserved habitat may additionally be improved for giant garter snakes by using some restoration guidelines.

Reference sites

A nearby reference site should be chosen both for restoration of giant garter snake habitat and for creation of replacement habitat. The reference site will be used to determine the success of conservation efforts. For habitat restoration, the pre-project condition may be used as a reference site if adequate documentation exists. For creation of replacement habitat or for restoration where pre-project conditions are not documented, the reference site should be nearby or adjacent to the project site and should represent high quality giant garter snake habitat.

Restoration of giant garter snake habitat

Restoration may include incorporating some of the Replacement Guidelines to enhance habitat value for giant garter snakes. Restoration should follow the guidelines outlined below:

1. Restoring giant garter snake habitat includes minimizing impacts of project activities to the existing habitat. In general, these minimization measures may include using silt fencing, designating environmentally sensitive areas, using protective mats, preventing runoff, and providing worker awareness training. Specific measures to minimize impacts include:

    a. Avoid construction activities within 200 feet from the banks of giant garter snake aquatic habitat. Confine movement of heavy equipment to existing roadways to minimize habitat disturbance.

    b. Construction activity within habitat should be conducted between May 1 and October 1. This is the active period for giant garter snakes and direct mortality is lessened, because snakes are expected to actively move and avoid danger. Between October 2 and April 30 contact the Service's Sacramento Fish and Wildlife Office to determine if additional measures are necessary to minimize and avoid take.

    c. Confine clearing to the minimal area necessary to facilitate construction activities. Flag and designate avoided giant garter snake habitat within or

adjacent to the project area as Environmentally Sensitive Areas. These areas should be avoided by all construction personnel.

d. Construction personnel should receive Service-approved worker environmental awareness training. This training instructs workers to recognize giant garter snakes and their habitat(s).

e. 24-hours prior to construction activities, the project area should be surveyed for giant garter snakes. The survey of the project area should be repeated if a lapse in construction activity of two weeks or greater has occurred. If a snake is encountered during construction, activities shall cease until appropriate corrective measures have been completed or it has been determined that the snake will not be harmed. Report any sightings and any incidental take to the Service immediately by telephone at (916) 414-6620.

f. Any dewatered habitat should remain dry for at least 15 consecutive days after April 15 and prior to excavating or filling of the dewatered habitat.

2. Remove all construction debris and stockpiled materials.

3. Re-grade area to preexisting contour, or a contour that would improve restoration potential of the site.

4. Replant and hydroseed the restoration area. Recommended plantings consist of a) wetland emergents, b) low-growing cover on or adjacent to banks, and c) upland plantings/hydroseeding mix to encourage use by other wildlife. Extensive riparian (e.g., shaded riverine aquatic - SRA) plantings are not appropriate because shading may result in lack of basking sites. Native plantings are encouraged except where non-natives will provide additional values to wildlife habitat and will not become invasive in native communities. The applicant should obtain cuttings, plantings, plugs, or seeds, from local sources wherever possible. The applicant should attempt to restore conditions similar to that of adjacent or nearby habitats.

a. Emergent wetland plants recommended for giant garter snake habitat are California bulrush (*Scirpus californicus*), cattail (*Typha* spp.), and water primrose (*Ludwigia peploides*). Additional wetland plantings may include common tule (*Scirpus acutus*), Baltic rush (*Juncus balticus*), or duckweed (*Lemna* spp.).

b. Cover species on or adjacent to the bank may include California blackberry (*Rubus vitifolius*) or wild grape (*Vitis californica*), along with the hydroseeding mix recommended below.

c. Upland plantings/hydroseeding mix: Disturbed soil surfaces such as levee slopes should be hydroseeded to prevent erosion. The Service recommends a mix of at least 20-40 percent native grass seeds [such as annual fescue (*Vulpia* spp.), California brome (*Bromus carinatus*), blue wild rye (*Elymus glaucus*), and needle grass (*Nassella* spp.)] 2-10 percent native forb seeds, 5 percent rose clover (*Trifolium hirtum*), and 5 percent alfalfa (*Medicago sativa*). Approximately 40-68 percent of the mixture may be non-aggressive European annual grasses [such as wild oats (*Avena sativa*), wheat (*Triticum* ssp.), and barley (*Hordeum vulgare*)]. The Corps will not include aggressive nonnative grasses, such as perennial ryegrass (*Lolium perenne*), cheatgrass (*Bromus tectorum*), fescue (*Festuca* spp.), giant reed (*Arundo donax*), medusa-head (*Taeniatherum caput-medusae*), or Pampas grass (*Cortaderia selloana*) in the hydroseed mix. The Corps will not include endophyte-infected grasses in the mix. Mixes of one-hundred percent native grasses and forbs may also be used, and are encouraged.

Replacement of giant garter snake habitat

Location

Replacement location should be within the same population cluster boundaries (population clusters are defined in 58 FR 54053) as the habitat lost. For example: The boundaries of the Sacramento Basin population cluster are approximately, Highway 16 to the north, Sacramento River to the west, Twin Cities Road to the south, and the Folsom Aqueduct to the east. Habitat lost within this area must also be replaced within this area.

Habitat components

Giant Garter Snake Habitat. The giant garter snake inhabits marshes, sloughs, ponds, small lakes, low gradient streams, other waterways and agricultural wetlands such as irrigation and drainage canals and rice fields, and the adjacent uplands. Essential habitat components consist of (1) adequate water during the snake's active period, (early spring through mid-fall) to provide a prey base and cover; (2) emergent, herbaceous wetland vegetation, such as cattails and bulrushes, for escape cover and foraging habitat; (3) upland habitat for basking, cover, and retreat sites; and (4) higher elevation uplands for cover and refuge from flood waters. For the purposes of this programmatic opinion, a basic giant garter snake habitat unit will incorporate 2.00 acres (0.81 hectares) of surrounding upland for every 1.00 acre (0.40 hectare) of aquatic habitat. The 2.00 acres (0.81 hectares) of upland also may be defined as 218 linear feet (66 meters) of bank side habitat which incorporates adjacent uplands to a width of 200 feet (61 meters) from the edge of the bank.

Replacement habitat must provide the above mentioned essential habitat components and include the following:

1. All replacement habitat must include both upland and aquatic habitat components. Upland and aquatic habitat components must be included in the replacement habitat at a ratio of 2:1 upland acres to aquatic acres.

2. A semi-permanent or permanent aquatic habitat which provides water during the active period for giant garter snakes (April through October) with suitable vegetative cover present. Linear or meandering channels with slow flowing water over a mud or silt substrate are preferred.

3. Upland basking and retreat sites with low-growing vegetation cover adjacent to aquatic habitat, and upland retreats and flood refugia with partially buried broken concrete or animal burrows.

4. Small fish and amphibian larvae for foraging, but predatory "game fish" (bass, *Micropterus* spp.; sunfish, *Lepomis* spp.; catfish, *Ictalurus* spp. and *Ameiurus* spp.) absent or controlled.

5. An adequate buffer (at least 200 feet) from roadways to reduce vehicular mortality.

6. Follow planting recommendation provided above under restoration guidelines.

Monitoring

Habitat restoration

Restoration of habitat should be monitored for one year following implementation. Monitoring reports documenting the restoration effort should be submitted to the Service: (1) upon completion of the restoration implementation; and (2) one year from restoration implementation. Monitoring reports should include photo documentation, when restoration was completed, what materials were used, plantings (if specified) and justification of any substitutions to the Service recommended guidelines. Monitoring reports should also include recommendations for remedial actions and approval from the Service, if necessary, and justification from release of any further monitoring, if requested.

Creation of replacement habitat

Replacement habitat should be monitored for five years following implementation. Hydrology should be monitored for the first two years after creation of wetlands. The monitoring effort should continue for three additional years to ensure success criteria are met. Monitoring reports documenting implementation of conservation measures should be submitted to the Service: (1) upon completion of wetland creation; (2) yearly for the first two years of monitoring; and (3) five years from implementation. Monitoring reports should include photo documentation, when restoration was completed, what materials were used, plantings (if specified) and justification of any substitutions to the Service

recommended guidelines. Monitoring reports should also include recommendations for remedial actions and approval from the Service, if necessary, and justification from release of any further monitoring, if requested.

Success criteria for replacement habitat:

1. At completion of monitoring, the cover measured on the habitat area should be 90 percent of cover measured on the reference site.

2. At completion of monitoring, the species composition measured on the habitat area should be 90 percent of that measured on the reference site.

3. At completion of monitoring, wetlands created on the site should meet Corps jurisdictional criteria.

Maintenance and management of replacement giant garter snake habitat

1. A final management plan of replacement habitat must be approved by the Service.

2. All maintenance activities should follow the Service's Standard Avoidance and Minimization Measures During Construction Activities in Giant Garter Snake Habitat.

3. Additional guidance includes:

   a. Canal Maintenance - Hand clearing of canals is preferred for removal of excessive vegetation or debris. Any equipment should be operated from the bank top. Excavate from only one side of the canal during a given year. Avoid excavating the banks above the high water level. Preferably, one side of the canal should be left undisturbed indefinitely (the preferred side would be the west or north side) so that emergent vegetation and bank side cover is left in place.

   b. Place the spoils from canal clearing in a designated location, rather than along bank tops. This will prevent burying or crushing snakes basking on the banks, or trapping snakes taking cover in burrows or bank-top soil crevices.

   c. Vegetation control - Uplands should not be disced. Leave vegetation on levees and canal sides wherever possible. Mowing to control vegetation should take place July through September and mower blades should be raised to leave at least six inches of grassy cover to avoid injuring snakes.

   d. Traffic - Control vehicle access to avoid vehicular mortality of giant garter snakes.

4. Use a water maintenance regime that will keep some open water channels adjacent to vegetated edges for giant garter snake foraging.

5. Eradicate/control non-natives and invasive exotics.

Compatible uses of giant garter snake replacement habitat:

Rice farming is a compatible land use for adjacent properties.

Uses of giant garter snake replacement habitat that are incompatible with the habitat of giant garter snakes, or represent threats to giant garter snakes include row cropping on uplands, orchards on uplands, OHV (off-highway vehicle) use, and combining with riparian habitat creation which requires dense cover or SRA habitat.

Appendix C: Standard Avoidance and Minimization Measures During Construction Activities in Giant Garter Snake (*Thamnophis gigas*) Habitat

Standard Avoidance and Minimization Measures During Construction Activities in Giant Garter Snake (*Thamnophis gigas*) Habitat

HABITAT TYPE:

The giant garter snake inhabits marshes, sloughs, ponds, small lakes, low gradient streams, irrigation and drainage canals, and rice fields. Giant garter snakes require permanent aquatic habitat, or habitat seasonally flooded during its active period (early-spring through mid-fall), with herbaceous wetland vegetation, such as cattails and bulrushes, grassy banks (often salt grass), and uplands for cover and retreat sites during its active season and for refuge from flood waters during the dormant season (winter). Giant garter snakes are typically absent from larger rivers and from wetlands with sand, gravel, or rock substrates because of lack of suitable habitat. Some riparian woodlands may not provide suitable habitat because of excessive shade, lack of basking sites, and absence of giant garter snake prey.

AVOIDANCE AND MINIMIZATION MEASURES:

1. Avoid construction activities within 200 feet from the banks of giant garter snake aquatic habitat. Confine movement of heavy equipment to existing roadways to minimize habitat disturbance.

2. Construction activity within habitat should be conducted between May 1 and October 1. This is the active period for giant garter snakes and direct mortality is lessened because snakes are expected to actively move and avoid danger. Between October 2 and April 30 contact the Service's Sacramento Fish and Wildlife Office to determine if additional measures are necessary to minimize and avoid take.

3. Confine clearing to the minimal area necessary to facilitate construction activities. Flag and designate avoided giant garter snake habitat within or adjacent to the project area as Environmentally Sensitive Areas. These areas should be avoided by all construction personnel.

4. Construction personnel should receive Service-approved worker environmental awareness training. This training instructs workers to recognize giant garter snakes and their habitat(s).

5. 24-hours prior to construction activities, the project area should be surveyed for giant garter snakes. The survey of the project area should be repeated if a lapse in construction activity of two weeks or greater has occurred. If a snake is encountered during construction, activities shall cease until appropriate corrective

measures have been completed or it has been determined that the snake will not be harmed. Report any sightings and any incidental take to the Service immediately by telephone at (916) 414-6620.

6. Any dewatered habitat should remain dry for at least 15 consecutive days after April 15 and prior to excavating or filling of the dewatered habitat.

7. After completion of construction activities, remove any temporary fill and construction debris and, wherever feasible, restore disturbed areas to pre-project conditions. Restoration work may include such activities as replanting species removed from banks or replanting emergent vegetation in the active channel.

8. Follow the conservation measures in Table 1 to minimize the effects of loss and disturbance of habitat on giant garter snakes. Replacement ratios are based on the acreage and on the duration of disturbance.

TABLE 1 - SUMMARY OF GIANT GARTER SNAKE CONSERVATION MEASURES

	IMPACTS: DURATION	**IMPACTS:** ACRES	**CONSERVATION MEASURE:** COMPENSATION
LEVEL 1	1 season	Less than 20 and temporary	Restoration
LEVEL 2	2 seasons	Less than 20 and temporary	Restoration plus 1:1 replacement
LEVEL 3	More than 2 seasons and temporary	Less than 20 and temporary	3:1 Replacement (or restoration plus 2:1 replacement)
	Permanent loss	Less than 3 acres total giant garter snake habitat AND Less than 1 acre aquatic habitat; OR Less than 218 linear feet bank habitat	3:1 Replacement

Giant garter snake habitat includes 2.0 acres of surrounding upland habitat for every 1.0 acre of aquatic habitat. The 2.0 acres of upland habitat also may be defined as 218 linear feet of bank side habitat which incorporates adjacent uplands to a width of 200 feet from the edge of each bank. Each acre of created aquatic habitat should be supported by two acres of surrounding upland habitat. Compensation may include creating upland refuges and over-wintering sites for the giant garter snake that are above the 100-year flood plain.

A season is defined as the calendar year period between May 1 and October 1: the active period for giant garter snakes, when mortality is less likely to occur.

Exhibit 3

California Department of Fish and Game
Bay Delta Region

California Endangered Species Act
Incidental Take Permit No. **2081-2009-005-03**

CITY OF STOCKTON
STOCKTON DELTA WATER SUPPLY PROJECT

Authority: This California Endangered Species Act (CESA) Incidental Take Permit (ITP) is issued by the Department of Fish and Game (DFG) pursuant to Fish and Game Code sections 2081(b) and 2081(c), and California Code of Regulations, title 14, subdivision 3, chapter 6, article 1, commencing with section 783. CESA prohibits the take[1] of any species of wildlife designated as an endangered, threatened, or candidate species[2] by the Fish and Game Commission. DFG, however, may authorize the take of such species by permit if the conditions set forth in Fish and Game Code sections 2081(b) and 2081(c) are met. (See also Cal. Code Regs., tit. 14, § 783.4.)

Permittee:	**City of Stockton**
Name and title of principal officer:	**Mark J. Madison, P.E., Director of Municipal Utilities**
Contact person:	**Robert L. Granberg, (209) 937-8779**
Mailing address:	**2500 Navy Drive** **Stockton, California 95206**

Effective Date and Expiration Date of the ITP:
This ITP shall be executed in duplicate original form and shall become effective once a duplicate original is acknowledged by signature of the Permittee on the last page of the ITP and returned to DFG's Habitat Conservation Planning Branch at the address listed in the Notices section of this ITP. Unless renewed by DFG, this ITP's authorization to take the Covered Species shall expire on December 31, 2014.

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[1]Pursuant to Fish and Game Code section 86, "'Take' means hunt, pursue, catch, capture, or kill, or attempt to hunt, pursue, catch, capture or kill."

[2]"Candidate species" are species of wildlife that have not yet been placed on the list of endangered species or the list of threatened species, but which are under formal consideration for listing pursuant to Fish and Game Code section 2074.2.

Project Location:
The City of Stockton's Delta Water Supply Project will be located west and north of Stockton. The Project will be on the San Joaquin River and will extend from the southwestern tip of Empire Tract, west of Stockton, adjacent to the Stockton Deep Water Ship Channel, to a location north of Stockton, approximately three miles east of Interstate 5 (I-5) (Figure 1).

Project Description:
The Permittee proposes to construct: 1) a new water intake and pump facility on Empire Tract; 2) an approximately 67,000-foot (12.7-mile) raw water pipeline; 3) a new water treatment plant (WTP) and associated infrastructure on 56 acres of a 126-acre parcel just north of Stockton, and 4) an approximately 23,760-foot (4.5-mile) treated water pipeline. Construction of the new WTP and associated infrastructure, the 12.7 mile raw water pipeline and the 4.5 mile treated water pipeline are activities covered under the San Joaquin County Multi-Species Habitat Conservation and Open Space Plan (SJMSCP), and therefore, incidental take of Swainson's Hawk (*Buteo swainsoni*) and giant garter snake (*Thamnophis gigas*) associated with those activities are authorized pursuant to DFG's ITP for the SJMSCP (ITP No. 2081-2000-006-02). In order to avoid the potential for additional incidental take of the species covered by this ITP that could result from pipeline construction, the Permittee has proposed trenchless construction techniques such as, bore and jack and microtunneling where the pipeline construction activities cross waterways. As a result, this ITP covers only the portion of the proposed activities not covered under the SJMSCP, which is limited to construction and operation of the new water intake and pump facility on Empire Tract, as described below (hereafter, the Project).

The initial capacity of the Project will divert up to 30 million gallons per day (mgd) (47 cubic feet per second [cfs]), with possible, future staged incremental expansions to an ultimate capacity of 160 mgd (250 cfs). The State Water Resources Control Board (SWRCB) bifurcated the water rights application into two separate applications; Application 30531A (WA30531A) and Application 30531B. WA 30531A covers only the initial phase of the Project up to 30 mgd (33,600 AF/year) under Water Rights Permit 21176 (WRP 21176) issued on March 8, 2006. WRP 21176 only covers water allowable under WA 30531A and additional diversion amounts require additional analysis and authorization. The current place of use for WRP 21176 is confined to the City's current 1990 General Plan boundary. The new water intake facility will be designed to accommodate expansion to avoid extensive future construction in the river and sloughs. This ITP covers Project operation of up to 30 mgd and 47 cfs. When phases of the Project beyond 30 mgd are needed, the Permittee will be required to prepare additional project-level California Environmental Quality Act (CEQA) documentation, request additional water rights from the SWRCB under Application 30531B and request additional take authorization from DFG.

Though diversion of water beyond 30 mgd is not covered under this ITP, the proposed in-bank intake and pump station facility will include flat plate screens sized to accommodate the

80 mgd intake capacity predicted for the year 2050. In the future and not addressed in this ITP, the City may propose to construct an additional 80 mgd intake and pump station to reach a total capacity of160 mgd.

The fish screen and intake channel for the pump station facility will be built into the levee bank of the existing levee. Water flows at the south bank location average 15,010 cfs (tidally driven), which will assist in maintaining the desired sweeping velocity of 0.4 feet per second (fps) across the intake fish screen. The vertical screen height of the fish screen will be 15 feet with a nominal structure length of 120 feet. The fish screen may be slightly angled away from vertical to better conform to the established slope of the levee. The fish screen will be designed to meet the current fish screen criteria established by National Marine Fisheries Service (NMFS), U.S. Fish and Wildlife Service (USFWS), and DFG. The void between the existing levee and the newly placed wing walls will be filled with imported material (1,300 cubic yards) and compacted to provide support for the intake structure. The dredging, cofferdam installation, removal of water from behind the cofferdam and backfilling of soil is expected to take approximately 60 days to complete. Within the area identified as the footprint for the intake structure, a network of 14-inch diameter pre-stressed concrete piles will be driven into the soil to a depth of 75 feet. These concrete piles will provide support to the poured concrete slab foundation of the intake facility and the related concrete structural elements of the fish screen and pumping platform.

Covered Species:

This ITP covers the following species:

Name	**Status Under CESA**[3]
Fish	
1. Delta smelt (*Hypomesus transpacificus*)	Threatened[4]
2. longfin smelt (*Spirinchus thaleichthys*)	Candidate[5]

[3]Under CESA, a species may be on the list of endangered species, the list of threatened species, or the list of candidate species. All other species are "unlisted."

[4] The Fish and Game Commission has approved a petition to uplist the Delta smelt from threatened to endangered. The Delta smelt's legal status will officially change upon conclusion of the rulemaking process that was initiated to modify regulations to update the species' status. The same take prohibitions apply to threatened and endangered species, and therefore this ITP will remain in effect after the status change.

3. Winter-run Chinook salmon (*Oncorhynchus tshawytscha*) Endangered

4. Spring-run Chinook salmon (*Oncorhynchus tshawytscha*) Threatened

These species and only these species are hereinafter referred to as "Covered Species."

Impacts to Covered Species:
The Project activities described above and their resulting impacts are expected to result in the incidental take of individuals of the Covered Species as follows:

Construction

Individuals of the Covered Species may be incidentally taken as a result of mortality due to instream cofferdam construction and project related dewatering. Specifically, preconstruction dredging will remove approximately 6,700 cubic yards of native river bank and channel bottom material; construction of the facility will permanently remove 0.32 acres of instream habitat; the waterside portion of the construction area will then be isolated from the main channel by permanent sheet pile wing walls and a temporary sheet pile cofferdam; approximately 833 cubic yards of rock riprap will be placed along the permanent wing walls of the intake structure; and the area within the cofferdam and the existing levee will be pumped dry and filled with approximately 1300 cubic yards of material to allow for construction activities to occur.

Operation

Impacts of the proposed taking also include the temporary and permanent impacts to the Covered Species resulting from the operation of the Project. The Covered Species may be incidentally taken as a result of mortality due to Project operations including entrainment/ salvage, increased habitat degradation, and the Project's incremental contribution to cumulative impacts. To compensate for impacts, the City will be required to uphold minimization and mitigation measures regarding flows, screening of intakes, effectiveness monitoring, habitat restoration, and land acquisition. The design of the fish screens will protect Chinook salmon and longfin and Delta smelt greater than 20mm.

Incidental Take Authorization of Covered Species:
This ITP authorizes incidental take of the Covered Species and only the Covered Species.

[5] The Fish and Game Commission has approved a petition to list the longfin smelt as a threatened species. The longfin smelt's legal status will officially change upon conclusion of the rulemaking process that was initiated to modify regulations to update the species' status. The same take prohibitions apply to candidate, threatened and endangered species, and therefore this ITP will remain in effect after the status change.

With respect to incidental take of the Covered Species, DFG authorizes the Permittee, its employees, contractors, and agents to take Covered Species incidentally in carrying out the Project, subject to the limitations described in this section and the Conditions of Approval identified below. This ITP does not authorize take of Covered Species from activities outside the scope of the Project as described above, take of Covered Species resulting from violation of this ITP, or intentional take of Covered Species, except for capture and relocation of Covered Species as authorized by this ITP.

Conditions of Approval:
Unless specified otherwise, the following measures shall pertain to all ground- or vegetation-disturbing activities (including in-water work) within the Project construction boundaries, including areas used for ingress and egress routes during construction. DFG's issuance of this ITP and Permittee's authorization to take the Covered Species are subject to Permittee's compliance with and implementation of the following Conditions of Approval:

1. Permittee shall comply with all applicable state, federal, and local laws in existence on the effective date of this ITP or adopted thereafter.

2. Permittee shall implement and adhere to the mitigation measures related to the Covered Species in the Environmental Impact Report (SCH# 2003112060) certified by the Permittee as lead agency for the Project under the California Environmental Quality Act (CEQA) on November 8, 2005.

3. Permittee shall fully implement and adhere to the conditions of this ITP within the time frames set forth below and as set forth in the Mitigation Monitoring and Reporting Program (MMRP), which is included as Attachment 1 to this ITP.

4. General Provisions:

4.1. Before initiating ground-disturbing activities, the Permittee shall designate a representative (Designated Representative) responsible for communications with DFG and for overseeing compliance with this ITP. The Permittee shall notify DFG in writing prior to commencement of ground- or vegetation-disturbing activities of the Designated Representative's name, business address, and contact information, and shall notify DFG in writing if a substitute Designated Representative is selected or identified at any time during the term of this ITP.

4.2. The Permittee shall hire a biologist knowledgeable and experienced in the biology and natural history of the Covered Species (Designated Biologist). The Designated Biologist shall monitor construction activities within the Project area. At least 30 days prior to ground-disturbing activities, the Permittee shall submit to DFG in writing the proposed Designated Biologist's name, qualifications, business

address, and contact information for review and approval. The Permittee shall not commence ground-disturbing activities until DFG approves the Designated Biologist.

4.3. The Designated Biologist shall have authority to require Project-related personnel to immediately stop any activity that is not in compliance with this ITP, and to order any reasonable measure to avoid the unauthorized take of an individual of the Covered Species. Neither the Designated Biologist nor DFG shall be liable for any costs incurred in complying with the Conditions of Approval, including cease-work orders issued by DFG.

4.4. All in-water work within Honker Cut, Bishop Cut, Pixley Slough and San Joaquin River shall be conducted within sheetpile cofferdams and in isolation from the flowing water. Installation of all sheetpile cofferdams shall be limited to August 1 through October 31. Work within cofferdams may occur outside of this work period. Alternative cofferdam designs shall only be used if approved by DFG. The Permittee shall use a vibratory hammer to install all cofferdams.

4.5. Piles will only be driven for one 80 mgd pumping unit. Piles shall only be driven during the period August 1 through October 31.

4.6. A minimum buffer zone of 25 feet shall be implemented at entry and exit points during boring under Honker Cut and Bishop Cut. The pipeline shall be tunneled at sufficient depth to avoid the potential for a fracture in the streambed (frac-out).

4.7. Erosion control measures shall be utilized throughout all phases of operation in areas where soil, silt, dirt and/or sediment from project activities threatens to enter waters of the State. Runoff and sedimentation will be prevented by the implementation of appropriate construction best management practices (BMPs). The stockpiled soil will be protected from the elements. At no time shall any of these materials be allowed to enter or be placed where it may enter waters of the State. Erosion control matting will not include monofilament or plastic; the matting will be composed of jute, straw, coconut matting, or other natural fibers.

4.8. Construction and trench dewatering activities shall comply with a permit issued by the California Central Valley Regional Water Quality Control Board (Regional Board) before being discharged. Surface areas disturbed by the open trenching activities will be restored to their original condition. Unpaved areas will be replanted with grasses, shrubs, and trees as required by DFG.

4.9. Permittee shall employ trenchless construction techniques such as bore and jack and microtunneling to pass under sensitive areas, such as the waterways of

Bishop and Honker Cuts. Spoils from the excavation will be placed alongside the pits outside of the channel for future use as backfill. Staging and storage areas for equipment, materials, fuels, lubricants, and solvents shall be located outside of the channel and banks. Stationary equipment such as motors, pumps, generators, compressors, and welders, located within or adjacent to the channel, shall be positioned over drip pans. Any equipment or vehicles driven and/or operated within or adjacent to the channel shall be checked and maintained daily to prevent leaks of materials that if introduced to water could be deleterious to aquatic life. Vehicles shall be moved away from the channel prior to refueling and lubrication.

4.10. Poured concrete shall be excluded from the wetted channel for a period of 30 days after it is poured. During that time the poured concrete shall be kept moist, and runoff from the concrete shall not be allowed to enter waters of the State. Commercial sealants (e.g. Deep Seal, Elasto-Deck BT Reservoir Grade) may be applied to the poured concrete surface where difficulty in excluding water flow for a long period may occur. If sealant is used, water shall be excluded from the site until the sealant is dry.

4.11. Permittee shall conduct an education program for all persons employed or otherwise working on the Project site prior to performing work on-site. Instruction shall consist of a presentation by the Designated Biologist that includes a discussion of the biology and general behavior of the Covered Species, information about the distribution and habitat needs of the Covered Species, sensitivity of the Covered Species to human activities, their status under CESA including legal protection, recovery efforts, penalties for violations and Project-specific protective measures described in this ITP. In particular, the education program shall instruct workers to notify the Designated Biologist during fish rescue operations (as described in Condition 6.4) if fish are observed and specify that activities shall cease until additional fish have been relocated. The Designated Biologist will remain at the site to rescue additional fish if the workers observe them within the dewatering area. Interpretation shall be provided for non-English speaking workers, and the same instruction shall be provided for any new workers prior to on-site Project activity. Copies of this ITP shall be maintained at the worksite with the Project Manager. Permittee shall prepare and distribute wallet-sized cards or a fact sheet handout containing this information for workers to carry on-site. Upon completion of the program, employees shall sign an affidavit stating they attended the program and understand all protection measures. These forms shall be filed at the City of Stockton offices and be available to DFG upon request.

4.12. Project-related personnel shall access the Project site during construction and development activities using existing routes and shall not cross habitat outside of pre-approved access roads. To the extent possible, the Permittee shall use

previously disturbed areas within the Project site for temporary storage areas, laydown sites, and any other surface-disturbing activities. If construction of offsite routes of travel will be required, DFG shall be contacted prior to carrying out such an activity. DFG may require an amendment to this ITP if additional take of Covered Species may result from Project modification.

4.13. The Permittee shall provide DFG representatives with reasonable access to the Project site and mitigation lands under its control, and shall otherwise fully cooperate with DFG efforts to verify compliance with or effectiveness of mitigation measures set forth in the ITP.

4.14. Upon Project completion, the Permittee shall remove from the site and properly dispose of all construction refuse, including, but not limited to, broken equipment parts, wrapping material, cords, cables, wire, rope, strapping, twine, buckets, metal or plastic containers, and boxes.

4.15. Notwithstanding any expiration date on this ITP's take authorization, the Permittee's obligations under this ITP do not end until DFG accepts as complete the Permittee's Final Mitigation Report required by Condition 5.8 of this ITP.

5. **Notification and Reporting Provisions**:

5.1. The Permittee shall notify DFG and shall document compliance with all pre-construction Conditions of Approval before initiating ground-disturbing activities.

5.2. Weekly Status Report: The Designated Representative shall provide DFG with a single status report every Monday on all activities authorized by this ITP. The status report shall list the schedule of events (beginning dates, work in progress, and completion dates) and shall be submitted until the list of authorized activities is complete or there are scheduled periods of inactivity. The status report shall be sent via email transmittal to cgray@dfg.ca.gov.

5.3. Monthly Compliance Report: The Designated Biologist shall be on-site daily while construction and/or surface-disturbing activities are taking place to minimize take of the Covered Species and to check for compliance with all mitigation and avoidance measures. These inspections shall be compiled into a Monthly Compliance Report and submitted to DFG at the office listed below or via e-mail to DFG's regional representative at cgray@dfg.ca.gov. DFG may at any time increase the timing and number of compliance inspections and reports required under this provision depending upon the results of previous compliance inspections. If DFG determines the reporting schedule is inadequate, DFG will notify Permittee by letter of the new reporting schedule.

5.4. The Permittee shall immediately notify DFG in writing if it determines that it is not in compliance with any condition of approval of this ITP, including but not limited to any actual or anticipated failure to implement mitigation measures within the time periods indicated in this ITP and/or the MMRP. Permittee shall report any non-compliance during the construction phase to DFG within 24 hours.

5.5. All observations of Covered Species during Project activities shall be conveyed to the Permittee's Designated Representative or Designated Biologist. This information shall be included in the next weekly status report (see Condition 5.2) submitted to DFG by the Permittee.

5.6. If a Covered Species is killed by Project-related activities during construction, or if a Covered Species is otherwise found dead, the Designated Biologist shall be immediately notified and a written report will be sent to DFG within two (2) calendar days. The report will include the date, time of the finding or incident, location of the carcass, and the circumstances.

5.7. Annual Status Report: Beginning with issuance of the ITP and continuing until DFG accepts the Final Mitigation Report identified below, Permittee shall provide DFG an Annual Status Report (ASR) no later than January 31 of every year. Each ASR shall include, at a minimum: 1) a general description of the status of the Project site and construction activities, including actual or projected completion dates, if known; 2) a copy of the table in the MMRP with notes showing the current implementation status of each mitigation measure; and 3) an assessment of the effectiveness of each completed or partially completed mitigation measure in minimizing and compensating for Project impacts.

5.8. Final Mitigation Report: No later than 45 days after completion of construction, including completion of all mitigation measures, Permittee shall provide DFG with a Final Mitigation Report. The Final Mitigation Report shall be prepared by the Designated Biologist and shall include, at a minimum: 1) a copy of the table in the MMRP with notes showing when each of the mitigation measures was implemented; 2) all available information about Project-related incidental take of Covered Species; 3) information about other Project impacts on the Covered Species; 4) construction dates; 5) an assessment of the effectiveness of the ITP's conditions of approval in minimizing and mitigating for Project impacts; 6) recommendations on how mitigation measures might be changed to more effectively minimize and mitigate the impacts of future projects on the Covered Species; and 7) any other pertinent information, including the level of take of the Covered Species associated with the Project.

6. Take Minimization Measures:
Take avoidance of Covered Species is the first priority of this ITP. Relocation of Covered Species discovered within the work area prior to ground- or vegetation-disturbing activities, as well as during Project construction, is the second priority of this ITP. Permittee shall implement and adhere to the following conditions to minimize take of Covered Species.

Diversion of Water

6.1. The initial capacity of the Project shall be limited to 30 million gallons per day (mgd) and a maximum instantaneous rate of diversion of 47 cfs. Further expansion of the Project is not covered under this ITP and will require additional take authorization from DFG.

6.2. The Project intake shall be operated to minimize entrainment of Delta and longfin smelt larvae by reducing and curtailing diversion during sensitive time periods. Pumping rate shall not exceed 24 cfs during the periods February 15 and March 15 and May 21 through June 15. Pumping shall cease during the period of March 15 through May 20. The Permittee may divert up to 47 cfs outside of these time frames.

6.3. Smelt Monitoring Plan: To evaluate the effectiveness of the minimization measures, the Permittee shall develop and implement a plan to monitor and quantify the entrainment of the Covered Species at the Project intake. A Smelt Monitoring Plan shall be submitted to DFG for approval prior to any water diversion. In addition to quantifying the amount of take, the monitoring shall assess the effectiveness of the period of curtailment and reduced pumping and evaluate if other periods would provide better protection. An annual Smelt Monitoring Report, which is separate from and in addition to the ASR identified in Condition 5.7, shall be submitted to DFG for review and comment by December 31 of each year.

6.4. Fish Rescue Plan: The Permittee shall submit a Fish Rescue Plan to be implemented during cofferdam dewatering operations for DFG approval prior to any in-water work. The plan shall include at minimum the following:

a) Cofferdams shall only be closed during low tide events to minimize fish capture.

b) Prior to fully dewatering the cofferdams, remaining fish in the work area will be rescued. Efforts will be made to reduce collecting and handling stress, minimize the time that fish are held in buckets, and minimize handling stress during processing and release. Immediately after collection, fish will be identified, measured, and counted.

c) Under the direct supervision of the Designated Biologist, longfin smelt and Delta smelt shall be processed first and released as soon as possible. Species name and length data shall be recorded on data sheets, as well as time, date, location, gear type, water temperature, and any other pertinent observations of the fish.

d) No employee or contractor shall remove any fish, dead or alive, from the site for personal use. All efforts to reduce the time that live fish are out of the water shall be made so as to reduce the chances of incidental take during the fish rescue. All fish are to be promptly returned to the water with the exception of any dead longfin smelt or Delta smelt.

e) During the fish rescue, there is potential for fish mortality. If any Covered Species suffers mortality, the individuals will be preserved via freezing or placing in a container with 10 percent formalin solution. Information on time and exact location of any incidental take, method of take, length of time from death to preservation, water temperature, and any other relevant information shall be recorded in writing. Preserved individuals will be brought to DFG laboratories.

f) After completing the fish rescue, the Designated Biologist shall prepare a brief documentation report. The report shall include information on the personnel conducting the fish rescue, methods used, numbers of each species collected and relocated, length data, and estimate of the survival of fish immediately after release. Photographs of the site and rescue operations shall be included. The report shall be provided by the Permittee to DFG within 30 days of completing the fish rescue. This report is separate from, and in addition to, the reports required by Condition 5 of this ITP.

g) After the fish rescue effort is completed, dewatering of the area within the cofferdams may continue. If additional fish are observed, dewatering activities shall cease until those fish have been relocated. The Designated Biologist shall remain at the site to rescue additional fish if the workers observe them within the dewatering area.

6.5. Pumps used to dewater the area behind the cofferdam will be screened to protect the Covered Species and other aquatic species. Pumps used to dewater cofferdams shall be screened as follows:

a) Perforated plate: screen openings shall not exceed 3/32 inches (2.38 mm), measured in diameter.

1. Woven wire: screen openings shall not exceed 3/32 inches (2.38 mm), measured diagonally.
2. Screen material shall provide a minimum of 27% open area.

3. Approach velocity shall not exceed 0.33 feet per second.

7. Full Mitigation for Take:
DFG has determined that implementation of both of the following measures is necessary and required under CESA to fully mitigate impacts of the taking on Covered Species that will result from implementation of this Project.

7.1 Condition 6.2 shall be implemented to ensure diversion of water is reduced or ceased during the most sensitive periods for the Covered Species. The implementation of Condition 6.2 not only minimizes take, but partially mitigates the take caused by the Project by providing additional freshwater inflows through the delta, thus increasing available aquatic habitat.

7.2 Habitat Management Land Acquisition and Funding Assurances:
Prior to initiating ground- or vegetation-disturbing Project activities, or no later than 18 months from the effective date of this ITP if Security is provided pursuant to Condition 8 below, the Permittee shall acquire, restore, enhance and permanently preserve 5.96 acres of tidal wetland habitat that shall be the Habitat Management Lands (HM Lands). The required acreage includes 0.96 acres to compensate the permanent loss of 0.32 acres of shallow water habitat and 5.0 acres to mitigate the loss of Covered Species during Project operations. This determination is based on an assessment of timing and quantity of the aquatic habitat impacted by the Project, an evaluation of the potential ongoing impacts due to operation, and an assessment of the value of the other mitigation provided. Permittee shall provide the HM Lands as follows:

7.2.1 A minimum of three months prior to acquisition of the HM Lands, the Permittee shall submit to DFG for approval a formal Proposed Lands for Acquisition Form (see Attachment 2B) identifying the land to be purchased as mitigation for the Project's impacts on Covered Species. As part of this condition, Permittee shall:

7.2.1.1 Transfer fee title to the HM Lands to DFG or another entity under terms approved by DFG. If fee title is held by an entity other than DFG, a conservation easement in a form approved by DFG shall be recorded on title of the HM Lands. The grantee of the conservation easement must be approved by DFG and may be DFG, a DFG-approved non-profit organization qualified pursuant to California Government Code section 65965, or a public agency authorized to hold conservation easements. If a DFG-approved non-profit organization or authorized public agency are grantee on a conservation easement, DFG shall be named third party beneficiary;

7.2.1.2 Provide a recent preliminary title report, initial hazardous materials survey report, and other necessary documents (see Attachment 2A and 2B). All documents conveying the HM Lands and all conditions of title are subject to the approval of DFG, and if applicable, the Wildlife Conservation Board and the Department of General Services;

7.2.1.3 Provide for the initial protection and enhancement of HM Lands as determined by DFG once Permittee identifies the HM Lands. DFG estimates that initial protection and enhancement will cost approximately $10,000.00/acre for 5.96 acres;

7.2.1.4 Conduct a Property Analysis Record (PAR) or PAR-like analysis once the HM Lands have been identified to determine the appropriate endowment amount to fund the in-perpetuity management of the 5.96 acres of required HM Lands. Permittee shall provide the required endowment to DFG or a DFG authorized third party after DFG reviews and approves the analysis. Permittee shall provide funding assurances for the endowment in the Security (see Condition 8 below). Interest from the endowment amount shall be available for reinvestment in the principal and for the long-term operation, management, and protection of the HM Lands, including reasonable administrative overhead, biological monitoring, improvements to biological carrying capacity, law enforcement measures, and any other action designed to protect or improve the habitat values of the HM Lands. Any monies received by DFG pursuant to this Condition shall be deposited in a special deposit account established pursuant to Fish and Game Code section 13014. Alternatively, endowment funds may be held by a DFG-approved non-profit organization qualified to hold endowment funds. DFG may pool the endowment with other endowments for the operation, management and protection of HM Lands for local populations of the Covered Species;

7.2.1.5 Reimburse DFG for reasonable expenses incurred during title and documentation review, expenses incurred from other state agency reviews, and overhead related to transfer of HM Lands to DFG. DFG estimates that this Project will create an additional cost to DFG of no more than $3,000 for every fee title deed or easement processed.

8. Performance Security:

8.1. Permittee may proceed with ground- or vegetation-disturbing activities before completing all of the required mitigation (including acquisition of HM Lands), monitoring, and reporting activities only if Permittee ensures funding to complete those activities by providing to DFG prior to commencing ground- or vegetation disturbing activities or within thirty (30) days after the effective date of this ITP, whichever occurs first, an irrevocable letter of credit in the form of Attachment 4 or another form of security (Security) approved by DFG's Office of the General Counsel. The Security shall allow DFG to draw on the principal sum if DFG, at its sole discretion, determines that Permittee has failed to comply with the Conditions of Approval of this ITP. The Security shall be in the amount of **$119,200.00** based on the following estimated costs of implementing the ITP's mitigation, monitoring and reporting requirements:

8.1.1. Land acquisition costs for impacts to habitat, calculated at $5,000.00/acre for 5.96 acres: **$29,800.00;**

8.1.2. Costs of initial protection and enhancement/restoration of HM Lands, calculated at $10,000.00/acre for 5.96 acres: **$59,600.00;**

8.1.3. Endowment estimate, calculated at $ 5,000.00/acre for 5.96 acres: **$29,800.00.**

Even if the Security is provided, the Permittee must complete the required acquisition, protection and transfer of all HM Lands and record the required conservation easements in favor of DFG no later than 18 months after the start of the ground- or vegetation-disturbing activities.

Amendment:
This ITP may be amended without the concurrence of the Permittee if DFG determines that continued implementation of the Project under existing ITP conditions would jeopardize the continued existence of a Covered Species or that Project changes or changed biological conditions necessitate an ITP amendment to ensure that impacts to the Covered Species are minimized and fully mitigated. DFG may also amend the ITP at any time without the concurrence of the Permittee as required by law.

Stop-Work Order:
DFG may issue Permittee a written stop-work order to suspend any activity covered by this ITP for an initial period of up to 25 days to prevent or remedy a violation of ITP conditions (including but not limited to failure to comply with reporting, monitoring, or habitat acquisition obligations) or to prevent the illegal take of an endangered, threatened, or candidate species. Permittee shall comply with the stop-work order immediately upon receipt thereof. DFG may

extend a stop-work order under this provision for a period not to exceed 25 additional days, upon written notice to the Permittee. DFG shall commence the formal suspension process pursuant to California Code of Regulations, Title 14, section 783.7 within five working days of issuing a stop-work order.

Compliance with Other Laws:
This ITP contains DFG's requirements for the Project pursuant to CESA. This ITP does not necessarily create an entitlement to proceed with the Project. Permittee is responsible for complying with all other applicable state, federal, and local laws.

Notices:
The Permittee shall deliver the fully executed duplicate original ITP by first class mail or overnight delivery to the following address:

Habitat Conservation Planning Branch
California Department of Fish and Game
Attention: CESA Permitting Program
1416 Ninth Street, Suite 1260
Sacramento, CA 95814

Written notices, reports and other communications relating to this ITP shall be delivered to DFG by first class mail at the following addresses, or at addresses DFG may subsequently provide the Permittee. Notices, reports, and other communications should reference the Project name, Permittee, and ITP Number (2081-2009-005-03) in a cover letter and on any other associated documents.

Original cover with attachment(s) to:
Charles Armor, Regional Manager
Bay Delta Region
PO Box 47
Yountville, California 94599
Telephone (707) 944-5517
Fax (707) 944-5553

Copy of cover without attachment(s) to:
Office of the General Counsel
California Department of Fish and Game
1416 Ninth Street, 12th Floor
Sacramento, CA 95814
And:
Habitat Conservation Planning Branch
California Department of Fish and Game

1416 Ninth Street, Suite 1260
Sacramento, CA 95814

Unless Permittee is notified otherwise, DFG's Regional Representative for purposes of addressing issues that arise during implementation of the ITP is:

Corinne Gray, Environmental Scientist
Post Office Box 47
Yountville, California 94599
Telephone (707) 944-5526
Fax (707) 944-5595

Compliance with CEQA:
DFG's issuance of the ITP is subject to CEQA. DFG is a responsible agency under CEQA with respect to the ITP because of prior environmental review of the Project by the Permittee as lead agency for the Project. (See generally Pub. Resources Code, §§ 21067, 21069.) The lead agency's prior environmental review of the Project is set forth in the Environmental Impact Report (EIR) (SCH# 2003112060) that the Permittee certified for the Delta Water Supply Project on November 8, 2005. At the time the lead agency certified the EIR and approved the Project it also adopted all mitigation measures identified in the EIR as conditions of Project approval.

In fulfilling its obligations as a responsible agency, DFG's obligations under CEQA are more limited than the lead agency. DFG, in particular, is responsible for considering only the effects of those activities involved in the Project which it is required by law to carry out or approve and mitigating or avoiding only the direct or indirect environmental effects of those parts of the Project which it decides to carry out, finance, or approve. (Pub. Resources Code, § 21002.1, subd. (d); CEQA Guidelines, §§ 15041, subd. (b), 15096, subds. (f)-(g).)[6] Accordingly, because DFG's exercise of discretion is limited to issuance of the ITP, DFG is responsible for considering only the environmental effects that fall within its permitting authority under CESA.

In conjunction with the issuance of the ITP, DFG is adopting an Addendum to the EIR pursuant to CEQA. (CEQA Guidelines § 15164.) The Addendum describes changes to the Project required by the ITP, including: monitoring requirements, dewatering activities, implanting a fish rescue plan, installing DFG approved fish screens, and restricting diversions to times that Delta and longfin smelt are likely not to be in the system. Further, the Addendum concludes that the recent decision of the Fish and Game Commission to approve

[6] The "CEQA Guidelines" are found in Title 14 of the California Code of Regulations, commencing with section 15000.

a petition to list the longfin smelt as threatened does not constitute a new significant or substantially more severe impact.

Therefore, DFG finds that substantial evidence in the record shows that the changes described in the Addendum are not substantial changes that would require major revisions of the EIR due to the involvement of new significant environmental effects or a substantial increase in the severity of previously identified significant effects. Moreover, since the adoption of the EIR, there have been no significant changes in the circumstances under which the Project will be undertaken, nor has any new information of substantial importance become available. Therefore, pursuant to CEQA Guidelines sections 15164(b) and 15162, an Addendum is the appropriate environmental document for these changes.

This ITP, along with DFG's CEQA findings for the ITP and Project, which are available as a separate document, provide evidence of DFG's consideration of the EIR for the Project and the environmental effects related to issuance of the ITP. (CEQA Guidelines, § 15096, subd. (f).) DFG has considered the adopted EIR and the environmental effects described therein, in conjunction with the Addendum, prior to making a decision on the issuance of the ITP. DFG finds that issuance of the ITP will not result in any previously undisclosed potentially significant effects on the environment or a substantial increase in the severity of any potentially significant environmental effects previously disclosed by the lead agency. Furthermore, to the extent the potential for such effects exists, DFG finds adherence to and implementation of the Conditions of Project Approval adopted by the lead agency, as well as adherence to and implementation of the Conditions of Approval imposed by DFG through the issuance of this ITP, will avoid or reduce to below a level of significance any such potential effects. DFG consequently finds that issuance of the ITP will not result in any significant, adverse impacts on the environment. DFG finds that the EIR and the Addendum are adequate under CEQA to support approval of this ITP.

Findings under CESA:
These findings are intended to document DFG's compliance with the specific findings requirements set forth in CESA and related regulations. (Fish & G. Code § 2081, subs. (b)-(c); Cal. Code Regs., tit. 14, §§ 783.4, subds, (a)-(b), 783.5, subd. (c)(2).)

DFG finds that issuance of this ITP complies and is consistent with the criteria governing the issuance of ITPs under CESA:

(1) Take of Covered Species as defined in the ITP will be incidental to the otherwise lawful activities covered under the ITP;

(2) Impacts of the taking of the Covered Species will be minimized and fully mitigated through the implementation of measures required by this ITP and as described in the

MMRP. Measures include: 1) Permanent habitat protection and management; 2) Monitoring and Compliance Reports; 3) establishment of avoidance zones; 4) seasonal operations and work restrictions; and 4) worker education. As part of making this determination, DFG evaluated the quality of the habitat on the Project site, the scope and extent of direct impacts, the scope and extent of indirect impacts, and other relevant information available to DFG or provided by the Permittee. Based on this evaluation, DFG determined that the protection and management in perpetuity of 5.96 acres of compensatory habitat that is contiguous with other protected Covered Species habitat and/or is of higher quality than the habitat being destroyed by the Project, along with the minimization, monitoring, reporting, and funding requirements of this ITP, meet the CESA issuance criteria;

(3) The take avoidance and mitigation measures required pursuant to the conditions of this ITP and its attachments are roughly proportional in extent to the impact of Permittee's take;

(4) The measures required by this ITP maintain Permittee's objectives to the greatest extent possible;

(5) All required measures are capable of successful implementation;

(6) The ITP is consistent with any regulations adopted pursuant to Fish and Game Code sections 2112 and 2114;

(7) Permittee has ensured adequate funding to implement the measures required by the ITP as well as for monitoring compliance with, and the effectiveness of, those measures for the Project; and

(8) Issuance of the ITP will not jeopardize the continued existence of the Covered Species based on the best scientific and other information reasonably available, and this finding includes consideration of the species' capability to survive and reproduce, and any adverse impacts of the taking on those abilities in light of (a) known population trends; (b) known threats to the species; and (c) reasonably foreseeable impacts on the species from other related projects and activities. Moreover, DFG's finding is based, in part, on DFG's express authority to amend the terms and conditions of the ITP without concurrence of the Permittee as necessary to avoid jeopardy and as required by law.

Attachments:

Figure 1	Map
ATTACHMENT 1	Mitigation Monitoring and Reporting Program
ATTACHMENT 2A,2B	Habitat Management Lands Checklist; PLFAF Form

ATTACHMENT 3 Mitigation Payment Transmittal Form
ATTACHMENT 4 Letter of Credit Form

ISSUED BY THE CALIFORNIA DEPARTMENT OF FISH AND GAME

on June 29, 2009.

Charles Armor, Regional Manager
BAY DELTA REGION

APPROVED AS TO FORM:

Thomas Gibson
Deputy General Counsel

ACKNOWLEDGMENT

The undersigned: 1) warrants that he or she is acting as a duly authorized representative of the Permittee, 2) acknowledges receipt of this ITP, and 3) agrees on behalf of the Permittee to comply with all terms and conditions of the ITP.

By: _____ Date: 7/22/09

Printed Name: J. GORDON PALMER, JR. Title: CITY MANAGER

APPROVED AS TO FORM AND CONTENT

By _____
Assistant City Attorney

Attachment 1

DEPARTMENT OF FISH AND GAME
MITIGATION MONITORING AND REPORTING PROGRAM (MMRP)

CALIFORNIA INCIDENTAL TAKE PERMIT NO. 2081-2009-005-03

PERMITTEE: **City of Stockton**

PROJECT: **Stockton Delta Water Supply Project**

PURPOSE OF THE MMRP

The purpose of the MMRP is to ensure that the impact minimization and mitigation measures required by the Department of Fish and Game (DFG) for the above-referenced Project are properly implemented, and thereby to ensure compliance with section 2081(b) of the Fish and Game Code and section 21081.6 of the Public Resources Code. A table summarizing the mitigation measures required by DFG is attached. This table is a tool for use in monitoring and reporting on implementation of mitigation measures, but the descriptions in the table do not supersede the mitigation measures set forth in the California Incidental Take Permit (ITP) and in attachments to the ITP, and the omission of a ITP requirement from the attached table does not relieve the Permittee of the obligation to ensure the requirement is performed.

OBLIGATIONS OF PERMITTEE

Mitigation measures must be implemented within the time periods indicated in the table that appears below. Permittee has the primary responsibility for monitoring compliance of all mitigation measures and for reporting to DFG on the progress in implementing those measures. These monitoring and reporting requirements are set forth in the ITP itself and are summarized at the front of the attached table.

VERIFICATION OF COMPLIANCE, EFFECTIVENESS

DFG may, at its sole discretion, verify compliance with any mitigation measure or independently assess the effectiveness of any mitigation measure.

TABLE OF MITIGATION MEASURES

The following items are identified for each mitigation measure: Mitigation Measure, Source, Implementation Schedule, Responsible Party, and Status/Date/Initials. The "Mitigation Measure" column summarizes the mitigation requirements of the ITP. The "Source" column identifies the ITP document that sets forth the mitigation measure. The "Implementation Schedule" column shows the date or phase when each mitigation measure will be implemented. The "Responsible Party" column identifies the person or agency that is primarily responsible for implementing the mitigation measure. The "Status/Date/Initials" column shall be completed by the Permittee during preparation of each Status Report and the Final Mitigation Report, and must identify the implementation status of each mitigation measure, the date that status was determined, and the initials of the person determining the status.

	Mitigation Measure	Source	Implementation Schedule	Responsible Party	Status / Date / Initials
BEFORE DISTURBING SOIL OR VEGETATION					
1	Before initiating ground-disturbing activities, the Permittee shall designate a representative (Designated Representative) responsible for communications with DFG and for overseeing compliance with this ITP. The Permittee shall notify DFG in writing prior to commencement of ground- or vegetation-disturbing activities of the Designated Representative's name, business address, and contact information, and shall notify DFG in writing if a substitute Designated Representative is selected or identified at any time during the term of this ITP.	ITP Condition # 4.1	Before commencing ground- or vegetation-disturbing activities/ Entire Project	Permittee	
2	The Permittee shall hire a biologist knowledgeable and experienced in the biology and natural history of the Covered Species (Designated Biologist). The Designated Biologist shall monitor construction activities within the Project area. At least 30 days prior to ground-disturbing activities, the Permittee shall submit to DFG in writing the proposed Designated Biologist's name, qualifications, business address, and contact information for review and approval. The Permittee shall not commence ground-disturbing activities until DFG approves the Designated Biologist.	ITP Condition # 4.2	Before commencing ground- or vegetation-disturbing activities	Permittee	
3	Permittee shall conduct an education program for all persons employed or otherwise working on the Project site prior to performing work on-site. Instruction shall consist of a presentation by the Designated Biologist that includes a discussion of the biology and general behavior of the Covered Species, information about the distribution and habitat needs of the Covered Species, sensitivity of the Covered Species to human activities, their status under CESA including legal protection, recovery efforts, penalties for violations and Project-specific protective measures described in this ITP. In particular, the education program shall instruct workers to notify the Designated Biologist during fish rescue operations (as described in Condition 6.4) if fish are observed and specify that activities shall cease until additional fish have been relocated. The Designated Biologist will remain at the site to rescue additional fish if the workers observe them within the dewatering area. Interpretation shall be provided for non-English speaking workers, and the same instruction shall be provided for any new workers prior to on-site Project activity. Copies of this ITP shall be maintained at the worksite with the Project Manager. Permittee shall prepare and distribute wallet-sized cards or a fact sheet handout containing this information for workers to carry on-site. Upon completion of the program, employees shall sign an affidavit stating they attended the program and understand all protection measures. These forms shall be filed at the City of Stockton offices and be available to DFG upon request	ITP Condition # 4.11	Before commencing ground- or vegetation-disturbing activities / Entire Project	Permittee	
5	The Permittee shall submit a Fish Rescue Plan to be implemented during cofferdam dewatering operations for DFG approval prior to any in water work. The Plan shall conform to the requirements described in Condition 6.4 of the ITP	ITP Condition # 6.4	Before commencing in water activities Entire Project	Permittee	
6	Prior to initiating ground- or vegetation-disturbing Project activities, or no later than 18 months from the effective date of this ITP if Security is provided pursuant to Condition 8 below, the Permittee shall acquire, restore, enhance and permanently preserve 5.96 acres of tidal wetland habitat that shall be the Habitat Management Lands (HM Lands). The required acreage includes 0.96 acres to compensate the permanent loss of 0.32 acres of shallow water habitat and 5.0 acres to mitigate the loss of covered species during project operations. HM Lands shall be provided in accordance with Condition 7.2 of the ITP	ITP Condition # 7.2	Before commencing ground- or vegetation-disturbing activities or no later than 18 months from effective date Entire Project	Permittee	

	Mitigation Measure	Source	Implementation Schedule	Responsible Party	Status / Date / Initials
8	The Permittee shall notify DFG and shall document compliance with all pre-construction Conditions of Approval before initiating ground-disturbing activities.	ITP Condition # 5.1	Before commencing ground- or vegetation-disturbing activities	Permittee	
DURING CONSTRUCTION					
9	The Designated Representative shall provide DFG with a single status report every Monday on all activities authorized by this ITP. The status report shall list the schedule of events (beginning dates, work in progress, and completion dates) and shall be submitted until the list of authorized activities is complete or there are scheduled periods of inactivity. The status report shall be sent via email transmittal to cgray@dfg.ca.gov.	ITP Condition # 5.2	Entire Project	Permittee	
10	The Designated Biologist shall be on-site daily while construction and/or surface-disturbing activities are taking place to minimize take of the Covered Species, to check for compliance with all mitigation and avoidance measures. These inspections shall be compiled into a Monthly Compliance Report and submitted to DFG at the office listed below or via e-mail to DFG's regional representative at cgray@dfg.ca.gov. DFG may at any time increase the timing and number of compliance inspections and reports required under this provision depending upon the results of previous compliance inspections. If DFG determines the reporting schedule is inadequate, DFG will notify Permittee by letter of the new reporting schedule.	ITP Condition # 5.3	Entire Project	Permittee	
11	Permittee shall immediately notify DFG in writing if it determines that it is not in compliance with any condition of approval of the ITP, including but not limited to any actual or anticipated failure to implement mitigation measures within the time periods indicated. Permittee shall report any non-compliance during the construction phase to DFG within 24 hours.	ITP Condition # 5.4	Entire Project	Permittee	
12	All observations of Covered Species during Project activities shall be conveyed to the Permittee's Designated Representative or Designated Biologist. This information shall be included in the next weekly status report submitted to DFG by the Permittee.	ITP Condition # 5.5	Entire Project	Permittee	
13	If a Covered Species is killed by Project-related activities during construction, or if a Covered Species is otherwise found dead, the Designated Biologist shall be immediately notified and a written report will be sent to DFG within two (2) calendar days. The report will include the date, time of the finding or incident, location of the carcass, and the circumstances.	ITP Condition # 5.6	Entire Project	Permittee	
14	Beginning with issuance of the ITP and continuing until DFG accepts the Final Mitigation Report identified below, Permittee shall provide DFG an annual Status Report no later than January 31 of every year. Each Status Report shall include, at a minimum: 1) a general description of the status of the Project site and construction activities, including actual or projected completion dates, if known; 2) a copy of this table with notes showing the current implementation status of each mitigation measure; and 3) an assessment of the effectiveness of each completed or partially completed mitigation measure in minimizing and compensating for Project impacts.	ITP Condition # 5.7	Entire Project	Permittee	

	Mitigation Measure	Source	Implementation Schedule	Responsible Party	Status / Date / Initials
15	DFG may issue Permittee a written stop-work order to suspend any activity covered by this ITP for an initial period of up to 25 days to prevent or remedy a violation of ITP conditions (including but not limited to failure to comply with reporting, monitoring, or habitat acquisition obligations) or to prevent the illegal take of an endangered, threatened, or candidate species. Permittee shall comply with the stop-work order immediately upon receipt thereof. DFG may extend a stop-work order under this provision for a period not to exceed 25 additional days, upon written notice to the Permittee. DFG shall commence the formal suspension process pursuant to California Code of Regulations, Title 14, section 783.7 within five working days of issuing a stop-work order.	ITP	Entire Project	Department of Fish and Game	
PRIOR TO DIVERSION					
16	Smelt Monitoring Plan: To evaluate the effectiveness of the minimization measures, the Permittee shall develop and implement a plan to monitor and quantify the entrainment of the Covered Fish Species at the Project intake. A Smelt Monitoring Plan shall be submitted to DFG for approval prior to any water diversion. In addition to quantifying the amount of take, the monitoring shall assess the effectiveness of the period of curtailment and reduced pumping and evaluate if other periods would provide better protection. An annual Smelt Monitoring report, separate from and in addition to the Project Annual Status Report identified above, shall be submitted to DFG for review and comment by December 31 of each year.	ITP Condition # 6.3	Entire Project	Department of Fish and Game	
POST-CONSTRUCTION					
17	No later than 45 days after completion of the Project, including completion of all mitigation measures, Permittee shall provide the DFG with a Final Mitigation Report. The Final Mitigation Report shall be prepared by the Designated Biologist and shall include, at a minimum: 1) a copy of this table with notes showing when each of the mitigation measures was implemented; 2) all available information about Project-related incidental take of the Covered Species; 3) information about other Project impacts on the Covered Species; 4) construction dates; 5) an assessment of the effectiveness of the ITP's Conditions of Approval in minimizing and compensating for Project impacts; 6) recommendations on how mitigation measures might be changed to more effectively minimize and mitigate the impacts of future projects on the species; and 7) any other pertinent information, including the level of tale pf the Covered Species associated with the Project.	ITP Condition # 5.8	Post-construction and after completion of mitigation	Permittee	
18	DFG accepts the Final Mitigation Report as complete.	ITP Condition # 4.15	Post-construction	Department of Fish and Game	

EXHIBIT 2

ATTACHMENT 2A
DEPARTMENT OF FISH AND GAME
HABITAT MANAGEMENT LAND ACQUISITION PACKAGE CHECKLIST FOR PROJECT APPLICANTS

The following checklist is provided to inform you of what documents are necessary to expedite Department processing of your Habitat Management Land acquisition proposal. Any land acquisition processing requests which are incomplete when received, will be returned. The Region contact will review and approve the document package and forward it to the Lands and Facilities Branch (LFB) Realty Services Coordinator with a request to process the land acquisition for formal acceptance.

To: Charles Armor
Regional Manager, Region Name

From: City of Stockton
Project Applicant

Phone: _____

Tracking #: 2081-2009-005-03
CDFG assigned permit or agreement #

Project Name: Stockton Delta Water Supply Project

Enclosed is the complete package for the ☐ Conservation Easement OR ☐ Grant Deed

Documents in this package include:

☐ Fully executed, approved as to form Conservation Easement Deed or Grant Deed.
Date executed: _____

☐ Proposed Lands for Acquisition Form (PLFAF)

☐ Phase I Environmental Site Assessment Report Date on report: _____
(An existing report may be used, but it must be less than two years old.)

☐ Preliminary Title Report(s) for subject property is enclosed and has been reviewed for encumbrances and other easements. The title report must be less than six months old when final processing is conducted.
Included are additional documents:
- ☐ document(s) to support title exceptions
- ☐ document(s) to explain title encumbrances
- ☐ a plot or map of easements/encumberances on the property

☐ Policy of Title Insurance (an existing title policy is not acceptable)

☐ County Assessor Parcel Map(s) for subject property

☐ Site Location Map (Site location with property boundaries outline on a USGS 1:24,000 scale topo)

☐ Final Permit or Agreement (or other appropriate instrument)
Type of agreement: ☐ Bank Agreement ☐ Mitigation Agreement
☐ Permit _____ Other: _____
(write in type of permit)

☐ Final Management Plan (if required prior to finalizing permit or agreement or if this package is for a Grant Deed)

☐ Biological Resources Report

☐ Draft Summary of Transactions ☐ hard copy ☐ electronic copy (both are required)

PROPOSED LANDS FOR ACQUISITION FORM ("PLFAF")

Date: _____

TO: Regional Representative
_____
_____
_____
Facsimile:

FROM: _____
_____
_____
_____

Applicant proposes that the following parcel of land be considered for approval by the Department as suitable for purposes of habitat management lands to replace the adverse environmental impacts of the Project:

Section	Township	Range	Number of Acres
_____	_____	_____	_____

Current Legal Owner(s), include Parcel Number(s):
_____
_____
_____

Location of Parcel:
_____
_____
_____
_____
_____

APPROVED ___ By: _____ DATE: _____
REJECTED ___ _____
Region

Explanation: _____
_____
_____

Jan 2003

California Department of Fish and Game

Mitigation Payment Transmittal Form

Project Applicant Instructions: Please fill out and attach this form to payment. For conservation banks, also attach the Bill(s) of Sale for credits sold. One form may be used for multiple transactions, **BUT YOU MUST USE A SEPARATE FORM FOR EACH CHECK YOU TRANSMIT**. Make sure to include Project Name, Project Tracking Number, and FASB Mitigation Tracking Number (if available) on the attached payment type.

(1) **DATE:** _____

TO: Charles Armor
[CDFG Regional Manager]
P.O. Box 47, Yountville, CA 94599
[CDFG Region Office Address]

(2) **FROM:** _____
Name

_____
Mailing Address

_____
City, State, Zip

_____
Telephone Number/FAX Number

(3) **RE:** Stockton Delta Water Supply Project
[Project Name as appears on permit/agreement]

(4) **AGREEMENT/ACCOUNT INFORMATION:**
(Check the applicable type)

X 2081 Permit ☐ Conservation Bank ☐ 1802 Agreement

☐ 2835 NCCP ☐ Other _____

2081-2009-005-03
[Project Tracking Number]

_____
[FASB Mitigation Tracking Number (if available)]

Index _____ PCA _____

(5) PAYMENT TYPE (One check per form only): The following funds are being remitted in connection with the above referenced project:

Check information:

Total $_____ Check No. _____

Account No. _____ Bank Routing No. _____

a. Endowment: for Long-Term Management Subtotal $_____

b. Habitat Enhancement Subtotal $_____

c. Security:

1. Cash Refundable Security Deposit Subtotal $_____

2. Letter of Credit Subtotal $_____

1. Financial Institution: _____

2. Letter of Credit Number: _____

3. Date of Expiration: _____

IRREVOCABLE STANDBY LETTER OF CREDIT NO. [***number***]

Issue Date: [***date***]

Beneficiary:

Department of Fish and Game
1416 Ninth Street, 12th Floor
Sacramento, CA 95814
Attn: Office of the General Counsel

Amount: U.S. $[***dollar number***] [(***dollar amount***)]

Expiry: [***Date***] at our counters

Comment: Bank or Applicant will complete the heading (i.e., the information above this comment box). The heading will be subject to change by bank on a bank-by-bank basis. DFG will verify the amount and expiry date are correct.

Dear Sirs:

1. At the request and on the instruction of our customer, [***name of applicant***] ("Applicant"), we, [***name of bank***] ("Issuer"), hereby establish in favor of the beneficiary, the California Department of Fish and Game ("Department"), this irrevocable standby letter of credit ("Credit") in the principal sum of U.S. $[***dollar number***] [(***dollar amount***)] ("Principal Sum").

Comment: Bank or Applicant will complete.

Comment: Bank or Applicant will complete.

Comment: Applicant or DFG will insert amount. If the former, DFG will verify the amount is correct.

2. We are informed this Credit is and has been established for the benefit of the Department pursuant to the terms of the incidental take permit for the [***name of project***] issued by the Department to the Applicant on [***date***] (No. [***number***]) ("Permit").

Comment: Applicant or DFG should insert project name. If the former, DFG will verify the name is correct.

3. We are further informed that pursuant to the Permit, the Applicant has agreed to complete certain mitigation requirements, as set forth in Conditions [***numbers***] in the Permit ("Mitigation Requirements").

Comment: Applicant or DFG should insert date and number. If the former, DFG will verify the information is correct.

Comment: DFG will insert numbers.

4. We are finally informed that this Credit is intended by the Department and the Applicant to serve as a security device for the performance by the Applicant of the Mitigation Requirements.

5. The Department shall be entitled to draw upon this Credit only by presentation of a duly executed Certificate for Drawing ("Certificate") in the same form as Attachment A, which is attached hereto, at our office located at [***name and address of bank***].

Comment: Bank or Applicant will complete.

6. The Certificate shall be completed and signed by an "Authorized Representative" of the Department as defined in paragraph 12 below. Presentation by the Department of a completed Certificate may be made in person or by registered mail, return receipt requested, or by overnight courier.

7. Upon presentation of a duly executed Certificate as above provided, payment shall be made to the Department, or to the account of the Department, in immediately available funds, as the Department shall specify.

8. If a demand for payment does not conform to the terms and conditions of this Credit, we shall give the Department prompt notice that the demand for payment was not effected in accordance with the terms and conditions of this Credit, state the reasons therefore, and await further instruction.

9. Upon being notified that the demand for payment was not effected in conformity with the Credit, the Department may correct any such non-conforming demand for payment under the terms and conditions stated herein.

10. All drawings under this Credit shall be paid with our funds. Each drawing honored by us hereunder shall reduce, *pro tanto*, the Principal Sum. By paying to the Department an amount demanded in accordance herewith, we make no representations as to the correctness of the amount demanded.

11. This Credit will be cancelled upon receipt by us of Certificate of Cancellation, which: (i) shall be in the form of Attachment B, which is attached hereto, and (ii) shall be completed and signed by an Authorized Representative of the Department, as defined in paragraph 12 below.

12. An "Authorized Representative" shall mean either the Director of the Department of Fish and Game, the General Counsel of the Department of Fish and Game, or a Regional Manager of the Department of Fish and Game.

13. This Credit shall be automatically extended without amendment for additional periods of one year from the present or any future expiration date hereof, unless at least sixty (60) days prior to any such date, we notify the Department in writing by registered mail, return receipt requested, or by overnight courier that we elect not to consider this Credit extended for any such period.

14. Communications with respect to this Credit shall be in writing and addressed to us at [***name and address of bank***], specifically referring upon such writing to this credit by number. The address for notices with respect to this Credit shall be: (i) for the Department: Department of Fish and Game, Office of the General Counsel, 1416 Ninth Street, 12th Floor, Sacramento, California 95814-2090 Attn: General Counsel; and (ii) for the Applicant: [***name and address of Applicant***].

Comment: Bank or Applicant will complete.

Comment: Bank or Applicant will complete.

15. This Credit may not be transferred.

DFG Template,No Reduction
Rev. 11/08

16. This Credit is subject to the International Standby Practices 1998 ("ISP 98"). As to matters not covered by the ISP 98 and to the extent not inconsistent with the ISP 98, this credit shall be governed by and construed in accordance with the Uniform Commercial Code, Article 5 of the State of California.

Comment: Paragraph 16 is subject to change by bank on a bank-by-bank basis. OGC will review and approve final language.

17. This Credit shall, if not cancelled, expire on [***expiration date***], or any extended expiration date.

Comment: Bank or Applicant, or DFG will complete. If the former, DFG will verify the date is correct.

18. We hereby agree with the Department that documents presented in compliance with the terms of this Credit will be duly honored upon presentation, as specified herein.

19. This Credit sets forth in full the terms of our undertaking. Such undertaking shall not in any way be modified, amended or amplified by reference to any document or instrument referred to herein or in which this Credit is referred to or to which this Credit relates and any such reference shall not be deemed to incorporate herein by reference any document or instrument.

[***Name of bank***]

By: _____
Name: _____
Title: _____

Comment: Bank will complete.

DFG Template.No Reduction
Rev. 11/08

ATTACHMENT A

Comment: DFG will complete this Certificate if it determines that drawing is required.

IRREVOCABLE STANDBY LETTER OF CREDIT NO. [***number***]
CERTIFICATE FOR DRAWING

To:

[***Name and address of bank***]

Re: Incidental Take Permit No. [***permit number***]

The undersigned, a duly Authorized Representative of the Department of Fish and Game ("Department"), as defined in paragraph 12 in the above-referenced Irrevocable Standby Letter of Credit ("Credit"), hereby certifies to the Issuer that:

1. [***Insert one of the following statements:*** "In the opinion of the Department, the Applicant has failed to complete the Mitigation Requirements referenced in paragraph 3 of the Credit." ***or*** "As set forth in paragraph 13, the Issuer has informed the Department that the Credit will not be extended and the Applicant has not provided the Department with an equivalent security approved by the Department to replace the Credit."]

2. The undersigned is authorized under the terms of the Credit to present this Certificate as the sole means of demanding payment on the Credit.

3. The Department is therefore making a drawing under the Credit in amount of U.S. $_____.

4. The amount demanded does not exceed the Principal Sum of the Credit.

Therefore, the Department has executed and delivered this Certificate as of the ___day of _____, _____.

CALIFORNIA DEPARTMENT OF FISH AND GAME

BY: _____
[Insert one of the following: "DIRECTOR" ***or*** "GENERAL COUNSEL" ***or*** "REGIONAL MANAGER, [***NAME OF REGIONAL OFFICE***]"]

DFG Template.No Reduction
Rev. 11/08

ATTACHMENT B

Comment: DFG will complete this Certificate if it determines the Letter of Credit may be canceled.

IRREVOCABLE LETTER OF CREDIT NO. [***number***]
CERTIFICATE FOR CANCELLATION

To:

[***Name of bank and address***]

Re: Incidental Take Permit No. [***permit number***]

The undersigned, a duly Authorized Representative of the California Department of Fish and Game ("Department"), as defined in the paragraph 12 in the above-referenced Irrevocable Standby Letter of Credit ("Credit"), hereby certifies to the Issuer that:

1. [***Insert one of the following statements:*** "The Applicant has presented documentary evidence of full compliance with the Mitigation Requirements referenced in paragraph 3 of the Credit." ***or*** "The natural expiration of this Credit has occurred."]

2. The Department therefore requests the cancellation of the Credit.

Therefore, the Department has executed and delivered this Certificate for Cancellation as of the ____ day of _____, _____.

CALIFORNIA DEPARTMENT OF FISH AND GAME

BY: _____
[Insert one of the following: "DIRECTOR" ***or*** "GENERAL COUNSEL" ***or*** "REGIONAL MANAGER, [***NAME OF REGIONAL OFFICE***]"]

DFG Template.No Reduction
Rev. 11/08

Exhibit 4

Final

STOCKTON DELTA WATER SUPPLY PROJECT

Larval Smelt Entrainment Risk Analysis 2011-2021

Prepared for
City of Stockton

July 2023

ESA

Final

STOCKTON DELTA WATER SUPPLY PROJECT

Larval Smelt Entrainment Risk Analysis 2011-2021

Prepared for
City of Stockton

July 2023

2600 Capitol Avenue
Suite 200
Sacramento, CA 95816
916.564.4500
esassoc.com

D202200643.00

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TABLE OF CONTENTS

Stockton Delta Water Supply Project
Larval Smelt Entrainment Risk Analysis 2011-2021

List of Figures

List of Tables

Appendices

STOCKTON DELTA WATER SUPPLY PROJECT

Larval Smelt Entrainment Risk Analysis 2011-2021

Introduction

The City of Stockton (City) received an Incidental Take Permit (ITP) issued by the California Department of Fish and Wildlife (CDFW) in 2009 and Biological Opinions (BOs) from the National Marine Fisheries Service (NMFS) in 2006 and U.S. Fish and Wildlife Service (USFWS) in 2007 for the City's Delta Water Supply Project (DWSP). The City completed construction and commenced operation of a screened intake structure located on the lower San Joaquin River as part of the DWSP in 2012.

The intake was designed and constructed in accordance with CDFW, and NMFS fish screening criteria (NMFS 1996; CDFW 2000) and regulatory permit requirements. The intake screen (screen) is designed to effectively exclude juvenile and adult fish inhabiting the Delta but not completely exclude fish eggs and larvae (Normandeau Associates, Inc. 2009). The screen is designed to have an approach velocity equal to or less than 0.2 feet per second (fps). Tuning vanes behind the screen allow for adjustment of the approach velocity to equalize flow patterns across the face of the screen and to minimize any "hot" spots which may occur. The screen is designed to have openings no more than 1.75 millimeters (mm) wide to exclude juvenile and larger fish from being entrained into the intake and diversion. The screen is approximately 50.83 ft by 14.75 ft leading to a surface area of 749.74 square feet. At the permitted maximum diversion rate of 46.4 cubic feet per second (cfs), the constructed screen approach velocity is 0.062 fps, or 31% of the maximum 0.2 fps fish screening criteria. Operations are seasonally reduced to minimize entrainment of delta and longfin smelt. The reduced operational limit of 24 cfs leads to an approach velocity of 0.03 fps, or 15% of the maximum 0.2 fps fish screening criteria.

The ITP and BOs issued for the construction and operation of the intake include a range of design and operational conditions intended to reduce incidental take of listed species. In addition, the ITP and BOs included two specific requirements for fish monitoring:

1. NMFS BO: Conduct pre-operational and post-operational surveys in the area of the intake prior to and after one year of operation to characterize the predator population surrounding the intake structure (Predator Survey). Results of the predator surveys are presented in Environmental Science Associates (2012a and 2014); and

2. CDFW ITP and USFWS BO: Develop and implement a plan to monitor and quantify entrainment of delta and longfin smelt and other covered fish through the screened intake and assess the effectiveness of the proposed period of curtailment and reduced diversions on reducing the risk of entrainment of larval smelt too small to be excluded by the screen. Results of the first year smelt surveys are presented in Environmental Science Associates (2012b).

Additionally, condition 19 of Water Right Permit 21176 for Diversion and Use of Water requires development and implementation of a similar yearly monitoring plan for larval delta smelt conducted between February 15 and July 31.

The City and its consultants coordinated with USFWS and CDFW on the development of a study plan (Larval Smelt Surveys) to meet these conditions. During a coordination meeting held on April 27, 2012, it was noted that the fish agencies (i.e., CDFW, NMFS, USFWS) requested the City to analyze and summarize existing data, including data from other intakes (i.e., Contra Costa Water District [CCWD] Old River intake), and that entrainment monitoring behind the DWSP screen would not be required. It was also requested that the study plan evaluate if curtailment windows and percentages of curtailment are effective. The study plan was submitted to the fish agencies for review and implemented in 2012 (ESA 2012b).

The report concluded that, based on results of the extensive fishery monitoring conducted to evaluate the performance of the CCWD Old River intake screen in excluding larval and juvenile fish from entrainment into the diversion, the DWSP fish screen is effective in reducing and avoiding entrainment of larval and juvenile fish. Further, the report found that, based on results of CDFW larval and juvenile smelt seasonal distribution data, it was recommended that consideration be given to revising the seasonal periods for reduced diversion operations by the DWSP project. Recommended revisions to the seasonal diversion operations included eliminating the reduced diversion period from May 21 through June 15 and extending the reduced diversion period from January 1 through February 15. Additional years of monitoring were not conducted.

Therefore, the following report provides an updated analysis of historical data from 2011 through 2021; conducted to fulfill the monitoring requirement in the CDFW ITP, USFWS BO, and condition 19 of Permit 21176. This analysis followed similar methods used for the 2012 analysis and report, relying on existing data. Specifically, the multi-agency Interagency Ecological Program (IEP) has been collecting standardized data at multiple sample sites close (<10km) to the DWSP intake for the period of interest and the currently available datasets were determined to be adequate for this analysis.

Purpose

The purpose and objective of this analysis is to analyze the risk of larval and early juvenile smelt entrainment at the Stockton DWSP intake to satisfy the requirement for annual monitoring stipulated within the ITP and Permit 21176 and includes:

- evaluation of the potential for entrainment of delta smelt and other protected fish species (e.g., longfin smelt larvae) during operation of the intake;

- evaluation of the effectiveness of the ~~proposed~~ curtailment and reduced pumping periods identified in the ITP and BOs

Background

The fish screen for the DWSP intake was designed and constructed to meet current fish screen criteria for Delta applications similar to several other protective fish screens that are currently in operation in the Delta. The DWSP fish screen operates at no more than 31% of the maximum approach velocity of current established fish screen criteria . The protectiveness of such screens has been established through ongoing entrainment monitoring programs associated with other fish screens in the Delta. A previous review of fishery monitoring results from the Contra Costa Water District (CCWD) Old River intake, which is similar in design and operation to the DWSP intake, evaluated existing monitoring data to determine the effectiveness of the intake screen design in excluding larval and early lifestages of delta and longfin smelt, juvenile Chinook salmon and steelhead, and other fish from entrainment into the diversion (Environmental Science Associates 2012b). This analysis concluded that the CCWD fish screen, and therefore the DWSP, is effective at reducing and avoiding entrainment of larval and juvenile fish and this is further enhanced at the DWSP by the seasonal reductions of diversion operations.

Results of previous fishery monitoring conducted by CDFW and USFWS in the lower San Joaquin River and Delta have shown that both longfin and delta smelt inhabit the area in the vicinity of the DWSP intake structure seasonally and would potentially be vulnerable to entrainment losses from an unscreened or improperly screened intake (Environmental Science Associates 2012b; Bashevkin et al. 2022). The DWSP intake includes both physical features (a fish screen), operational limits (reduced approach velocities), and constraints (curtailment and reduced pumping periods) that have been specifically developed to avoid and/or minimize entrainment of larval and early juvenile delta and longfin smelt that are too small to be effectively excluded by the screen. Project specific permits and approvals currently require that pumping rates shall not exceed 24 cubic feet per second (cfs) during the periods from February 15 to March 15 and from May 21 through June 15 and that all water diversions cease during the period from March 15 through May 20. These are periods of the year when larval and early juvenile lifestages of both longfin and delta smelt are potentially present in the vicinity of the intake and would potentially be vulnerable to entrainment.

Data from eight[1] different fish monitoring surveys conducted in the Delta, including in the vicinity of the DWSP intake, from 2011-2021 were used to assess the effectiveness of these periods of reduced diversion operations in protecting larval delta and longfin smelt from entrainment (Bashevkin et al. 2022). The surveys contained within the selected dataset, their governing agency, and their temporal coverage are shown in Table 1.

[1] Although data from a ninth study, the Suisun Marsh Study, was included within the original dataset, this data was excluded from current analyses due to its distance from the study area.

TABLE 1
SACRAMENTO – SAN JOAQUIN DELTA FISH MONITORING SURVEYS

Survey Name	Abbreviation	Temporal Coverage of Surveys	Years of Analysis for this Report	Mean Captured Length of Smelt (Min – Max) (mm)
CDFW				
Bay Study	BS	1980 – 2021	2011 – 2021	66 (15 – 203)
Fall Midwater Trawl	FMWT	1967 – 2021	2011 – 2021	69 (15 – 282)
20mm Trawl Survey	20mm	1995 – 2021	2011 – 2021	21 (3 – 183)
Spring Kodiak Trawl Survey	SKT	2002 – 2021	2011 – 2021	63 (15 – 135)
Summer Townet	STN	1959 - 2021	2011 – 2021	39 (7 – 141)
Smelt Larva Survey	SLS	2009 – 2021	2011 – 2021	8 (4 – 80)
USFWS				
Delta Juvenile Fish Monitoring Program	DJFMP	1976 – 2019	2011 – 2021	70 (8 – 210)
San Francisco Estuary Enhanced delta smelt Monitoring Program	EDSM	2016 – 2021	2011 – 2021	43 (6.1 – 132)

SOURCE: ESA 2023

Methods

Interagency Ecological Program Fish Monitoring Studies

As part of the Interagency Ecological Program (IEP), multiple agencies have been involved with fish monitoring efforts within the Delta, leading to nine ongoing monitoring studies, eight of which have stations within 10km of the DWSP. These study data were collected using different methods briefly outlined below, with method descriptions taken from the respective data sources.

Bay Study

The Bay Study was initiated in 1980 with the intent of determining the effects of freshwater outflow on the abundance and distribution of fish and invertebrates in the San Francisco Estuary (Estuary). From 2011 to 2021 only midwater trawls (sampling primarily pelagic organisms) and otter trawls (sampling primarily benthic organisms) were conducted, generally from January to December of each year at 52 stations[2], 1 of which occurs within 10km of the DWSP.

The otter trawl has a 4.9 meter (m) headrope, a 2.5 centimeter (cm) stretch mesh body, and a 1.3cm stretch mesh cod-end. The otter trawl is deployed with a 5:1 scope to keep the trawl on the bottom and towed for five minutes against the current. The assumed door spread of the trawl was 2.4m (70% of 3.4m maximum spread).

The midwater trawl has a mouth opening of $3.7m^2$, which is slightly reduced under tow. The mesh of the midwater trawl net is graduated in 9 sections from 20.3 cm stretch mesh at the mouth to 1.3cm at the cod-end. A 5:1 scope was also used to deploy the midwater trawl. The midwater trawl was towed for approximately 12 minutes and then retrieved obliquely to sample the entire water column. Further information about the Bay Study methods can be found in Baxter et al. (1999).

Fall Midwater Trawl

The Fall Midwater Trawl study (FMWT) was initiated in 1967, specifically targeting age-0 Striped Bass (*Morone saxitilis*) in the Estuary. delta smelt and longfin smelt have been captured during surveys. The FMWT samples 122 stations each month from September to December, seven of these stations are within 10km of the DWSP.

The midwater trawl has a mouth opening of $3.7m^2$, which is slightly reduced under tow. The mesh of the midwater trawl net is graduated in 9 sections from 20.3 cm stretch mesh at the mouth to 1.3cm at the cod-end. A 5:1 scope was also used to deploy the midwater trawl. The midwater trawl is retrieved obliquely to sample the entire water column, according to a tow schedule which is dependent on depth. Further information about the Fall Midwater Trawl methods and activities can be found in the most recent FMWT summary reports (White 2020, 2021, 2022).

[2] Not all Stations were sampled in all years

20mm Trawl Survey

The 20mm Trawl Survey, or "20mm", was initiated in 1995 to monitor the distribution and abundance of post-larval and juvenile delta smelt. The 20mm survey currently samples 47 stations at fixed locations from San Pablo Bay through Suisun Bay and into the Sacramento-San Joaquin River Delta every other week from March to July. During high outflow years, 5 additional stations are sampled in San Pablo Bay to provide greater spatial coverage of potential delta smelt habitat. At each station, three 10-minute stepped oblique tows are conducted for fish. Each stepped oblique tow follows a tow schedule to sample the entire water column, and the volume of water sampled is estimated using a General Oceanics flowmeter. The net is a cone shaped plankton net composed of 1600µm mesh and measuring 5.5 meters in length with a mouth area of 1.51m^2 lashed onto a rigid D-frame with skis. Additional information and data from the 20mm survey is found in IEP et al. (2021a).

Spring Kodiak Trawl Survey

The Spring Kodiak Trawl Survey (SKT) was initiated in 2002 to improve the detection of adult delta smelt as an extension of the Fall Midwater Trawl Survey. The SKT operates 6 monthly surveys from December through May each lasting 4-5 days in length. Each survey, 40 stations are sampled using a standard 10 minute Kodiak trawl. The trawl net has a total length of 19.8m and a fully expanded mouth opening of 7.6m by 1.8m. The net mesh is graduated in size from 5cm knotted stretched mesh at the mouth and decreasing by 1.3cm through a series of 5 panels to a minimum 0.6cm knotless stretched mesh at the cod-end. Additional information and data is found in IEP et al. (2021b).

Summer Townet

The Summer Townet (STN) survey was initiated in 1959 to determine relative distribution and abundance age-0 Striped Bass in the Delta. As with the FMWT, Delta and longfin smelt are both captured during STN Surveys. The STN samples 41 stations throughout the Delta, with 4 stations occurring within 10km of the DWSP. Beginning in 2003, CDFW standardized sampling to 6 surveys annually, starting in early June and running on alternate weeks through August. Two 10 minute stepped oblique tows are performed at each station. The townet has two sections; the first is made of 1.3cm stretched knotted mesh 1.8m long, tapering down to an additional 0.6m "fyke". This "fyke" fits entirely within the second section, a 2.7m section of woven mesh with approximately 8 holes per 2.5cm. The entire net measures approximately 4.6m in total, and is lashed directly to a fixed metal "D" frame. The "D" frame is in turn mounted on a 10kg sled. Additional information can be found in the latest STN Survey reports (Malinich 2021, 2023).

Smelt Larva Survey

The Smelt Larva Survey (SLS) was initiated by CDFW in 2009 to monitor the distribution and abundance of newly-hatched longfin smelt in the San Francisco Estuary. Surveys are conducted bi-weekly and sampling begins early January and continues through March. The surveys sample at fixed stations, from Carquinez Strait through Suisun Bay and into the Sacramento-San Joaquin River Delta. Each survey consists of 44 stations, four of which occur within 10km of the DWSP. At each station, one 10 minute stepped-oblique (bottom to top) tow is made following a

prescribed tow schedule. The net is a conical 505µm mesh lashed to a D shaped frame mounted on skis. Further information can be found in IEP et al. (2022).

Delta Juvenile Fish Monitoring Program

The Delta Juvenile Fish Monitoring Program (DJFMP) was initiated in 1976 to monitor the distribution and abundance of juvenile Chinook Salmon (*Oncorhynchus tshawytscha*) and other fish species within the Estuary. Currently the DJFMP consists of three trawl stations and 58 beach seine stations, sampled weekly or biweekly. Trawl samples consist of either ten 20-mintue Kodiak or midwater trawls between 7am and 1pm at all stations.

The mesh of the midwater trawl net is graduated in 6 sections from 20.3 cm stretch mesh at the mouth to 0.6cm before the cod-end, the cod-end is 0.3cm mesh. The maximum mouth opening of the net is 4.15m x 5m. The midwater trawl is retrieved obliquely to sample the entire water column, according to a tow schedule which is dependent on depth. Further information about the DJFMP can be found at https://www.fws.gov/lodi/juvenile_fish_monitoring_program/jfmp_index.htm.

Enhanced Delta Smelt Survey

The Enhanced delta smelt Monitoring Program (EDSM) was initiated by the U.S. Fish and Wildlife Service in 2016, and is focused on providing data on delta smelt distribution and abundance in near-real-time to managers and decision-makers. Sampling is done year-round via Kodiak and 20mm trawls. Stations are chosen via stratified random sampling. Over the course of a week, field crews sample between 18 and 41 random sites. A minimum of two tows are conducted at each site. The Kodiak and 20mm gear used in the EDSM are comparable to the Kodiak and 20mm gear described above. Further information and data from the EDSM can be found in USFWS et al. (2021).

Analytical Approach

Data from the above eight surveys was retrieved from Bashevkin et al. (2022) using code supplied by the repository within R (R Core Team 2021). The data were first filtered to include only those surveys with:

1. longfin or delta smelt data,
2. collected between 2011 and 2021, and
3. at stations located within 10km of the intake facility

A 10km boundary (or buffer) was established based on the previous work in ESA (2012b) which identified 3 stations for their analysis with a maximum distance of ~10km.

A total of 163 unique stations in the Lower San Joaquin River occurred within 10km of the DWSP intake structure. A table of each station, the survey(s) conducted, and the years of each survey (from 2011 – 2021) are found in Appendix A. Once the data were filtered, the data were plotted to visually compare the spatial distribution of smelt observations within 10km of the intake facility.

Smelt data was divided by length size classes (<20mm and ≥20mm) based on findings on the susceptibility of delta smelt entrainment through a 1.75mm mesh opening from Appendix 6.A of the Biological Assessment for the California Waterfix (ICF International 2016).

Finally, the temporal distribution of smelt observations was analyzed. The total catch of each size class for each species was added together within 7 day periods (week) within each year. This was then divided by the total annual catch for that species and size class for the entire Delta, to derive the percent of total annual catch for each week of each year. Individual plots for each year are provided in Appendix B. This value was then averaged by week to derive a mean percent of total annual catch for each week. This temporal occurrence was then overlaid on top of the operational period identified in the operating permits for reduced diversion rates (February 15 – March 15 and May 21 – June 15) and curtailment of diversions (March 15 – May 20) at the DWSP intake.

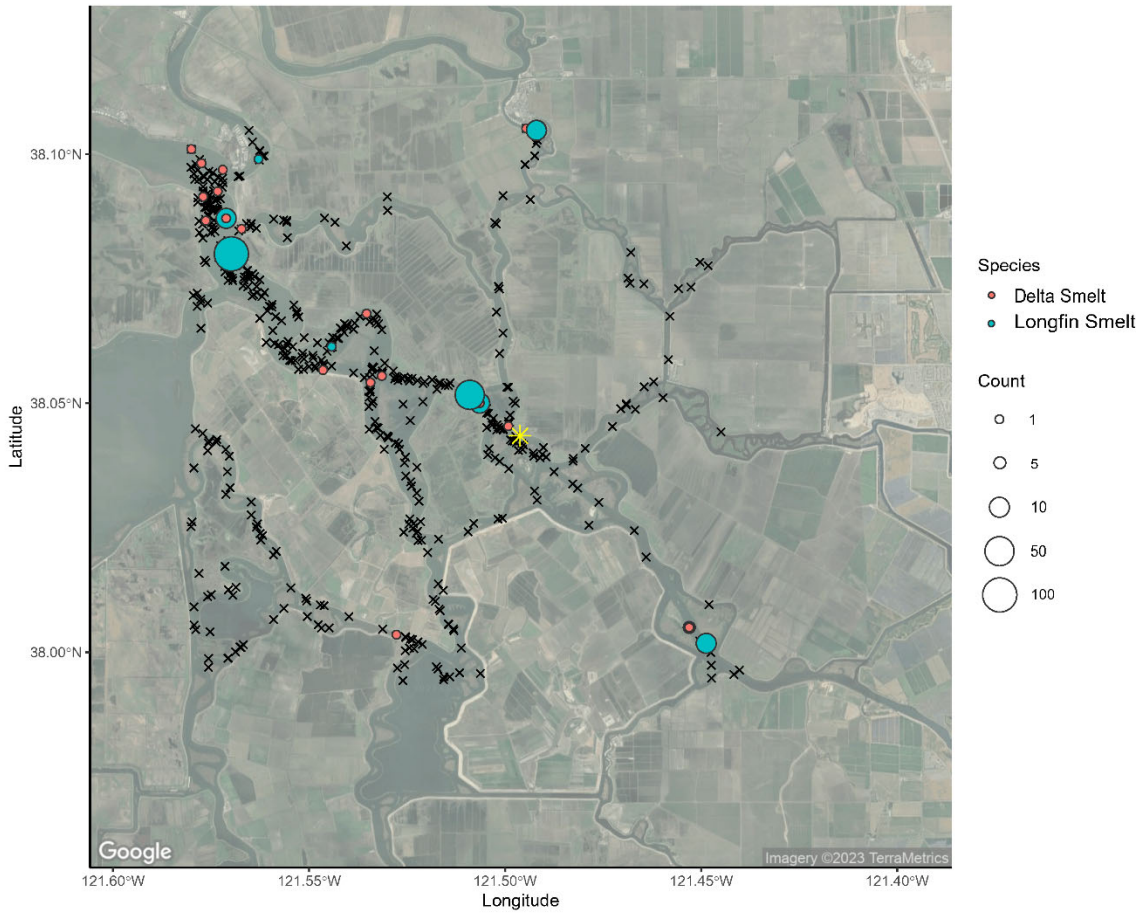
The relative percentage of each size class smelt which occurred outside of the reduced or curtailed operations periods were calculated by dividing the total catch of each species which occurred within each period (February 15 – March 15 (Reduced), March 16 – May 20 (Curtailed), May 21 – June 15 (Reduced), June 16 – February 14(Normal) by the total catch of each species for the entire period January to December.

SOURCE: ESA 2023

Stockton Delta Water Supply – Larval Smelt 2011-2021

Results

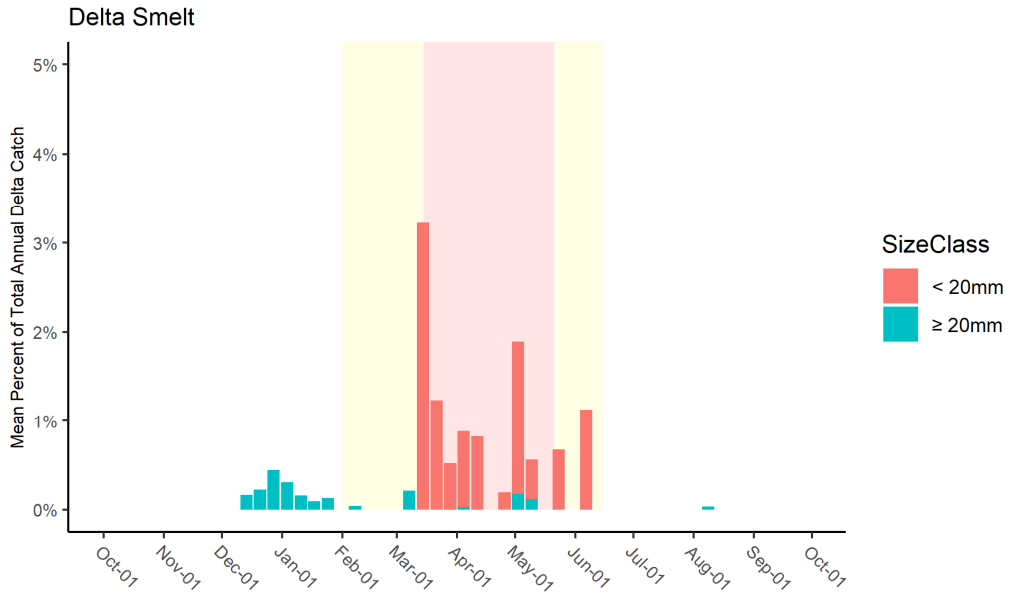
Of the 163 stations sampled from 2011 – 2021, 44 station surveys detected smelt (**Figure 1**). Temporal detection data from January through June are presented for delta smelt and longfin smelt in **Figures 2** and **3**, respectively. The presented percentage is the mean of the percent of each year's total catch for each species and size class caught within 10km of the intake facility. These composite data approximate the general spatial and temporal distribution of smelt in the vicinity of the intake.



SOURCE: ESA 2023

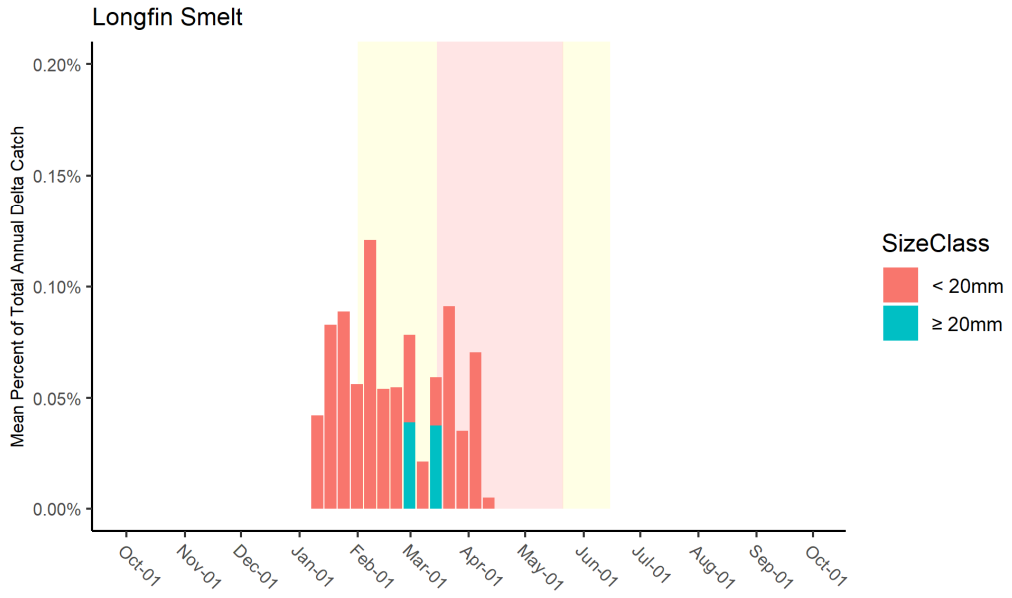
Stockton Delta Water Supply – Larval Smelt 2011-2021

Figure 1
Map of the sampled stations within 10km of the DWSP Intake Structure (yellow star at center). Small x's mark samples at stations with 0 smelt observations in the last 10 years, colored circled represent samples at stations with at least 1 smelt (Delta or Longfin) observation.



SOURCE: ESA 2023

Figure 2
Mean annual delta smelt catch within 10km of the intake facility for each size class as a percentage of the annual total catch within the Delta. Yellow areas indicate current periods of reduced pumping (24 cfs) and red areas indicate periods of pumping curtailment.



SOURCE: ESA 2023

Figure 3
Mean annual longfin smelt catch within 10km of the intake facility for each size class as a percentage of the annual total catch within the Delta. Yellow areas indicate current periods of reduced pumping (24 cfs) and red areas indicate periods of pumping curtailment.

The total number of individuals caught between 2011 and 2021 within 10km of the intake facility for each operational period are presented in **Table 2** alongside the average annual percentage of the total Delta catch within each period.

TABLE 2
TOTAL CATCH AND MEAN PERCENT OF ANNUAL CATCH IN THE VICINITY OF THE DWSP INTAKE DURING EACH OPERATIONAL PHASE

		Operational Period Catch (Mean Annual % of Total Delta Catch)				
	Total Catch (2011 – 2021)	Jan 1 – Feb 14 Normal	Feb 15 – Mar 15 Reduced	Mar 15 – May 20 Curtailed	May 21 – Jun 15 Reduced	Jun 16 – Dec 31 Normal
Delta Smelt						
<20mm	63	--	2 (3.23%)	45 (2.99%)	16 (1.8%)	--
≥20mm	33	11 (0.4%)	10 (0.18%)	5 (0.17%)	--	7 (0.42%)
Longfin Smelt						
<20mm	247	64 (0.11%)	151 (0.12%)	32 (0.13%)	--	--
≥20mm	2	--	2 (0.04%)	--	--	--

SOURCE: ESA 2023

Catch data show that the reduced diversion period (February 15 – June 15) is inclusive of delta smelt presence within the vicinity of the intake for fish small enough to be entrained (<20mm). While the reduced period does not cover the winter period (Dec-Jan) of elevated presence of larger delta smelt (≥20mm), these fish are large enough to be physically excluded and therefore represent a lower risk of entrainment. However, longfin smelt <20mm do appear within the vicinity as early as January, before pumping restrictions are in effect **(**Figure 3 and Table 2**).** These individuals would be more vulnerable to being entrained through the 1.75mm intake screen mesh given the higher intake rates.

Summary of Findings

The DWSP intake includes both physical features (a fish screen), operational limits (reduced approach velocities), and constraints (curtailment and reduced pumping periods) that have been specifically developed to avoid and/or minimize entrainment of larval and early juvenile delta and longfin smelt. Below is a summary of each of these features and an assessment of their protectiveness for larval smelt.

Fish Screen Mesh Size

Monitoring conducted at the nearby Contra Costa Water District (CCWD) Old River intake screen has shown the effectiveness of 2.4mm mesh at excluding larval fish as small as 10mm in length (Environmental Science Associates 2012b). The DWSP intake mesh is smaller (1.75mm) and therefore is expected to be as effective, if not more effective, at excluding larvae >10mm.

Reduced Approach Velocities

The DWSP fish screen is designed to have an approach velocity equal to or less than 0.2 feet per second (fps) (equating to a maximum diversion rate of 159 cfs) as required by CDFW and NMFS screening criteria to protect early life stages of delta smelt (NMFS 1996; CDFW 2000), and described in the DWSP ITP. However, the DWSP ITP further requires adherence to the reduced initial diversion rate for the project authorized under Water Rights Permit 21176, which equates to an approach velocity of less than 0.062 fps (31% of the maximum 0.2 fps), corresponding to a maximum diversion rate of 46.4 cfs. Protectiveness of larval fish is further improved by seasonal reductions in pumping operations, which reduces the approach velocity at the screen to 0.03 fps (maximum diversion rate of 24 cfs) during periods of smelt presence.

Curtailment and Reduced Pumping Periods

Catch data show that the reduced diversion period (February 15 – June 15) is inclusive of delta smelt presence within the vicinity of the intake for fish small enough to be entrained (<20mm) and likely effective at avoiding entrainment of delta smelt. Longfin smelt <20mm do appear within the vicinity as early as January, before pumping restrictions are in effect (**Figure 3 and Table 2**) and may be at higher risk of entertainment during January 1 – February 14 prior to reductions starting on February 15. However, when putting these early winter catches of larval longfin smelt in context of the overall delta population, the observed larval longfin smelt seen in the vicinity of the DWSP during January 1 – February 14 in years 2011-2021 only represents 0.11% of the total annual catch of larval longfin smelt captured in the entire Delta during that time.

Conclusions

Entrainment Monitoring

The previous recommendation made in ESA (2012b) was to not include entrainment monitoring at the DWSP intake facility due to extensive monitoring results demonstrating the effectiveness of the comparable CCWD fish screen at Old River in excluding larval and juvenile fish from entrainment. Given the protectiveness of the fish screen mesh size, the reduced approach

velocities at the fish screen, continued operational management to reduce impacts, and the presumed low population level impact (especially for longfin smelt), no changes to the recommendation are made at this time.

Operational Periods

As summarized above, the current reduction and curtailment periods are expected to be protective for delta smelt given that the time periods completely capture the timing of larval delta smelt presence in the vicinity of the DWSP intake. And while the timing of larval longfin smelt presence begins prior to the beginning of the reduction period in mid-February, the portion of the overall population of longfin smelt potentially exposed to the intake during this time is very small, estimated as 0.11%. Therefore, no changes to the operational periods are recommended at this time.

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Appendix A

Survey Stations Included in Evaluation

ESA

TABLE A1
SAMPLING STATIONS AND STUDIES WITHIN 10KM OF DWSP INTAKE STRUCTURE

Survey	Station	Temporal Coverage
	20mm	2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021
	FMWT	2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020
	SKT	2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021
	SLS	2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021
815	STN	2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021
865	Bay Study	2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020
904	FMWT	2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020
905	FMWT	2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020
906	20mm	2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021
	FMWT	2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020
	SKT	2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021
	SLS	2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021
	STN	2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021
908	FMWT	2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020
909	FMWT	2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020
910	20mm	2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021
	FMWT	2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020
	SKT	2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021
	SLS	2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021
	STN	2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021
919	20mm	2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021
	SKT	2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021
	SLS	2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021
	STN	2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021
DS002S	DJFMP	2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020
DS01	EDSM	2017, 2018
DS02	EDSM	2018
DS101	EDSM	2017
DS103	EDSM	2017
DS104	EDSM	2017
DS202	EDSM	2017
DS203	EDSM	2017
DS204	EDSM	2017
DS51	EDSM	2017
DS53	EDSM	2017
HC01	EDSM	2017, 2018, 2019, 2020, 2021
HC02	EDSM	2018, 2019, 2020, 2021
HC101	EDSM	2017
HC102	EDSM	2017
HC103	EDSM	2017
HC104	EDSM	2017
HC105	EDSM	2017
HC203	EDSM	2017
HC206	EDSM	2017
HC51	EDSM	2017
HC52	EDSM	2017
HC53	EDSM	2017
HC54	EDSM	2017
HC55	EDSM	2017
MI01	EDSM	2017, 2018
MI02	EDSM	2017
MI101	EDSM	2017
MI104	EDSM	2017
MI105	EDSM	2017
MI106	EDSM	2017
MI108	EDSM	2017
MI203	EDSM	2017
MI205	EDSM	2017
MI208	EDSM	2017
MI210	EDSM	2017
MI212	EDSM	2017
MI52	EDSM	2017

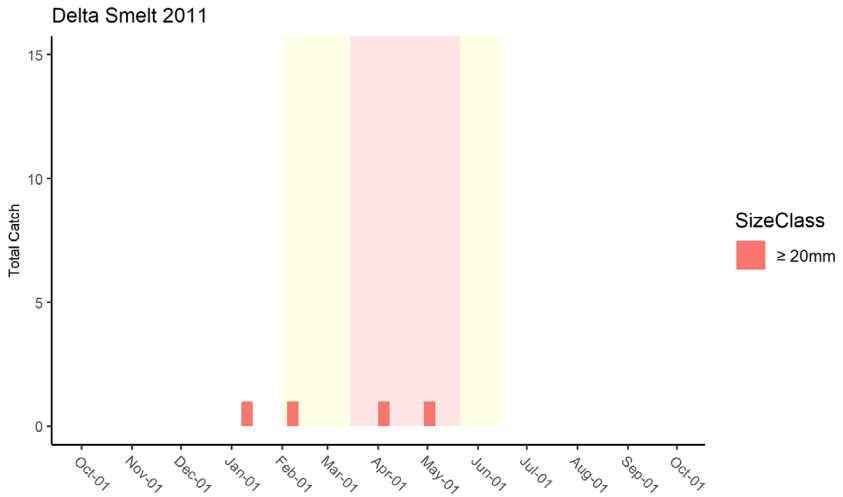
Survey	Station	Temporal Coverage
MI59	EDSM	2017
MI60	EDSM	2017
MIW01	EDSM	2018, 2019, 2020, 2021
MIW02	EDSM	2018, 2019, 2020, 2021
MIW03	EDSM	2018, 2019, 2020
MIW04	EDSM	2018
MKR01	EDSM	2017, 2018
MKR02	EDSM	2017, 2018
MKR03	EDSM	2017
MKR101	EDSM	2017
MKR102	EDSM	2017
MKR104	EDSM	2017
MKR107	EDSM	2017
MKR202	EDSM	2017
MKR203	EDSM	2017
MKR205	EDSM	2017
MKR208	EDSM	2017
MKR212	EDSM	2017
MKR213	EDSM	2017
MKR215	EDSM	2017
MKR219	EDSM	2017
MKR52	EDSM	2017
MKR59	EDSM	2017
MKR60	EDSM	2017
PP01	EDSM	2016, 2017, 2018, 2019, 2020, 2021
PP02	EDSM	2016, 2017, 2018, 2019, 2020, 2021
PP03	EDSM	2016, 2017, 2018, 2019, 2020, 2021
PP04	EDSM	2016, 2019, 2020
PP05	EDSM	2020
PP06	EDSM	2016
PP07	EDSM	2016
PP08	EDSM	2016
PP09	EDSM	2016
PP10	EDSM	2016
PP101	EDSM	2017
PP102	EDSM	2017
PP103	EDSM	2017
PP104	EDSM	2017
PP105	EDSM	2017
PP106	EDSM	2017
PP107	EDSM	2017
PP11	EDSM	2016
PP110	EDSM	2017
PP111	EDSM	2017
PP112	EDSM	2017
PP113	EDSM	2017
PP114	EDSM	2017
PP115	EDSM	2017
PP116	EDSM	2017
PP117	EDSM	2017
PP119	EDSM	2017
PP13	EDSM	2016
PP14	EDSM	2016
PP17	EDSM	2017
PP19	EDSM	2017
PP20	EDSM	2017
PP202	EDSM	2017
PP203	EDSM	2017
PP204	EDSM	2017
PP207	EDSM	2017
PP208	EDSM	2017
PP209	EDSM	2017
PP21	EDSM	2017
PP210	EDSM	2017
PP211	EDSM	2017

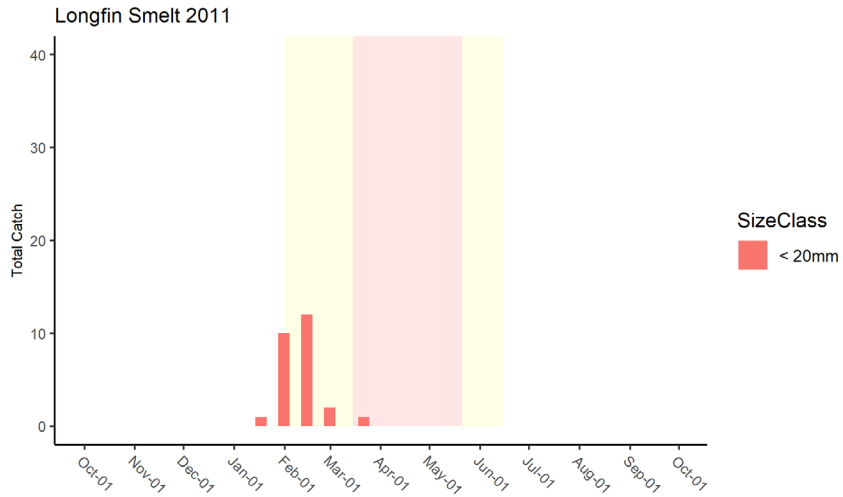
Survey	Station	Temporal Coverage
PP22	EDSM	2017
PP23	EDSM	2017
PP24	EDSM	2017
PP25	EDSM	2017
PP26	EDSM	2017
PP27	EDSM	2017
PP52	EDSM	2017
PP53	EDSM	2017
PP55	EDSM	2017
PP57	EDSM	2017
PP58	EDSM	2017
PP59	EDSM	2017
PP60	EDSM	2017
PP61	EDSM	2017
PP63	EDSM	2017
PP64	EDSM	2017
PP65	EDSM	2017
PP67	EDSM	2017
PP68	EDSM	2017
PP69	EDSM	2017
PP70	EDSM	2017
PP71	EDSM	2017
PP72	EDSM	2017
PP73	EDSM	2017
PP75	EDSM	2017
PP77	EDSM	2017
PP78	EDSM	2017
SJ026S	DJFMP	2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020
SJ032S	DJFMP	2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020
SJS01	EDSM	2017, 2018
SJS102	EDSM	2017
SJS201	EDSM	2017
SJS202	EDSM	2017
SJS204	EDSM	2017
SJS51	EDSM	2017
SJS57	EDSM	2017

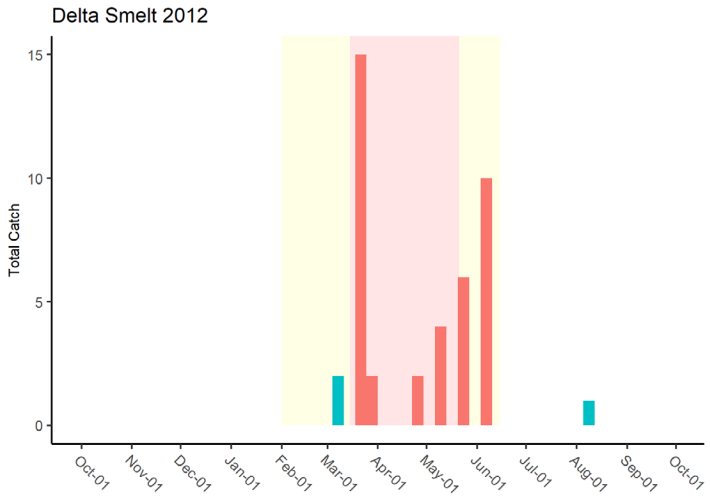
SOURCE: EDI 2022, ESA 2023

Appendix B
Yearly Smelt Catch 2011 - 2021

ESA


Delta Smelt 2011
Total Catch
15
10
5
0
Oct-01
Nov-01
Dec-01
Jan-01
Feb-01
Mar-01
Apr-01
May-01
Jun-01
Jul-01
Aug-01
Sep-01
Oct-01
SizeClass
≥ 20mm


Longfin Smelt 2011
Total Catch
40
30
20
10
0
Oct-01
Nov-01
Dec-01
Jan-01
Feb-01
Mar-01
Apr-01
May-01
Jun-01
Jul-01
Aug-01
Sep-01
Oct-01
SizeClass
< 20mm


Delta Smelt 2012
Total Catch
0
5
10
15
Oct-01
Nov-01
Dec-01
Jan-01
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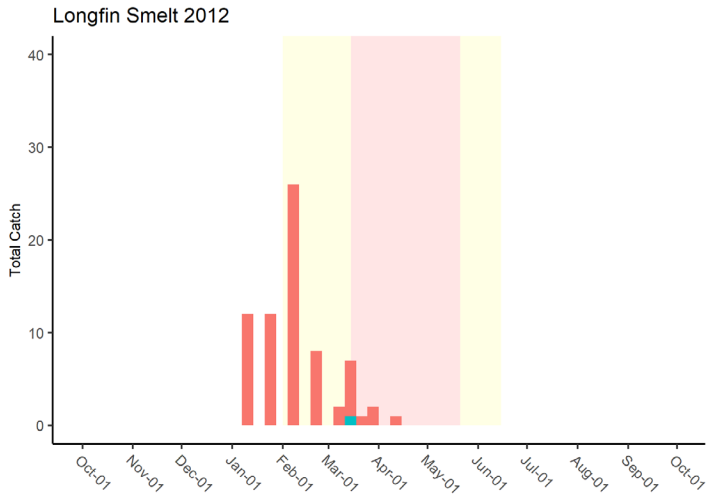
Longfin Smelt 2012
Total Catch
0
10
20
30
40
Oct-01
Nov-01
Dec-01
Jan-01
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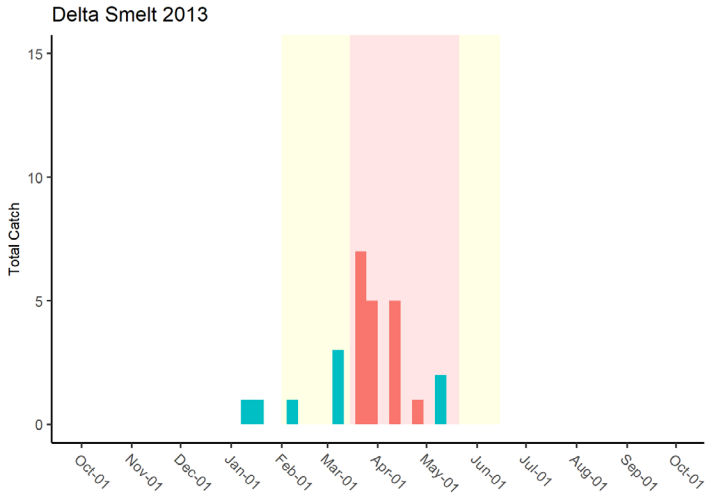
Delta Smelt 2013
Total Catch
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5
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15
Oct-01
Nov-01
Dec-01
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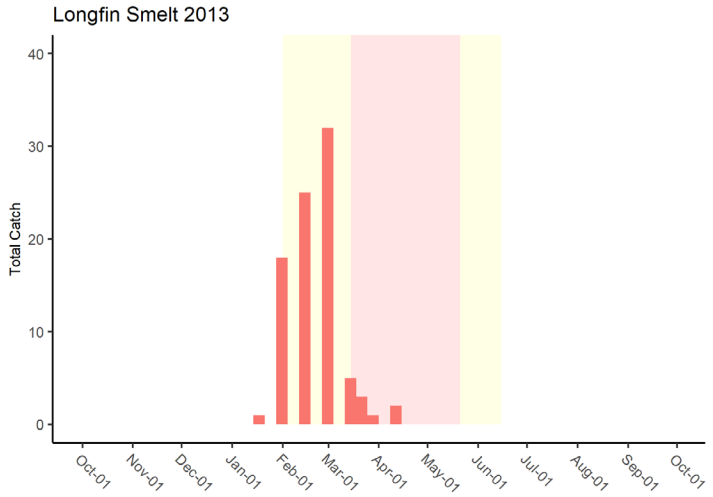
Longfin Smelt 2013
Total Catch
0
10
20
30
40
Oct-01
Nov-01
Dec-01
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Apr-01
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Sep-01
Oct-01
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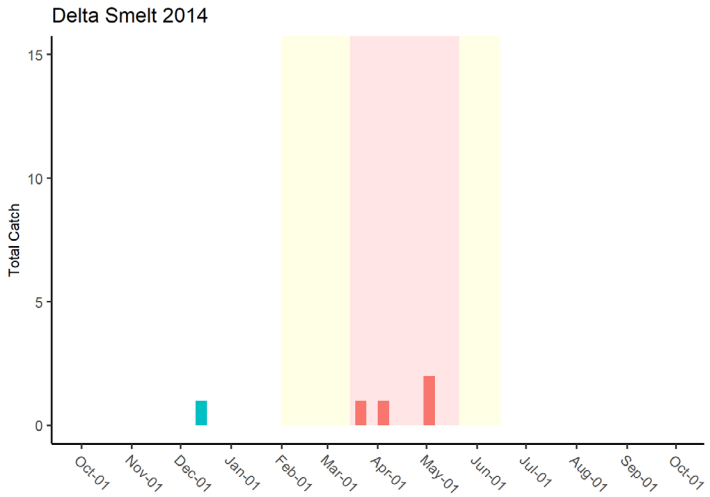
Delta Smelt 2014
Total Catch
0
5
10
15
Oct-01
Nov-01
Dec-01
Jan-01
Feb-01
Mar-01
Apr-01
May-01
Jun-01
Jul-01
Aug-01
Sep-01
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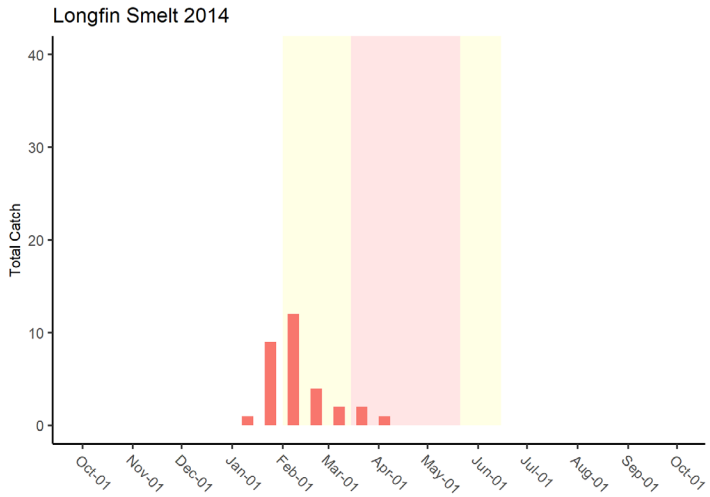
≥ 20mm


Longfin Smelt 2014
Total Catch
0
10
20
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40
Oct-01
Nov-01
Dec-01
Jan-01
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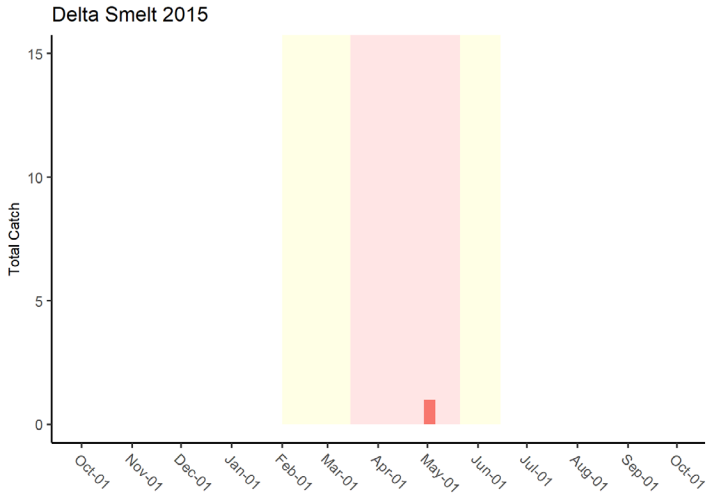
Jul-01
Aug-01
Sep-01
Oct-01
SizeClass
< 20mm


Delta Smelt 2015
Total Catch
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5
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15
Oct-01
Nov-01
Dec-01
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Jul-01
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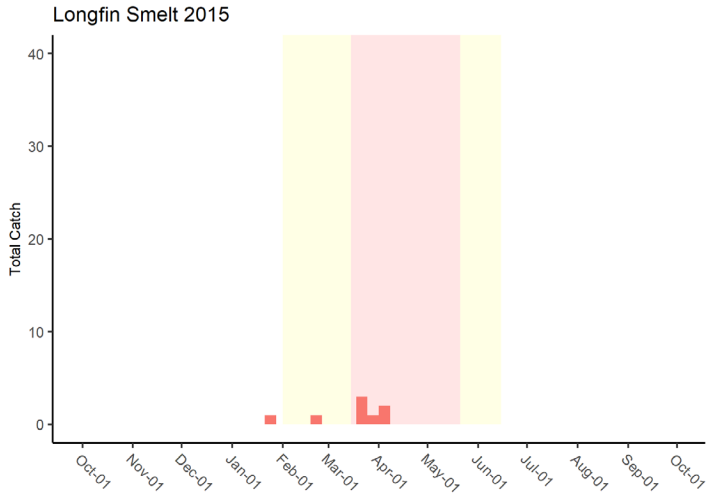
Oct-01
SizeClass
≥ 20mm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Total Catch
0
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Oct-01
Nov-01
Dec-01
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Jul-01
Aug-01
Sep-01
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SizeClass
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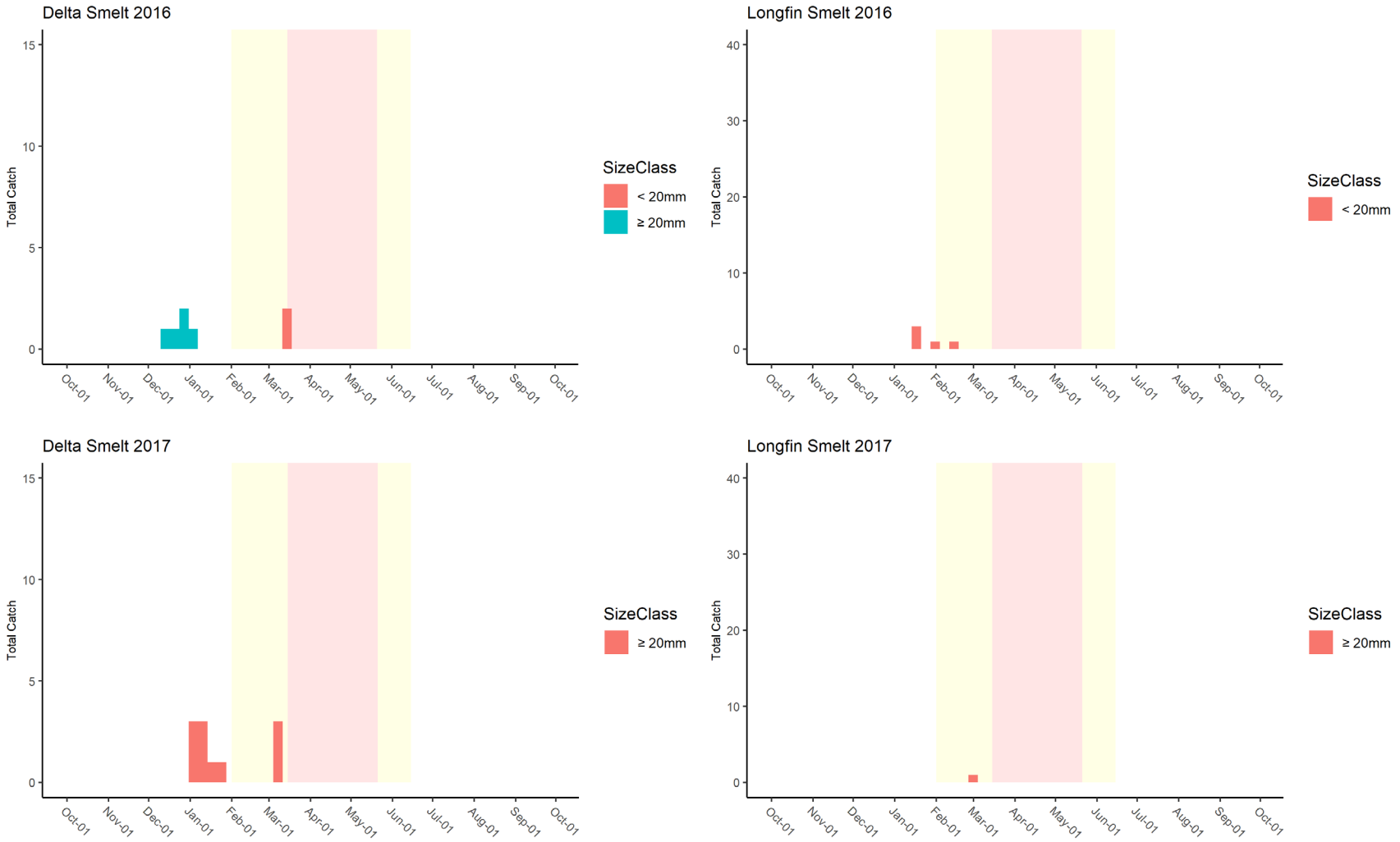
Delta Smelt 2016
Total Catch
0
5
10
15
Oct-01
Nov-01
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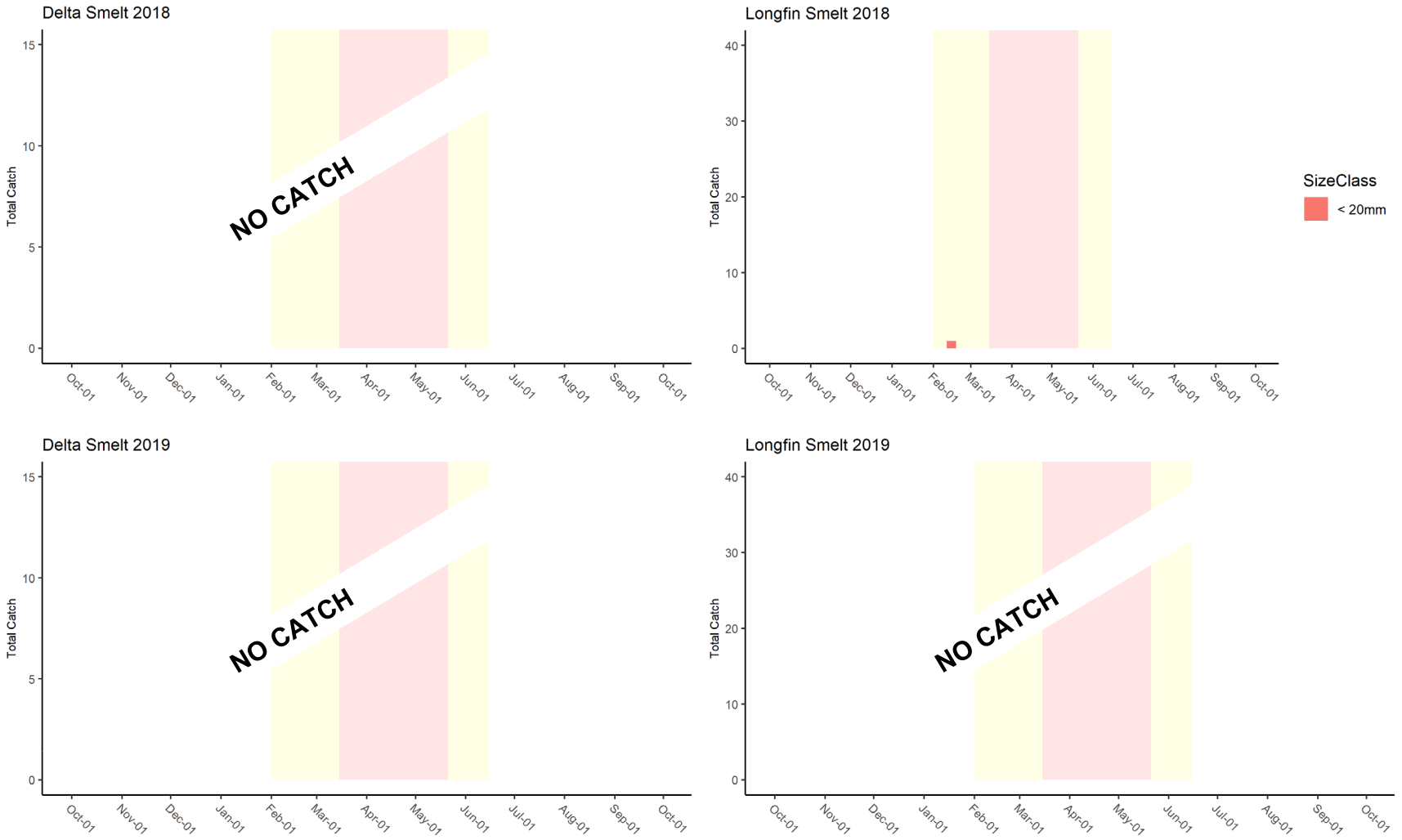
Feb-01
Mar-01
Apr-01
May-01
Jun-01
Jul-01
Aug-01
Sep-01
Oct-01
SizeClass
< 20mm
≥ 20mm
Longfin Smelt 2016
Total Catch
0
10
20
30
40
SizeClass
< 20mm
Delta Smelt 2017
Total Catch
SizeClass
≥ 20mm
Longfin Smelt 2017
Total Catch
SizeClass
≥ 20mm


Delta Smelt 2018
Longfin Smelt 2018
Delta Smelt 2019
Longfin Smelt 2019
NO CATCH
Total Catch
SizeClass
< 20mm
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Nov-01
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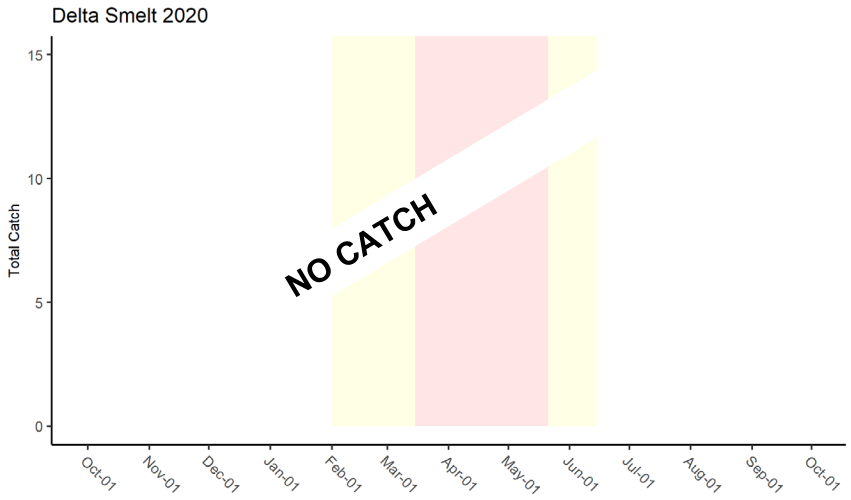
Apr-01
May-01
Jun-01
Jul-01
Aug-01
Sep-01


Delta Smelt 2020
Total Catch
0
5
10
15
NO CATCH
Oct-01
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Jan-01
Feb-01
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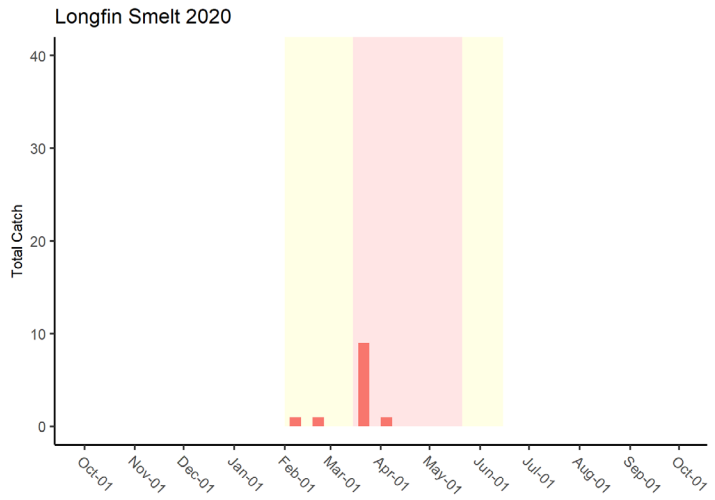
May-01
Jun-01
Jul-01
Aug-01
Sep-01
Oct-01


Longfin Smelt 2020
Total Catch
0
10
20
30
40
Oct-01
Nov-01
Dec-01
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Feb-01
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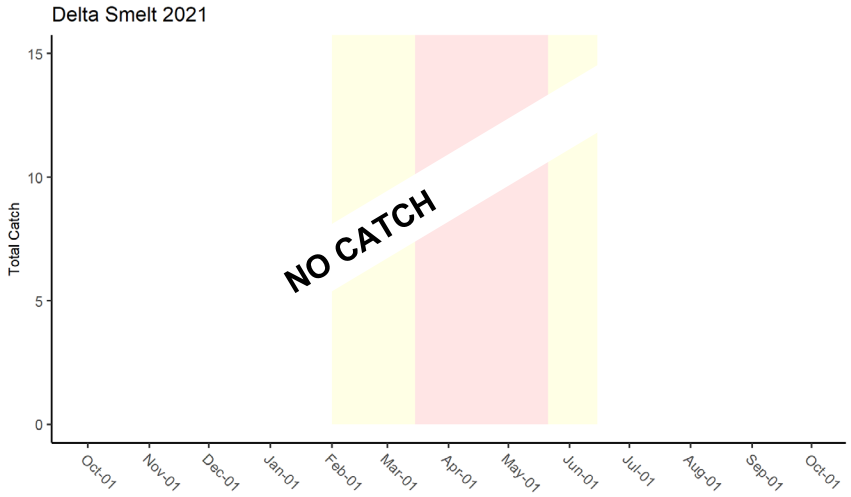
Jul-01
Aug-01
Sep-01
Oct-01
SizeClass
< 20mm


Delta Smelt 2021
Total Catch
0
5
10
15
NO CATCH
Oct-01
Nov-01
Dec-01
Jan-01
Feb-01
Mar-01
Apr-01
May-01
Jun-01
Jul-01
Aug-01
Sep-01
Oct-01

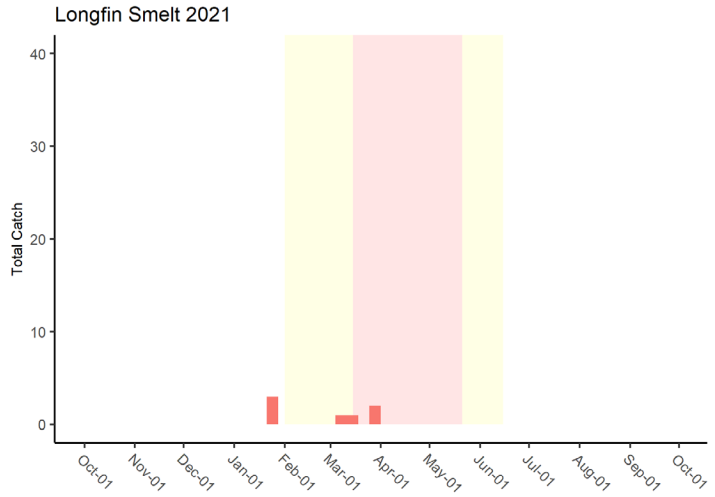

Longfin Smelt 2021
Total Catch
0
10
20
30
40
Oct-01
Nov-01
Dec-01
Jan-01
Feb-01
Mar-01
Apr-01
May-01
Jun-01
Jul-01
Aug-01
Sep-01
Oct-01
SizeClass
< 20mm

Exhibit 5

memorandum

date	December 24, 2025
to	Benjamin Huffer, CDFW
cc	Travis Small, City of Stockton; Brenda Blinn, CDFW; Mel Lytle, City of Stockton; Kelley Taber, Somach Simmons & Dunn Robert Granberg, Granberg & Associates, Inc Chris Fitzer, Environmental Science Associates
from	Taylor Spaulding, Environmental Science Associates
subject	RE: ADMINISTRATIVE DRAFT: ITP 2081-2024-058-03 (Stockton Delta Water Supply Project)

Dear Mr. Huffer,

Environmental Science Associates (ESA), on behalf of the City of Stockton (City), has reviewed the Administrative Draft Incidental Take Permit (Draft ITP; Permit No. 2081-2024-058-03) for the Stockton Delta Water Supply Project (DWSP). We appreciate the effort invested in preparing the Draft ITP; however, we have significant concerns regarding the scientific basis for the effects conclusions and the justification for the associated mitigation requirements. As currently drafted, the ITP does not demonstrate a defensible nexus between the project's minimal impacts and the scale of mitigation prescribed, nor does it acknowledge mitigation already in place to address operational impacts for the permitted 30 mgd project diversion. Specific concerns are summarized below:

Insufficient Effects Analysis

The effects characterization in the Draft ITP is almost entirely qualitative and does not include a meaningful quantitative evaluation of the effects of diversion operations on listed species or their habitat. In the absence of a defensible analytical foundation, the magnitude of effects asserted in the Draft ITP remains unsupported, and the resulting mitigation requirements lack proportionality to actual project risk. We request that the ITP be revised to include appropriate scientific justification, including a quantitative assessment of take risk, to support any proposed mitigation measures.

Outsized Mitigation Requirements

The City believes that the mitigation requirements included in the Draft ITP are substantially disproportionate to the actual impacts of DWSP operations, based on several key considerations summarized below.

Area of Influence

The Draft ITP relies on a 10-kilometer area of influence around the intake facilities, derived from the ITP application's use of a 10-kilometer radius in the entrainment risk analysis. This spatial extent substantially overstates the scale at which potential aquatic effects could reasonably occur.

The 10-kilometer extent used in the City's entrainment risk analysis was selected to maintain consistency with the original 2009 ITP analysis and to encompass Interagency Ecological Program (IEP) monitoring locations with detections of Delta Smelt and Longfin Smelt, given the extreme rarity of these species in the area and the spacing of available monitoring stations. It was not intended to represent the expected biological area of effect or the hydrodynamic footprint of the facility. In practice, the hydrodynamic influence of the facility, even at the maximum permitted diversion rate of 46.4 cubic feet per second (cfs), is expected to be confined to the immediate vicinity of the intake screen, likely on the order of less than 2 meters.

Hydraulic Influence

The Draft ITP does not adequately acknowledge the extremely small proportion of total, tidally driven discharge diverted at the intake location. A recent run of DSM2 by DWR calculated the average tidal discharge of the San Joaquin River at the site is approximately 13,658 cfs, while the facility's maximum diversion rate is 46.4 cfs, representing roughly 0.3 percent of flow under peak diversion conditions. This level of hydrologic influence is well below what would be observable in the field and does not substantively alter water movement, fish distribution, or habitat conditions beyond the immediate vicinity of the intake screens. Additionally, during periods when Delta Smelt and Longfin Smelt are present within the area (late winter and early spring) flows are considerably higher and diversion rates considerably less under permit-curtailed diversions, representing even lower hydraulic influence. During the summer, when the Draft ITP assumes that diversion will potentially impact downstream water quality, because tidal discharge at the site during summer (June – August) remains ~13,658, the diversion rate continues to remain small enough (0.3 percent) that impacts would not realistically be observed and differentiated from the natural fluctuation in these factors.

Protective Design and Operation

The DWSP intake facilities were designed to accommodate higher future capacities that may be required as the City's population increases; however, those higher capacities are neither currently needed nor permitted. As a result, the realized approach velocity at maximum diversion is approximately 0.062 feet per second (fps), or about 30 percent of the 0.2 fps approach velocity considered protective for Delta Smelt and Longfin Smelt. This conservative operational condition further reduces an already low entrainment risk and should be appropriately reflected in the effects analysis and mitigation rationale.

Summary of Mitigation Concerns

In summary, the City considers the Draft ITP's mitigation requirements to be outsized relative to the actual risk posed to Delta Smelt and Longfin Smelt. The limited discussion of effects provided in the Draft ITP does not present sufficient evidence to support the magnitude of mitigation specified. The DWSP's hydrologic and ecological effects are extremely small and highly localized, whereas the mitigation requirements appear to be scaled to a project with substantially greater impacts. Moreover, the

ITP does not reflect that as part of the original ITP permit condition (CDFW 2009), the City purchased a total of 5.96 acres of land acquisition credits to comply with Take Mitigation requirement 7.2. The required acreage included 0.96 acres to compensate for the permanent loss of 0.32 acres of shallow water habitat associated with construction activities and 5.0 acres to fully mitigate effects to Covered Species during Project operations. As described in the ITP permit (CDFW 2009), this determination was based on an assessment of timing and quantity of the aquatic species impacted by the Project and an evaluation of the potential ongoing impacts due to operation. The City's position continues to be that the substantial mitigation land credits purchased under the original ITP (for operations that began less than 13 years ago), are protected in perpetuity, providing permanent protection for the species, and are not limited to 5 years (or any other permit duration) and thus should be sufficient to address ongoing operations

Additional Concerns

The Draft ITP includes several General Provisions related to construction monitoring and terrestrial impacts that appear to be outside the scope of the proposed action, which is the continued operation of an existing facility. These provisions include requirements related to biological monitoring, erosion control, and project access routes, none of which are applicable given that the project does not involve new construction or ground-disturbing activities.

Additionally, under the Take Minimization Measures, the requirement for fish screen cleaning at five-minute intervals would effectively result in continuous cleaning. This approach is energetically demanding and excessive based on observed fouling conditions at the DWSP and fails to acknowledge the sweeping effect of tidal action parallel to the screen. The City's current screen cleaning program operates at intervals of once every 24 hours, with an additional manual cycle twice a week during inspections and has been sufficient to prevent debris accumulation that could affect hydrodynamics or increase entrainment risk for listed species

Request for Coordination

The City would appreciate the opportunity to discuss these concerns with CDFW staff in an in-person meeting. The City is willing to host the meeting at its Water Treatment Facility or, alternatively, to meet at a location preferred by CDFW personnel.

We look forward to continued coordination and are available to provide additional technical detail as needed.

Sincerely,

Taylor Spaulding
Senior Fisheries Biologist
Environmental Science Associates
On behalf of the City of Stockton