Appendix A
Essential Fish Habitat Assessment and Fisheries Biological Assessment

Essential Fish Habitat Assessment
And Fisheries Biological Assessment
for the

GWF
Outfall Pipe Removal Project

Bay Point, California
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1.0 INTRODUCTION

The Magnuson-Stevens Fishery Conservation and Management Act (MSA), as amended by the Sustainable Fisheries Act of 1996 (Public Law 104-267), established procedures designed to identify, conserve, and enhance Essential Fish Habitat (EFH) for those species regulated under a Federal fisheries management plan (FMP). The MSA requires Federal agencies to consult with the National Marine Fisheries Service (NMFS) on all actions, or proposed actions, authorized, funded, or undertaken by the agency, that may adversely affect EFH.

EFH is defined in the MSA as those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity. Adverse effect means any impact which reduces quality and/or quantity of EFH, and may include direct (*e.g.*, contamination or physical disruption), indirect (*e.g.*, loss of prey or reduction in species fecundity), site-specific or habitat-wide impacts, including individual, cumulative, or synergistic consequences of actions.

In Washington, Oregon, and California, there are three FMPs, covering groundfish, coastal pelagic species, and Pacific salmon. The EFH for these three FMP's support five species that occur in the project area: English sole, starry flounder, brown rockfish, northern anchovy, and Chinook salmon.

The objective of this EFH assessment is to determine whether or not the proposed action(s) "may adversely affect" designated EFH for relevant commercially, federally-managed fisheries species within the proposed action area. It also describes conservation measures proposed to avoid, minimize, or otherwise offset potential adverse effects to designated EFH resulting from the proposed action.

The purpose of this Fisheries Biological Assessment is to provide technical information and to review the proposed GWF Outfall Pipe Removal Project in sufficient detail to determine to what extent the project may affect federal and/or California threatened or endangered, and designated critical habitat for fish species. The Fisheries Biological Assessment is prepared in accordance with the legal requirements found in Section 7 (a)(2) of the Federal Endangered Species Act (16 U.S. C 1536(c)). No take of federally or state-listed threatened or endangered species is expected as a result of this project.

2.0 PROJECT DESCRIPTION

This project includes the removal of a 6-inch diameter by 275-foot long HDPE submarine outfall and diffuser section pipe buried beneath approximately 6-12 inches of crushed rock (2" to 3"), 12-inch of cover rock (6" minus), and between 3-in and over 60-in of mud and soft sediments. The outfall diffuser section, which spans the last 37'-8" of the pipeline to its terminus, is comprised of fifteen (15) 3-inch diameter by 43-inch tall HDPE open vertical riser ports equally spaced 2 feet 8 inches apart on centers. Although all of the diffuser ports were mostly or entirely full of soft sediments, the amount of sediment and extent of location that is present within the buried transmission pipe section is unknown but not expected to be significant.

The GWF Outfall pipe is located at Bay Point in Contra Costa County, California (see Figure 1: Vicinity Map). Near the shoreline, at approximately the MLLW elevation, the 6-inch diameter HDPE pipeline emerges from the sediment and rises at an incline to above the waterline where

it makes a flange connection to the land-portion welded steel pipeline. Two 15 foot tall by 1.5 feet wide timber piles, driven into the mud line at the shoreline, are present to identify and protect the pipe on both sides of the flange connection. Removal of the outfall pipe will also include the removal, demolition and disposal of both of the timber piles along with the installation of a blind flange closure plate onto the land-portion steel pipe terminus flange. None of the armor cover rock or bedding gravel will be removed from the pipeline corridor and the no other substrate fill, grade leveling or other restoration will be performed.

Water depths directly above the outfall alignment varied during high tidal times from 17 feet water at approximately 275 feet out from the shoreline to 4 feet of water at 150 feet out. Work scheduled to be conducted closer to shore, and within 150' away from the shoreline, will need to be scheduled and sequenced during higher tidal water elevations due to the shallow water depth.

2.1 WORK SEQUENCE

The deconstruction, demolition and removal of the job will primarily be carried out from floating equipment staged from the water near the shoreline with the exception of a work vehicle parked onshore that would be used to assist with servicing of equipment or for the expedient evacuation of an injured worker. The following sequence is presented for clarity and understanding even though some of the steps may change as both site and weather conditions develop:

1. The 6-inch diameter HDPE submarine pipeline will be disconnected from the land-portion steel pipe. This shoreline terminus of the 6-inch HDPE pipe will then be secured to the two timber piling, temporary fence stakes will be driven into the substrate to maintain the open pipe flange at the shoreline elevation and 25-50 foot long semi-circular silt/turbidity curtain installed over the HDPE pipe section "day-lighting" from being buried in order to contain muddy water and/or sediment discharge during pipe removal.
2. Divers will locate the diffuser section and install mechanical plugs into the top of the 3-inch vertical riser ports to contain the sediment within, will conduct minor water jetting around the underside of the 6-inch diameter diffuser section approximately 5-feet inshore from the outfall terminus, and install and "choke" a suitably sized chain around the HDPE pipe between Diffuser Nos. 2 and 3 to enable lifting with an excavator. As an alternate to "choking" the HDPE pipe with chain, the 1.5 cubic yard (CY) excavator bucket may also "grab" the pipeline directly with its "teeth" before lifting and "peeling" back additional buried pipe sections.
3. With the floating barge securely stationary and moored adjacent to the pipe terminus, the excavator will lift and "peel" back sections of the buried 6-inch HDPE pipe, 10-feet to 20-feet with each pull to the surface. Divers will relocate and "choke" the lifting chain close to a new location along the HDPE pipe alignment as the pipeline is recovered while working toward the shoreline.
4. As required, buoys will be affixed to the HDPE pipe section to help maintain it to float and keeping it visible while securing the 6" outfall terminus to a larger buoy and mooring at the furthest point offshore.
5. As necessary, and when the excavator is no longer able to "peel" the buried pipeline off the bottom at the correct angle, the barge anchor spuds will be lifted to enable relocation of the barge closer to the shoreline, before the barge is made stationary again by dropping the anchor spuds.

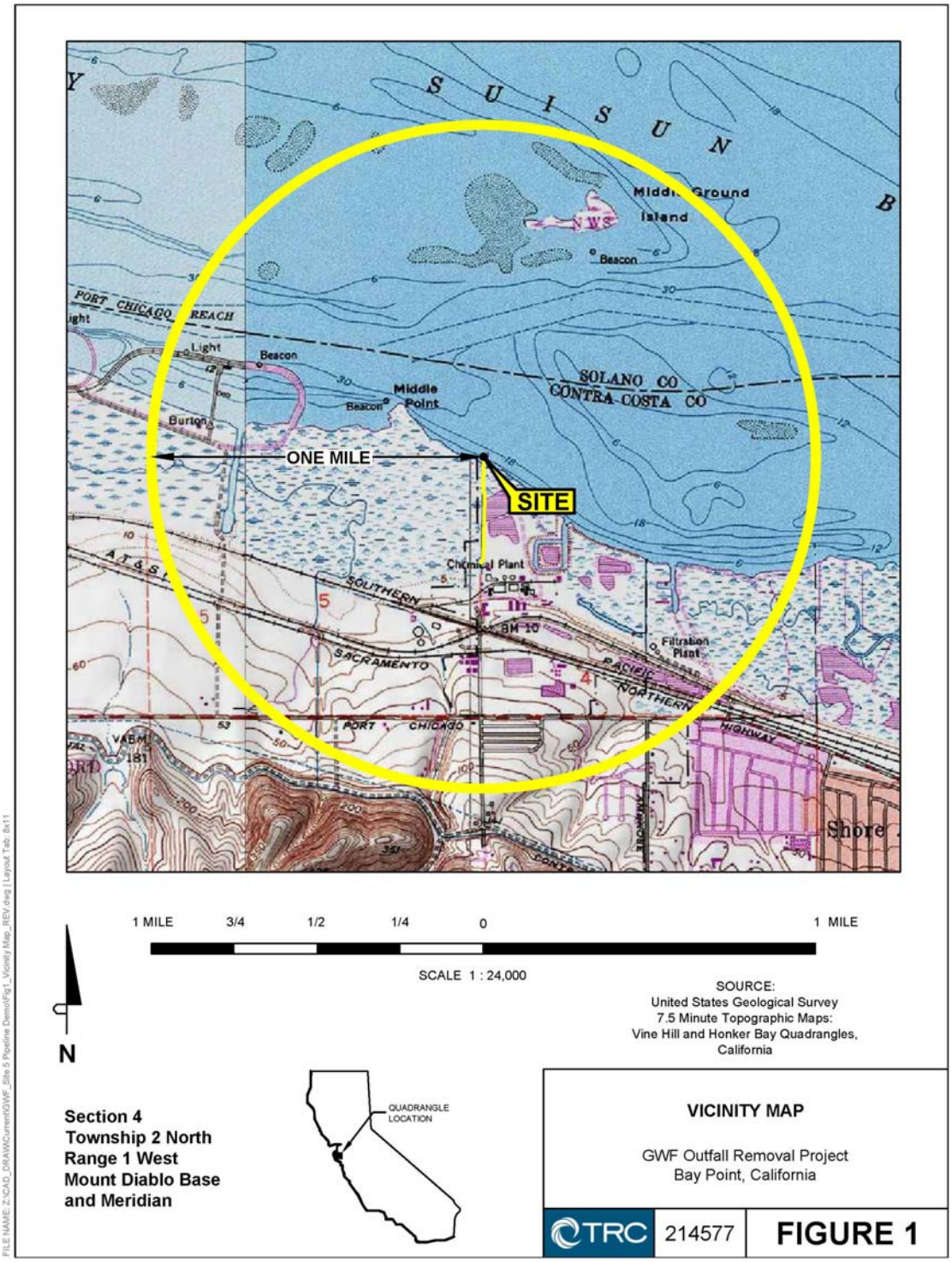
6. During low tidal periods, particularly when working close to the shore in shallow water depths, the “peeling” back of the HDPE pipeline from the its corridor will be temporarily secured in order to recover the floating section of the pipeline. The section of floating pipeline will be lifted onto the deck of the barge, cut into manageable sections, and will have 6-inch diameter mechanical “stopper” plugs installed at both ends if the pipe sections contain sediment.
7. The “peeling” and lifting of the pipeline will be as slow as is required to minimize turbidity from ascending into the water column and of the original ballast block “cages” that remain affixed to the HDPE pipeline will be removed, recovered and disposed at the completion of the project.
8. Extract and/or cut below the mud-line two timber piling coated with creosote residue located along the shoreline next to the 6-inch steel pipe flange connection, float and recover both piling onto the barge, cut-up as necessary, transport and properly dispose at Keller Canyon Landfill in Pittsburg.

2.2 PROJECT SCHEDULE

The entire deconstruction and demolition work schedule is anticipated and will be performed over two (2) consecutive 5-day weekday work weeks (estimated at 10 shifts) which will be conducted to stage/mobilize all equipment to the GWF pipe outfall location, remove and the recover the 275 foot long 6-inch HDPE outfall pipeline, remove and dispose of both shoreline timber piling and for the transit and recycling of all HDPE pipeline materials.

The personnel requirement for the project will include five (5) personnel on a daily basis, working five (5) days per week and ten (10) hours per shift for up to 50 hours per week. Personnel designations will include a Marine Superintendent, Diver, Tender/Standby-Diver, Deckhand/Pile Butt/Boat & Equipment Operator and Heavy Equipment Operator.

Figure 1: Vicinity Map



2.3 ESSENTIAL FISH HABITAT

The outfall pipe location overlaps with the EFHs for three fisheries management plans (NOAA, 2014):

1. **Pacific Groundfish Fishery**. Over 90 groundfish species (e.g., flatfish, rockfish, sharks) are included in the Pacific Groundfish FMP. The groundfish EFH includes seamounts, water depths less than 3,500 meters, and the upriver extent of saltwater intrusion. In the San Francisco Bay Delta, this definition encompasses all of the Bay and the Delta, and upriver toward the cities of Sacramento and Stockton.

2. **Pacific Salmon Fishery**. In California, Chinook and coho salmon are included in this FMP. This EFH includes all streams and other waterbodies occupied or historically accessible to salmon in specified hydrologic units in the San Francisco Bay Delta Region.

3. **Coastal Pelagic Species Fishery**. This fishery includes four finfish and one invertebrate; however, only the northern anchovy is found regularly in the San Francisco Bay. The geographic extent of this EFH includes all marine and estuarine waters from the shoreline to the limits of the U.S. EEZ; within the water column, it is limited to the water column between the thermoclines where temperatures range from 10 degrees Celsius (°C) to 26°C.

The outfall pipe is further located within the Estuary Habitat Area of Particular Concern (HAPC) incorporating San Francisco Estuary from the Pacific Ocean to the west bank of Broad Slough.

A dive survey of the project area conducted on February 27, 2014, characterized the bottom as soft mud along both sides of the pipe and soft mud and graded rock over the pipe. One patch of eel grass was identified approximately 25 feet east of the pipe centerline approximately 150 feet from shore (Belcher, 2014).

2.4 CRITICAL HABITAT

The project is located within critical habitat for delta smelt (Federal Register, 1994) and the southern Distinct Population Segment (DPS) of green sturgeon (Federal Register, 2009). Primary Constituent Elements (PCEs) for the delta smelt that are located within the vicinity of the project include the physical habitat, water, river flow, and salinity concentrations required to maintain delta smelt habitat for (1) larval and juvenile transport, (2) rearing habitat, and (3) adult migration. Because of the fluid nature of the San Francisco Bay Delta's hydrology, the quality of the PCEs for the delta smelt fluctuate within the designated area.

PCEs for the southern DPS of the green sturgeon in the estuary include food resources for all life stages, water flows, water quality, migratory corridors, channel depths, and sediment quality. Dredging, in-water construction, National Pollutant Discharge Elimination System (NPDES) activities, commercial shipping, and habitat restoration are identified in the final critical habitat rule as activities that may affect one or more PCEs through alteration of the physical parameters of the estuary.

The outfall pipe is located near, but not in, critical habitat for winter-run Chinook salmon (58 CFR Part 114). Critical habitat for the winter-run Chinook salmon includes the Sacramento River from Keswick Dam in Shasta County to Chipps Island, and all waters downstream of Chipps Island and north of the San Francisco-Oakland Bridge. In its critical habitat designation, the NMFS excluded rivers and sloughs of the Delta as nonessential for the conservation of winter-run Chinook.

2.5 EFH SPECIES PRESENCE IN THE PROJECT AREA

The area of the proposed action (Suisun Bay) has been identified as EFH for several species of fish as shown in Table 1.

Table 1: Species with Essential Fish Habitat (EHF) Designated in the Suisun Bay

Species	FMP [1]	Life Stage Present [2]
English sole (*Parophys vetulus*)	GF	J, A
Starry flounder (*Platichthys stellatus*)	GF	J, A
Brown rockfish (*Sepastes auricultus*)	GF	J
Northern anchovy (*Engraulis mordax*)	CP	L, J, A
Chinook salmon (*Oncorhynchus tshawystscha*)	PS	J, A

1 - Fisheries Management Plans:
GF – Pacific Coast Groundfish FMP
CP – Coastal Pelagics FMP
PS – Pacific Salmon FMP
Source: NMFS 2001 – 2011

2 - Life Stages:
L - Larvae
J – Juvenile
A – Adult

The information below was summarized from the life history descriptions provided in Appendix B Part 2 of the Pacific Coast Groundfish FMP (PFMC 2005), Appendix A of the Coastal Pelagic Species FMP (PFMC 1998), and the life history descriptions provided in Pacific Coast Salmon FMP (PFMC 2003).

English Sole

Juvenile and adult English soles are few in Suisun Bay. Juveniles and adults are demersal and prefer soft bottoms composed of fine sands and mud but also are reported to occur in eelgrass habitats. English soles are typically found in depths less than 250 m. They use near shore coastal and estuarine waters, including the San Francisco Estuary, as nursery areas. Juveniles prefer shallow-water coastal bays and estuaries; as they grow, they move to deeper water (generally in the fall/winter). Large juveniles commonly occur out to depths of 150 m.

Starry Founder

Juvenile and adult starry flounders are abundant in Suisun Bay. Juveniles are found in estuaries and the lower reaches of major coastal rivers. Juveniles prefer sandy to muddy substrata and adults prefer sandy to coarse substrata, including gravel.

Brown Rockfish

Juvenile brown rockfish are few in Suisun Bay. Brown rockfish are common in shallow water and occur from depths of 0 to 135 m, but are most common in waters less than 50 m. Brown rockfish use inland seas as nursery grounds, utilizing shallow, vegetated habitats such as beds of kelp or eelgrass. Juveniles usually live in shallower water than adults and are widely distributed in shallow water bays. Sub-adult and adult brown rockfish are generally residential, though they may migrate into somewhat deeper water in the winter.

Northern Anchovy

Northern anchovy larvae, juveniles, and adults are abundant in Suisun Bay. Estuaries and bays provide important habitat for the northern anchovies, which spend significant time in these habitats. Adults and juveniles are pelagic and are found in estuaries and near shore waters up to 300 m deep. The northern anchovy spawns throughout the year depending on the region; usually within 100 km of the coast near the surface. Anchovies are abundant in bays and estuaries in the spring, summer and fall.

Chinook Salmon

The Chinook salmon is the only coastal pelagic species covered under the Salmon FMP that has potential to occur in the vicinity of the Project. Juvenile and adult Chinook salmon are potentially present in Suisun Bay. The Chinook salmon occurring within the San Francisco Estuary include three evolutionary significant units (ESUs): the Central Valley fall/late fall-run ESU; the Central Valley spring-run ESU; and the Sacramento River winter-run ESU. The Central Valley fall/late fall-run ESU is a Federal Species of Concern and a California Species of Special Concern. The Central Valley spring-run ESU is listed as threatened under the Federal ESA and the CESA. This ESU includes all naturally spawned populations of spring-run Chinook salmon in the Sacramento River and its tributaries in California. The Sacramento River winter-run ESU is listed as endangered under the Federal ESA and CESA. Freshwater streams and estuaries provide important habitat for Chinook salmon. They feed on terrestrial and aquatic insects, amphipods, and other crustaceans while young, and primarily on other fish when older. Estuaries and associated wetlands provide nursery areas for the Chinook prior to its departure to the open ocean.

2.6 OTHER FEDERAL AND CALIFORNIA ESA SPECIES

Green Sturgeon (Southern Distinct Population Segment)

The Southern DPS of North American green sturgeon (*Acipenser medirostris*) is listed as threatened by the NMFS (Federal Register, 2006) and a species of special concern by the CDFW (CDFG, 2011a).

The green sturgeon Southern DPS is a long-lived anadromous species found in marine and estuarine waters of the North Pacific. The Southern DPS consists of the population segment of green sturgeon that utilizes the Sacramento River and tributaries for spawning. Green sturgeon spend most of their life in marine and estuarine environments. In winter, they aggregate in estuaries and migrate north along the North Pacific coastal shelf. They overwinter in waters north of Vancouver Island and return south in spring. Not all green sturgeon are migratory, however. They may be found in San Francisco Bay throughout the year, though numbers increase in summer with the return of migrants moving into the estuary for feeding, holding, and spawning (Lindley *et al*., 2011).

Green sturgeon reach maturity between 10 and 15 years. Mature green sturgeon are thought to spawn every two to four years. Mature fish enter and migrate rapidly up the Sacramento River in March and April, where they spawn and then either return to the estuary or over-summer and migrate out of the river with the first fall flow event (Heublein *et al*., 2009). Juveniles move from their natal river into the estuary at two years and may remain in the estuary from one to four years before migrating to the Pacific Ocean. In the estuary, green sturgeon are associated with turbid water, where they prey on benthic organisms such as clams and crabs. Green sturgeon live from 40 to 60 years and exhibit cohesive social behavior in overlapping age cohorts.

Longfin Smelt

The longfin smelt (*Spirinchus thaleichthys*) is listed as threatened by the CDFW (CDFG, 2011a). The USFWS has found that this species is in need of protection but will not be immediately considered for listing as an endangered species (77 CFR 19756, 2012). The longfin smelt is a small, pelagic fish distributed along the Pacific Coast of North America. San Francisco Bay supports the most southerly distributed and largest population in California. Longfin smelt mature at two to three years of age. They are partially anadromous, with at least some portion of the population of first-year smelt migrating in spring into coastal waters beyond the Golden Gate Bridge. Little is known about their movements in coastal waters, but they return to the bay in their second winter just before spawning season (Rosenfield and Baxter, 2007). Mature fish gradually migrate upstream December through February to spawn in fresh water. Longfin spawning occurs in fresh water over sandy-gravel substrates, rocks, and aquatic plants; the downstream extent of spawning is near the City of Pittsburg (LTMS, 2009). Larvae develop a swim bladder and move downstream into the estuary January through March.

Longfin smelt juveniles and adults feed on small copepods, though adults will also consume mysid shrimp when available. Longfin smelt can be found in the bay throughout the year. Juveniles and adults aggregate in cooler waters in deep-water habitats and are thought to be intolerant of higher temperatures (>22°C), thus, between approximately June and September, they are most abundant in the Central Bay (Rosenfield and Baxter, 2007). Longfin smelt prefer deep channel areas (> 7 meters) over shallower shoals (< 7 meters). Data from the CDFW's Fall Midwinter Trawl Surveys, which surveys September through December, show longfin smelt are found in the ship channel near Pittsburg throughout the fall, with numbers rising through November and average forklength generally rising through December as mature longfin smelt migrate upstream (see Table 2). Like the delta smelt, longfin smelt distribution is correlated with the inland intrusion of saline waters, and they are relatively abundant in the Lower Estuarine River in all seasons of drought years (CDFG, 2008d; Wang, 1991).

Table 2: Average Longfin Smelt Catch off New York Point 1996-2006

Month	Average Number of Longfin Caught	Average Forklength (millimeters)
September	17	57.6
October	120	59.8
November	261	60.1
December	14	66.9

Source: CDFG, 2008a

Delta Smelt

Delta smelt (*Hypomesus transpacificus*) is listed as threatened by the USFWS (Federal Register, 1993) and endangered by the CDFW (CDFG, 2008b). Delta smelt is a small, annual species endemic to the estuary. Delta smelt spend much of their lives in the brackish waters of the estuary. They are weakly anadromous; after the first high-winter flow, mature smelt migrate upstream in pulses between December and April to spawn in fresh water. Delta smelt most likely use selective tidal swimming behavior to reduce energy expenditure by migrating during periods of slack water (Sommer *et al.*, 2011). Most delta smelt die after spawning. By the beginning of June, most larvae have entered a post-larvae state (15 to 25 millimeters) in which they have developed a swim bladder and drifted passively downstream to rear in the brackish waters of the estuary. By the end of June, most smelt that will survive the winter are in the estuary and have entered the juvenile stage (20 to 40 millimeters). June through August represents the delta smelt's primary growing season. Delta smelt attain maturity between November and January when they are 50 to 80 millimeters in length (Bennet, 2005).

In the estuary, delta smelt are distributed within turbid waters over large shoals (depth < 7 meters) at the freshwater edge of the entrapment zone, where they feed on small crustaceans such as copepods and amphipods in the trophically rich waters (Bennet, 2005).

Delta smelt distribution is highly correlated with the location of X2, which in turn depends on the volume of freshwater flow from the Central Valley Project and State Water Project, two of the world's largest water-diversion projects. Water flows into the Delta are partially dependent on the previous water year's water index. Water years are measured from October of the previous year through September of the current year. The water index for the water year is estimated by the Department of Water Resources starting in December; the final water index is available May 1.

During the summer, X2 and the entrapment zone are typically located in Suisun Bay. Under the provisions of the USFWS Biological Opinion, issued to the Central Valley Project and State Water Project, in the fall following wet years in the Sacramento Basin, freshwater flows are expected to be sufficient to create an average X2 of 74 kilometers in September and October. This maintains the central axis of delta smelt distribution in Suisun Bay (DWR, 2011; USFWS, 2008). Following the fall of above-normal water years, fall X2 will be maintained at 81 kilometers, at the confluence of the Sacramento and San Joaquin rivers. No additional releases are triggered following water years with a below normal or dry water index.

Table 3 shows the average catch off New York Point from 1996 to 2006.

Table 3: Average Delta Smelt Catch off New York Point 1996-2006

Month	Average Number of Delta Smelt Caught	Average Forklength (millimeters)
September	72	50.9
October	1	59.8
November	2	63.1
December	9	56.7

Source: CDFG, 2008a

Steelhead

The Central Valley steelhead (*Oncorhynchus mykiss irideus*) is listed as threatened by the NMFS (Federal Register, 2006). Central Valley steelhead mature between two and three years of age. They are mainly "winter" run, though a small summer-run population exists. The small summer-run population migrates into the Sacramento River starting in July. The majority of steelhead begin migration in the fall. Spawning migration peaks in September and October and may continue through February or March. Unlike the Chinook salmon, not all steelhead die after spawning. Some may return to the ocean and return to spawn several times. Most juvenile steelhead spend one to two years in fresh water before migrating toward the ocean in the winter and spring, with an outmigration peak in mid-March (Moyle *et al.*, 2008). USFWS trawl data from Chipps Island, indicate that juvenile steelhead are present in Suisun Bay from at least October through July, with hatchery fish (clipped adipose fin) emigration peaking between January and March, and wild juvenile outmigration more evenly spread out over six months or more (USFWS, 2008). The difference in emigration peak is a reflection of the timing of hatchery releases of juvenile steelhead. Fish salvage data from the Delta pumps indicate that most steelhead move through the Delta from November to June, with the peak numbers occurring in February through April (USFWS, 2008).

3.0 POTENTIAL EFFECTS

The project proposes to lift the pipe from within its buried position beneath graded rock and mud while taking steps to minimize disturbance and sediment resuspension. The eel grass identified approximately 25 feet from the pipe will not be affected. Because of the short-term and temporary nature of the work, the small work area that is involved, and procedures proposed for minimizing resuspension of sediment, the impacts to the marine environment are expected to be minimal.

3.1 ESSENTIAL FISH HABITAT

The area of the proposed action (Suisun Bay) has been identified as EFH for several species of fish: English sole, starry flounder, brown rockfish, northern anchovy, and Chinook salmon, (which includes two ESUs that are federally and state listed as threatened or endangered).

The above fish species may utilize this area during a portion of their life cycles. The estuary is typically utilized as a forage area for juveniles and adults and as a nursery area for larvae and juveniles. These species would not use the project area for spawning.

Juvenile or adult fish species in the area would be expected to move out of the area during the pipe removal activities. Because of the temporary nature of the effects on benthic invertebrates (the disturbed area will be recolonized), the cumulative effects of this project on EFH are negligible.

3.2 ESA-LISTED SPECIES

In addition to Chinook salmon, these other federal and state listed species have the potential to occur in the proposed project area: green sturgeon, longfin smelt, Delta smelt, and Central Valley steelhead. Like the species listed above, these species may also utilize the area during a portion of their life cycles. There is no point during the year in which all special-status species are expected to be absent from the Lower Estuarine River. Expected presence and life stages of special-status species are summarized in Table 4 and discussed in detail below. Juvenile or adult fish species in the area would be expected to move out of the area during the pipe removal activities. Because of the temporary nature of the effects on benthic invertebrates (the disturbed area will be recolonized), the cumulative effects of this project on threatened or endangered fish species are negligible.

Table 4: Special-status Species and Timing in the Lower Estuarine River

Species	Status		Month											
	Federal	State	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Delta Smelt (water < 10 feet)	FT	SE	P	P	P	P	P	R	R	R	R	R	R	M_S
Delta Smelt (water > 10 feet)*	FT	SE	P	P	P	P	P	R	R					M_S
Longfin Smelt*	None	ST, SSC	S	S	S	S	R	R	R	R	M_S	M_S	M_S	S
Sacramento Splittail	None	SSC					M_O	M_O	M_O	M_O			M_S	M_S
Green Sturgeon (adult)	FT	SSC	M_S	M_S	M_S	M_S	M_S	M_S	M_S					M_O
Green Sturgeon (juv. and subadult)	FT	SSC	R	R	R	R	R	R	R	R	R	R	R	R
Central Valley Chinook Salmon (adult)														
Fall/Late Fall-run	FSC	SSC	M_S								M_S	M_S	M_S	M_S
Winter-run	FE	SE	M_S	M_S	M_S	M_S	M_S							
Spring-run	FT	ST		M_S	M_S	M_S	M_S	M_S						
Central Valley Chinook Salmon (juvenile)														
Fall/Late Fall-run	FSC	SSC	M_O	M_O	M_O	M_O	M_O	M_O	M_O	M_O	M_O	M_O	M_O	M_O
Winter-run	FE	SE	M_O	M_O	M_O	M_O	M_O							
Spring-run	FT	ST	M_O	M_O								M_O	M_O	M_O
Central Valley Steelhead (adult)	FT	None	M_S	M_S					M_S	M_S	M_S	M_S	M_S	M_S
Central Valley Steelhead (juvenile)	FT	None	M_O	M_O	M_O	M_O	M_O	M_O				M_O	M_O	M_O

M_S = spawning migration; M_O = outmigration; R = rearing; S = spawning; P = present

*Levine-Fricke (2004) shows a permissible work window from the Carquinez Strait to Collinsville from August 1 through November 30.

Sources: Bennett, 2005; CDFG, 2011a; Israel and Klimley, 2008; Levine-Fricke, 2004; LTMS, 2009; Moyle, 2002; Moyle *et al*, 2008; USFWS, 2008

Delta smelt

Delta smelt have the potential to occur in the vicinity of the project throughout the proposed construction term. Beginning in December, delta smelt are expected to begin to migrate upstream. As discussed above, the fall abundance of delta smelt in the area depends in large part on the water index of the previous year. However, under any scenario, the project is located within the low-salinity zone, so there is potential for delta smelt to use nearby areas for rearing and foraging while pipe removal is underway.

Longfin smelt

Longfin smelt are located in the project area year-round. Longfin smelt are more likely to be abundant in the ship channel north of the pipe removal area, and less likely in the shallow water area of the project. The furthest downstream extent of spawning occurs near the City of Pittsburg. Take is unlikely for project activities that occur in waters that are shallow (<6 meters) and warm (>=22°C), conditions that exist August 1 to September 31.

Chinook salmon

Adult Chinook salmon could potentially migrate past the project area during most months of the year, but minimal numbers of migrants are expected July 1 to August 31. Depending on environmental conditions and the timing of spawning runs, this lull in migration may extend through September 31. In-water work that occurs July 1 to November 31 is unlikely to impact adults of the threatened or endangered winter-run and spring-run Chinook salmon.

Juvenile Chinook salmon from the fall-run and late fall-run pass through Suisun Bay during all months of the year. Smolt of the threatened or endangered winter-run and spring-run pass through the area October 1 to April 30. Winter-run smolts enter the Delta January through April. Spring-run smolts enter the Lower Estuarine River starting October 1, with peak numbers in November and December. In-water work that occurs June 1 to September 31 is unlikely to impact juveniles of the threatened or endangered winter-run and spring-run Chinook salmon.

Adult and juvenile Chinook salmon and steelhead tend to travel under low light conditions such as early morning, dusk, and at night. Construction activities that occur during the daylight hours of 30 minutes after sunrise to 30 minutes before sunset, when there is less movement of salmonids, are less likely to impact salmonids. Construction activities, such as dredging, that occur at dusk, dawn, and nighttime, when salmonids are active, are more likely to cause negative impacts to these fish.

Steelhead

While some adult steelhead move upstream through the Delta beginning in July, the spawning migration through this area peaks in September and October and continues into the winter. Most juvenile steelhead emigrate through the Delta from November through June, with the peak numbers occurring in February through April. Relatively small numbers of adult or juvenile steelhead are present in the project area during the summer months.

Green sturgeon

Adult green sturgeon could potentially be present in the Lower Estuarine River from December through May, and juvenile and subadults of this species rear in Suisun Bay

all months of the year. However, green sturgeon are wide ranging throughout the bay and it can be assumed that if individuals find the area obnoxious, they can move elsewhere in the bay without adverse effect to their health or survival. With this assumption, construction during the summer months would minimize impacts to this species.

3.3 CRITICAL HABITAT

Delta smelt

PCEs at the pipe removal site include physical habitat for rearing and migration. Both PCEs may be temporarily adversely affected by pipe removal activities that increase turbidity or resuspend solids. No long-term adverse effects to PCEs of the delta smelt critical habitat are anticipated.

Green sturgeon

PCEs at the pipe removal site include physical habitat for foraging and migration. In-water work may temporarily adversely affect water quality, migratory corridors, and sediment quality. No long-term adverse effects to PCEs of the green sturgeon critical habitat are anticipated.

4.0 IMPACT AVOIDANCE, PROTECTION, AND MINIMIZATION MEASURES

Whereas the project impact area is small and pipe removal activities are expected to cause only minimal disturbance over a short time frame (two weeks), the impact avoidance and minimization recommendations below would further help to ensure that impacts to the marine environment are minimized and to impacts to sensitive fish species are avoided.

1. Confine in-water activities to daylight hours between August 1 through November 30 or as otherwise specified by regulatory agencies.
2. Prepare and implement a Spill Prevention, Control, and Countermeasures Plan to avoid and minimize the impact of minor spills during construction.

5.0 CONCLUSIONS

Potential adverse impacts to essential fish habitat and sensitive species are expected to be minimized or avoided due to the low-impact nature of the work, and can be further minimized by implementing avoidance and minimization measures outlined in Section 6.

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