Enclosure 2

MAGNUSON-STEVENS FISHERY CONSERVATION AND MANAGEMENT ACT ESSENTIAL FISH HABITAT CONSULTATION

ACTION AGENCY:	California Department of Fish and Game, Region 3, and the U.S. Fish and Wildlife Service
ACTION:	South Bay Salt Pond (SBSP) Restoration Project Phase 1 Actions and Operations and Maintenance Activities
CONDUCTED BY:	National Marine Fisheries Service, Southwest Region
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I. STATUTORY AND REGULATORY INFORMATION

The Magnuson-Stevens Fishery Conservation and Management Act (MSA), as amended by the Sustainable Fisheries Act of 1996, establishes a national program to manage and conserve the fisheries of the United States through the development of federal Fishery Management Plans (FMPs), and federal regulation of domestic fisheries under those FMPs, within the 200-mile U.S. Exclusive Economic Zone (EEZ, 16 U.S.C. §1801 *et seq.*). To ensure habitat considerations receive increased attention for the conservation and management of fishery resources, the amended MSA required each existing, and any new, FMP to "describe and identify essential fish habitat for the fishery based on the guidelines established by the Secretary under section 1855(b)(1)(A) of this title, minimize to the extent practicable adverse effects on such habitat caused by fishing, and identify other actions to encourage the conservation and enhancement of such habitat" (16 U.S.C. §1853(a)(7)). Essential Fish Habitat (EFH) is defined in the MSA as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity" (16 U.S.C. §1802(10)). The components of this definition are interpreted at 50 C.F.R. §600.10 as follows: "Waters" include aquatic areas and their associated physical, chemical, and biological properties that are used by fish and may include aquatic areas historically used by fish where appropriate; "substrate" includes sediment, hard bottom, structures underlying the waters, and associated biological communities; "necessary" means the habitat required to support a sustainable fishery and the managed species' contribution to a healthy ecosystem; and "spawning, breeding, feeding, or growth to maturity" covers a species' full life cycle.

Pursuant to the MSA, each federal agency is mandated to consult with NOAA's National Marine Fisheries Service (NMFS), as delegated by the Secretary of Commerce) with respect to any action authorized, funded, or undertaken, or proposed to be, by such agency that may adversely affect any EFH under this Act (16 U.S.C. §1855(b)(2)). The MSA further mandates that where NMFS receives information from a Fishery Management Council or federal or state agency or determines from other sources that an action authorized, funded, or undertaken, or proposed to be, by any federal or state agency would adversely effect any EFH identified under this Act, NMFS has an obligation to recommend to such agency measures that can be taken by such agency to conserve EFH (16 U.S.C. §1855(4)(A)). The term "adverse effect" is interpreted at 50 C.F.R. §600.810(a) as any impact that reduces quality and/or quantity of EFH and may include direct or indirect physical, chemical, or biological alterations of the waters or substrate and loss of, or injury to, benthic organisms, prey species and their habitat, and other ecosystem components, if such modifications reduce quantity and/or quality of EFH. In addition, adverse effects to EFH may result from actions occurring within EFH or outside EFH and may include site-specific or habitat-wide impacts, including individual, cumulative, or synergistic consequences of actions.

If NMFS determines that an action would adversely affect EFH and subsequently recommends measures to conserve such habitat, the MSA proscribes that the federal action agency that receives the conservation recommendation must provide a detailed response in writing to NMFS within 30 days after receiving EFH conservation recommendations. The response must include a description of measures proposed by the agency for avoiding, mitigating, or offsetting the impact of the activity on EFH. In the case of a response that is inconsistent with NMFS EFH conservation recommendations, the federal agency must explain its reasons for not following the recommendations (16 U.S.C. §1855(b)(4)(B)).

II. BACKGROUND AND CONSULTATION HISTORY

The South Bay Salt Pond (SBSP) Restoration Project has been under development for a number of years. Coordination with NMFS regarding EFH consultation began in 2006, with requests for consultation in 2007:

2004 – 2007	The United States Fish and Wildlife Service (USFWS) continued coordination with other federal, state, and local agencies as well as stakeholders regarding the development of the proposed action's components for National Environmental Policy Act (NEPA) and California Environmental Quality Act (CEQA) review.
2006 –2008	USFWS continued coordination with other Federal and State agencies regarding the development of the proposed action's programmatic and project-level biological assessments.
December 2007	USFWS and the California Department of Fish and Game (CDFG) released the Final NEPA Environmental Impact Statement and CEQA Environmental Impact Report for the proposed action.
December 18, 2007	Corps issued request for EFH consultation for SBSP Phase 1 Actions.

December 2007 July 2008 — NMFS met on various occasions with the Project manager from State Coastal Conservancy and project consultants, J.T. Harvey and Associates, to review programmatic, operations and maintenance, and Phase 1 Actions and information needs for the EFH Assessment.

April 15, 2008 — Corps issued request for EFH consultation for operations and maintenance of South Bay Salt Ponds.

August 2008 — USFWS and CDFG issued revised Programmatic Biological Assessment and project-level biological assessments for the Phase 1 Actions.

III. PROPOSED ACTION

A. Overall Restoration Plan Summary

The SBSP Project encompasses approximately 15,100 acres of former salt ponds located around the edge of South San Francisco Bay (Figure 1). The Project is intended to restore and enhance wetlands in South San Francisco Bay (San Mateo, Santa Clara, and Alameda counties) while providing for flood management and wildlife-oriented public access and recreation. When completed, the Project will restore 13,200 acres of commercial salt ponds, purchased from Cargill Salt in March 2003, to a mix of tidal wetlands and other habitats using state, federal, and private foundation funds. The remaining 1,900 acres will continue to be occupied by levees and other transitional habitats. The Project will be implemented through specific adaptive management actions anticipated to extend over a 50-year period, resulting in 6,800 to 11,880 acres of tidal habitat restoration (based on objective of 50% to 90% restoration to tidal habitat). This EFH consultation analyzes activities associated with Phase 1 Restoration Actions and proposed Operations & Maintenance (O&M) activities.

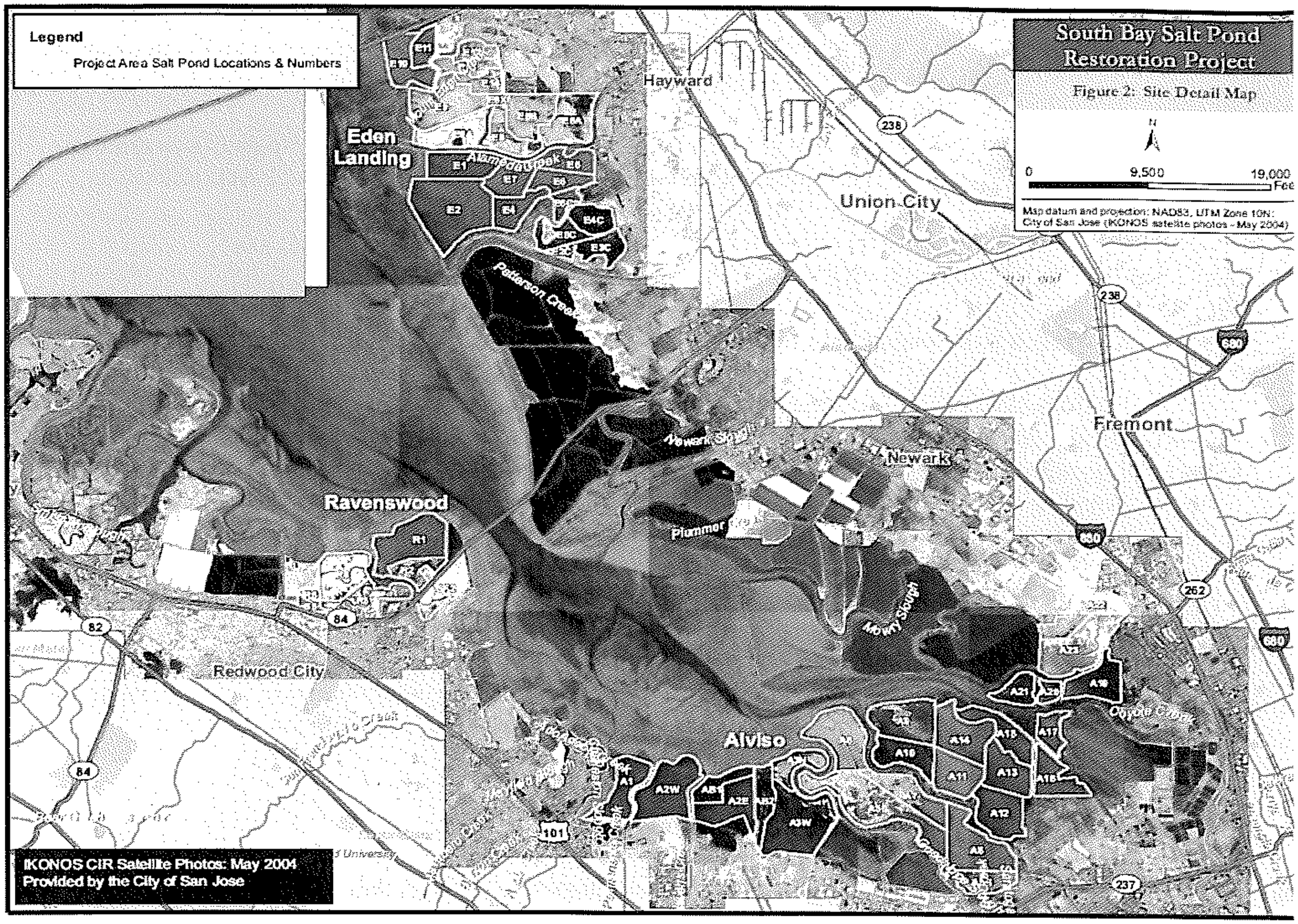
B. Phase 1 Restoration Actions

Phase 1 includes six site-specific actions encompassing ponds A6, A8, A16, E8A/E8X/E9, E12/E13, and SF2 (Figure 1).

1. <u>Pond SF2</u>

Pond SF2 will be reconfigured to create two managed ponds with islands for nesting birds and shallow water habitat for shorebird foraging. Up to 36 bird nesting islands are proposed to be constructed by depositing and contouring soil to form several different islands. Material needed to construct islands will be borrowed on-site with a minimum 20-foot bench left between the borrow area and the toe of slope of each new island. Each pond would be constructed to 4 feet above the average water level (assuming a water depth of 6 inches). Berms within the pond will be constructed to create three cells, such that the pond will maintain similar shallow water depths across the sloped surface to facilitate water flows throughout to improve water quality and prevent water stagnation.

Figure 1. Area map of South Bay Salt Pond Restoration Project with pond details.



For water quality management purposes six outlet culvert structures would be required where the berms cross deeper, historic channel and borrow ditches.

Five new 4-foot intake culverts and six new 4-foot outlet culverts will be installed at the northern and southern end of the bayfront levee, respectively. Each culvert will have combination slide/flap gates on each end. Culverts will be installed by cutting a trench in the bayfront levee and pipes will be placed directly onto bay mud. Pilot channels, approximately 1,000 feet in length by 40 feet in width through the outboard marsh and 50 feet in width across the mudflat, will be excavated to facilitate flow of water into and out of the pond. All excavated material will be used for restoration features inside the pond (*e.g.*, borrow ditch blocks, raising the marsh plain, *etc.*) to expedite restoration activities. Average and maximum summer inflows will be approximately 35 cubic feet per second (cfs) and 365 cfs, respectively. Winter inflows are expected to be lower due to the presence of rainwater in the pond. Approximately 3,650 linear feet of levee/trail will be raised and widened approximately 1 to 2 feet above the existing crest elevation.

2. Ponds E12/E13

Ponds E12 and E13 will be reconfigured and managed for birds as shallow water foraging habitat with six nesting and roosting islands. The ponds would be divided into six cells of varying salinity and would be connected by a water distribution canal (a series of small berms 6-10 feet in width and 2-6 feet above grade and flashboard weirs), with one nesting island in the middle of each area. The islands and berms will be constructed using fill material (on-site borrow). Water control structures will connect the distribution canal to each of the six foraging areas. Up to five new 4-foot intake culverts with combination slide/flap gates on each end of the culverts may be required. The existing culverts would be replaced with new combination slide/flap gate structures. The existing pump house at the northern extension of Pond E8X would be replaced to supplement gravity flow as needed. A new culvert with tide gates would be installed between Pond E8X and E9. A new discharge outlet structure consisting of eight new 4-foot outlet culverts would be installed at the Pond E13 and Mount Eden Creek levee. An approximately 220-foot long, 8-foot deep pilot channel would be excavated through Mount Eden Creek outboard marsh to facilitate flow.

A kayak launch area would be constructed at the Mount Eden Creek off of the main spur trail. The launch ramp is proposed to be 8-feet in width with a 10-foot wide floating dock, with a length of 60 feet. The launch will be in an area of reduced vegetative cover with a vertical drop of approximately 6.5 feet between the existing levee and the water elevation at low tide.

3. Pond A6

Alviso Pond A6 will be restored to tidal action to create approximately 330 acres of tidal salt marsh and tidal channel habitat through levee breaching, levee lowering, and the installation of borrow ditch blocks. Up to approximately 2,200 feet of the levee between Pond A6 and

Guadalupe Slough (Guadalupe Slough levee) will be lowered to the marsh plain elevation (mean higher high water or 7.5 feet North American Vertical Datum (NAVD) by excavating the levee. Up to approximately 1,150 feet of the outboard levee along Alviso Slough levee will be lowered. Excavated material from lowering the levees will be placed in the internal borrow ditch to restrict water flow through the borrow ditch. Breaches through the outboard levee and pilot channels through the outboard marsh will be excavated at four locations. Two breaches will be approximately 30 feet wide and 5 feet deep, and two breaches will be approximately 80 to 100 feet wide and 8 feet deep.

4. Pond A16 and A17

Alviso Pond A16 will be reconfigured to create 242 acres of managed pond habitat, incorporating islands for nesting birds and shallow water habitat for foraging shorebirds. Nesting islands and earth berms will be constructed using onsite materials. Water will enter the A16/A17 pond system through a new Pond A17 intake structure consisting of two new 4-foot intake culverts with slide/flap gates on each end, in addition to the existing 4-foot culvert, between Coyote Creek and Pond A17. Also, there will be a fish screen structure consisting of one or more culverts with fish screens on the Coyote Creek side and flap gates on the Pond A17 side. A 20-foot long (75-feet wide at the top and 28-feet wide at the bottom) trapezoidal pilot channel will be excavated from Coyote Creek to the structure through the existing fringe marsh. Three new 4-foot intake culverts, with combination slide/flap gates on the ends of each will be added between Pond A17 and Pond A16 to provide flexibility and ease of managing water levels in Pond A17. Each cell in Pond A16 will have two intake and two outlet structures, each consisting of multiple 4-foot wide weirs. Six new 4-foot outlet culverts, with combination slide/flap gates on both ends of each culvert, will be added between Pond A16 and Artesian Slough. A 50-foot long trapezoidal channel with a 105-foot top width and a 48-foot bottom width will be added here. Imported fill material will be used to fill the borrow ditches, if fill material of acceptable quality becomes available. The fill is intended to decrease borrow ditch depths while maintaining the hydraulic function of the intake and outlet canals and berm stability (*i.e.*, not filling the intake canal borrow ditch above the elevation of the pond bed). The levees may require grading and widening improvements for construction access.

5. Ponds E8A, E8X, E9

Ponds E8A, E8X, and E9 will be restored to create approximately 630 acres of tidal salt marsh and tidal channel habitat. Tidal action will be restored to historic existing channels in the ponds by a series of outboard breaches and pilot channels, as well as internal levee breaches. Up to approximately 18,400 feet (3.5 miles) of levees will be lowered to the marsh plain elevation. Levees will only be lowered to the extent necessary to provide enough fill material for restoration of features, such as ditch blocks, within the pond. The outboard levee along Whale's Tail marsh and the northwestern segment of the Pond E9 levee from the Pond E9 breach to Pond E14 will not be lowered. The existing internal levee between Ponds E8A and E9 will be breached in 5 locations to reconnect remnant historical channels and facilitate tidal drainage. Eight breaches through outboard levees will be excavated at locations of major remnant historical tidal channels. The western breach will have a top width of 90 feet and a bottom width of 10 feet, and the other breaches will have a top width of 50 feet and a bottom width of 3 feet. At the breaches, tidal channels through the outboard marsh will be excavated. The channels will have side slopes of 3:1 and the widths will be approximately 60% to 80% of the breach width at mean higher high water (MHHW). Marsh vegetation will be excavated down to the root zone.

Additionally, Mt. Eden Creek will be enlarged by dredging and reconfiguring the Pond E10 levee. The segment of the Pond E10 levee downstream of the Pond E9 breach will be realigned by constructing a new levee segment farther to the north. A new 1,020-foot segment will be constructed across the Pond E10 bed using material from other levees. The southern extension of the remnant Pond E10 levee on the north side of the existing Mt. Eden Creek breach will be excavated to widen and deepen the breach. The breach will be widened by approximately 110 feet at MHHW. After lowering the existing Pond E10 levee, material will be excavated from the outboard side of the lowered levee to widen the Mt. Eden Creek channel by approximately 25 feet. The Mt. Eden Creek channel will be deepened by approximately 8 feet by dredging the channel bottom. The channel width will be approximately 25 feet at the bottom and 60 feet at MLLW. Channel dredging will extend approximately 150 feet outboard of the Mt. Eden Creek breach through the mudflat sill 50-feet wide.

Pond E10 may be drained through the existing Pond E10 water control structure to facilitate construction. A flap gate will be temporarily installed on the Bay side of at least one of the three culverts to allow for drainage. The other culverts will be blocked to prevent intake. The existing water control structures between Pond E9 and Mt. Eden Creek (Pond E9 structure), Pond E8A and North Creek (Pond E8A structure), and Pond E8X and North Creek (Pond E8X structure) will be removed.

6. Ponds A5, A7, and A8

The Alviso Pond A8 restoration will introduce muted tidal action to create approximately 1,400 acres of shallow subtidal habitat in Ponds A5, A7, and A8 through the construction of a 40-foot notch at the southern end of Pond A8 and modified management of existing water control structures on A5 and A7. Water levels in Pond A8N (409 acres) would exceed elevations of internal levees and spill into adjacent Ponds A5, A7, and A8S (1,023 acres), modifying the existing hydrologic regime throughout the pond system.

The armored notch will be constructed through the perimeter levee that separates Pond A8 and upper Alviso Slough. Earth excavated to construct the notch would be placed within Pond A8 or used for maintenance of nearby levees. The depth of the notch would extend to approximately 1 foot above the average bed elevation. Water exchange would be limited, and tidal range within the 3 ponds would be muted during the dry summer and fall months. An approximately 475-foot-long pilot channel will be excavated through the fringe freshwater marsh of Alviso Slough immediately outboard of the armored notch. This channel will facilitate tidal exchange by providing an initial flow path so the channel can gradually enlarge through tidal scour. The top width of the constructed pilot channel will be over-excavated to approximately 130 feet to minimize the erosion of sediment that may be contaminated with mercury. The depth of the pilot channel will extend to approximately 9 feet below existing grade. Rock armor will be placed immediately adjacent to the armored notch to limit erosion.

C. Operations and Maintenance Activities

On-going O&M activities will be performed periodically for all South Bay Salt Pond Project facilities, including reconfigured and managed ponds, recreational/public access facilities, and (less frequently) tidal habitat restorations. Specific O&M actions that may affect EFH include the use of water-based equipment, dredge lock use and access, channel maintenance, borrow ditch dredging, levee fortification and maintenance, dock and other structure maintenance, material storage, and island maintenance. Each of these activities is described below.

1. Water-based Equipment Access

Access through San Francisco Bay, sloughs, and other channels will be required for water-based equipment. This equipment includes boats, floating dredges (*e.g.*, the Mallard), and amphibious equipment (*e.g.*, amphibious dredges or vegetation removal equipment).

2. Dredge Locks

Maintenance of locks involves dredging of and placement of dredged material at 21 existing dredge locks within the South Bay Salt Pond project footprint, and at any newly constructed authorized dredge locks, to allow the dredge to access the salt ponds. Earthen levee material, stockpiled from the last time the lock was accessed atop the main levee will be used to dam the breach following entry. Upon dredge exit, breaching and closing levees will be completed in a similar fashion to that described above. The salt marsh muds that were excavated and sidecast in the access cut will be retrieved and placed back into the access cut and channel, closing the lock once the dredge has exited. In order to gain access to the ponds for maintenance, there may also need to be dredging within shallow sloughs to provide up to four feet of clearance for access. Dredge material that cannot be placed on salt pond levees may be placed on bar mud flats or side-cast following approval in accordance with the notification procedure. Some slough dredging may also be performed near dredge locks for the purpose of obtaining additional mud to bring the access cut fills to the desired elevation following the dredge access.

3. Channel Maintenance

Periodically, inlet and outlet channels that allow water to flow into or out of water control channels will need to be maintained. This typically will involve dredging of any accumulated sediment that is preventing the free flow of water. Channel maintenance will also involve side-casting dredge material from the inlet/outlet channel of Pond A14 in accordance with regulatory permits. Additionally, periodic inspection and maintenance of restoration internal channels and associated infrastructure such as water control structures, internal managed pond berms and canals will be required to ensure that the ponds are operating as intended. This could include removal of accumulated sediments, repair of water control structures and placement of materials on internal levees as needed to maintain ecological functions and values.

4. Borrow Ditches

Activities may also include dredging in existing and new borrow ditches within the ponds for the purpose of placing the dredged material on existing levees, and dredging in ponds to allow a dredge to cross a pond. This includes the placement of dredge material within the pond. Placement of dredged material within the pond could occur on the pond bottom along the side of the dredged channel. Conversely, fill will also be placed in the borrow ditches themselves in strategic locations to re-direct water flow to enhance ecological functions.

5. Levee Fortification and Maintenance

Dredge material will be placed on levee tops and/or levee sides through the placement of material dredged from inside salt ponds or material imported in the minimum amount necessary to repair or protect levees. Levees may be serviced by a floating dredge (known as the Mallard) or other methods such as a dragline, barge-mounted dredge, an aquatic excavator, or amphibious construction equipment. Disposed material may be dredged from salt ponds along the inside and top of salt pond levees to maintain levee configuration. This method may require dredge access through pre-approved locations (*i.e.*, dredge locks). In limited instances, levee fortification may be accomplished by importing fill material to place on the top of and on the banks of levees, or by dredging muds from the outside, bay, or slough side of the levee for placement on the salt pond levee. Both alternate methods avoid the need for dredge lock access. Dredged sediment deposition occurs on approximately 5% of the salt pond levees a year (10 miles (mi) out of 200 total mi). The levee tops are disked and graded prior to maintenance.

Riprap will be placed in the minimum amount necessary to protect existing levees. In some instances, riprap is required because of continued localized erosion from high wave energy and is maintained on a continuing basis. The amount placed will be the minimum required to provide protection and will be placed from the levee toe upwards onto the levee or to stabilize structures. It is anticipated that riprap will be used to maintain outboard levees of ponds that do not have outboard marsh habitats and that are likely to be restored to tidal circulation in the future.

6. Dock and Other Structure Maintenance

Docks, boat launches, existing marine crossings, existing bridges, bridge foundations and abutments within the network of levees, intake channels, tide gates, ditches, pumps, piers, trestles, walkways, fences, bulkheads, platforms and other facilities will be used, maintained, and replaced on an in-kind, as needed basis, that does not result in a significant enlargement or increase of square footage (*i.e.*, not more than 100 feet^2) over that of the existing. If required, maintenance may require the installation and use of new pipes, culverts, siphons, intake structures, electrical distribution lines for the operation, and pumping facilities, all involving the minimum dredging or fill necessary. Portable pumps, such as diesel-powered pumps, may be used occasionally for operations and maintenance activities, such as supplementing gravity flows through the water control structures or dewatering cells or canals for maintenance.

7. Material Storage

On-going maintenance requires the storage, on a temporary basis, of shoreline protection or levee surface materials in certain previously approved or designated areas. The project includes the continued practice of using existing dredged material stockpile locations, which are used to dry material to create an effective dam after dredge lock and salt pond access, thus ensuring that disturbance occurs generally in the same area. As the material is removed and then replaced with new material on each pass (typically once every 5 to 10 years), the material is new Bay fill each time it is placed.

8. Island Maintenance

Nesting islands in managed ponds are expected to settle, or erode, over time due to the weak and soft condition of the Bay mud. Maintenance is expected to be required within about 5 to 10 years to raise the nesting islands, unless the lower, subsided nesting island elevations are used successfully by nesting birds. The nesting islands were designed to test the effectiveness of both island shape and spacing. Once the results of that testing are complete, the islands may be recreated in a different configuration.

9. Pacific Gas & Electric Operations and Maintenance Activities

Pacific Gas and Electric (PG&E) will conduct scheduled and unscheduled O&M activities within the Project Action Area (see below) on properties owned by the USFWS and CDFG. Activities will include line patrols, tower inspections and maintenance, access road maintenance, boardwalk maintenance, and boardwalk and boat dock construction (see Pond A6 above). O&M activities may include walking through tidal marshes and other wetland habitats. Activities may require the use of jackhammers, impact wrenches, helicopters, and other machinery that produce loud noises and vibrations.

D. Fish Monitoring Plan and Adaptive Management

The Adaptive Management Plan (AMP) is designed to help guide the planning and implementation of each SBSP Project phase. The AMP provides a directed approach to achieving the Project objectives through learning from restoration and management actions for which many scientific and social uncertainties exist. For each issue or Project objective, the AMP provides a restoration target, monitoring plan, management triggers, applied studies, and potential management actions. If monitoring shows that a management trigger is occurring, then applied studies and management actions, as appropriate, will be implemented to address the trigger, and ultimately address the project objectives. The following issues and objectives in the AMP are relevant to EFH:

- Preserve Existing Estuarine Habitat Areas: No significant decrease in South Bay intertidal and subtidal habitats, including restored pond mudflat, intertidal mudflat, subtidal shallow and subtidal channel areas.

- Water Quality (Dissolved Oxygen): Water quality parameters in ponds will meet Regional Water Quality Control Board standards, South San Francisco Bay water quality will not decline from baseline levels, and dissolved oxygen levels meet Basin Plan Water Quality Objectives.

- Mercury: Levels of mercury in sentinel species do not show significant increases over baseline conditions and are not higher in target restoration habitats than in existing habitats.

- Estuarine Fish: Enhance numbers of native adult and juvenile fish in foraging and rearing habitats relative to baseline numbers.

As part of the adaptive management process, the fish monitoring plan is designed to monitor indicator species, fish assemblages, and habitat conditions in South San Francisco Bay. The monitoring plan will focus on fish assemblages using restored areas, as they evolve toward mature tidal marshes with defined channel systems. The plan will also focus on the South San Francisco Bay in order to monitor changes in the abundance and diversity of fish and invertebrates. Specifically, the plan will evaluate:

- pond use by pelagic fish, including species diversity, presence/absence, and seasonal patterns;
- restored pond, slough channel and San Francisco Bay use by demersal fish, including species diversity, presence/absence, and seasonal patterns;
- fishing pressure on fish in the South San Francisco Bay and obtain further information on species composition by fish creel censuses;
- species composition of fish mortality events in managed ponds and document associated habitat conditions; and
- water quality conditions occurring when fish species are surveyed (*e.g.*, temperature, dissolved oxygen).

Annual reports of monitoring results will be submitted to NMFS. It is anticipated that monitoring will occur for at least 5 years, with additional monitoring possibly extending beyond the 5-year period based on review of monitoring results by NMFS.

E. Conservation Measures

A complete list of conservation measures are provided in the South Bay Salt Pond Restoration Project Programmatic Action Biological Assessment. Below is a list of the conservation measures aimed at avoiding or minimizing adverse effects to EFH:

- To avoid entrainment of Central California Coast (CCC) steelhead and other fish species, water control structures on managed ponds adjacent to steelhead migration habitat will be closed during peak migration periods (December - May), unless other specific conservation measures are in place and authorized.

- In some specifically authorized instances in managed ponds, water control structures will be operated in a 2-way fashion, to allow CCC steelhead and other fish species to exit the ponds during outgoing tides.

- In some specifically authorized instances in managed ponds, modified trash racks will be installed on water control structures in managed ponds to prevent CCC steelhead, green sturgeon, FMP species, and other fish species from entering the ponds.

- Fish screens will be used to prevent CCC steelhead, green sturgeon, FMP species, and other fish species from entering managed pond systems, in certain authorized situations.

- To reduce potential impacts from infestation by non-native *Spartina*, pepperweed, and other invasive, non-native plant species, all equipment (including personal gear) will be cleaned of soil, seeds, and plant material prior to arriving on site to prevent introduction of undesirable plant species. Equipment and personal gear will be subject to inspection. All infestations occurring within the wetlands would be controlled and removed to the extent feasible without substantially hindering or harming the establishment of native vegetation in the restored wetlands.

- A hazardous spill plan will be developed prior to construction of each action. The plan will describe what actions will be taken in the event of a spill. The plan will also incorporate preventative measures to be implemented, such as vehicle and equipment staging, cleaning, maintenance, and refueling; and contaminant (including fuel) management and storage. In the event of a contaminant spill, work at the site will immediately cease until the contractor has contained, and mitigated the spill. The contractor will immediately prevent further contamination and notify appropriate authorities, and mitigate damage as appropriate. Containers for storage, transportation, and disposal of contaminated absorbent materials will be provided on the project site.

- Project sites will be maintained trash-free and food refuse will be contained in secure bins and removed daily.

- Any large wood, native vegetation, and weed-free topsoil displaced by construction will be stockpiled for use during site restoration.

- A stormwater management plan will be developed to ensure that during rain events, construction activities do not increase the levels of erosion and sedimentation. This plan will include the use of erosion control materials (*i.e.*, baffles, fiber rolls, or hay bales; temporary containment berms) and erosion control measures such as straw application or hydroseeding with native grasses on disturbed slopes; and floating sediment booms and/or curtains to minimize any impacts that may occur due to increased mobilization of sediments.

- All clean fill material proposed for upland and wetland placement will meet the qualifications set forth in the Regional Water Quality Control Board's (RWQCB) waste discharge requirements (Tentative Order), approved with respect to chemical and biological suitability for uplands and wetlands by the Dredged Material Management Office (DMMO). If the above-mentioned thresholds are not attained and the material is approved for use by the RWQCB, consultation will be reinitiated to analyze the potential effects of the contaminated material to listed species.

- The restored tidal marsh wetlands would be monitored for possible infestation by non-native cordgrass and other invasive, non-native plant species. If any invasive, non-native plant species are found, a qualified botanist would recommend specific measures to control the spread of non-native plant species. All infestations within the restored tidal marsh wetlands would be controlled and removed in coordination with the current eradication program for *Spartina* being implemented within San Francisco Bay without substantially hindering or harming the establishment of native vegetation in the restored wetlands.

The conservation measures described here and in the consultation initiation package as parts of the proposed action reduce or avoid adverse effects to EFH. NMFS regards these conservation measures as integral components of the proposed action and expects that all proposed activities will be completed consistent with those measures. Any deviation from these conservation measures will be beyond the scope of this consultation and may require supplemental consultation to determine what effect the modified action is likely to have on EFH.

IV. ACTION AREA

SBSP Project restoration actions and on-going operations and maintenance activities include a number of actions that may occur throughout the South San Francisco Bay (Figure 1). As a result, the proposed Action Area encompasses:

- Three pond complexes (Eden Landing, Alviso, and Ravenswood) and the neighboring sloughs (Mt. Eden Creek, North Creek, Old Alameda Creek, Alameda Creek Flood Control Channel, Mud Slough, Coyote Creek, Alviso Slough, Guadalupe Slough, Stevens Creek, Mountain View Slough, Charleston Slough, and Ravenswood Slough);
- Recreation areas within those complexes, portions of the Bay Trail, Alameda Creek Regional Trail, Don Edwards Environmental Education Center, and the Alviso Marina County Park, as well as the associated staging areas, parking lots and access points near the three pond complexes;
- San Francisco Bay south of the Bay Bridge, where indirect effects of the proposed action on bathymetry and salinity may occur;
- Portions of San Francisco Bay that may be traversed by water-based equipment that may be used for dredging or other actions that require water access; and
- Any other areas in the vicinity of on-going maintenance and operations that may be directly or indirectly affected by noise, dust, or other factors resulting from associated operations.

The proposed project occurs within EFH for various federally managed fish species within the Pacific Groundfish, Coastal Pelagic and Pacific Salmonid FMPs, including starry flounder, English sole, leopard shark, and other elasmobranchs (*e.g.*, big skate, soupfin shark, spiny dogfish); Chinook salmon; and Northern anchovy. In addition, the project occurs within areas designated as coastal estuary Habitat Areas of Particular Concern (HAPC) for various federally managed fish species within the Pacific Groundfish FMP. HAPC are described in the regulations as subsets of EFH which are rare, particularly susceptible to human-induced degradation, especially ecologically important, or located in an environmentally stressed area. Designated HAPC are not afforded any additional regulatory protection under MSA; however, federal projects with potential adverse impacts to HAPC will be more carefully scrutinized during the consultation process.

V. EFFECTS OF THE ACTION

The main objective of the SBSP Restoration Project is to restore salt ponds to managed and tidal habitats, which ultimately will benefit EFH through the creation of intertidal and subtidal habitats. In South San Francisco Bay, managed ponds support lower diversity of native fishes than tidal habitats, and only a few species are present in managed ponds in large numbers (URS 2008). Conversely, many of the fish recorded in the South Bay use tidal channels and mudflats at high tide when they are inundated. These tidal habitats are particularly important as nursery habitat for juvenile fish. Thus, these tidal channels and mudflats are productive foraging habitats for estuarine fish in this system (Harvey 1988), and conversion of managed ponds to tidal habitats is expected to result in substantial increases in estuarine fish populations in the South Bay.

The project will be managed adaptively with the ultimate goal of restoring 90% of salt pond habitat to tidal habitat. With the proposed phased approach, not all ponds will initially be restored to full tidal action. Rather some ponds will first be restored to managed tidal habitats and then later restored to full tidal action. This approach could lessen potential erosion of San Francisco bay mud habitats by staggering the demand for sediment once subsided ponds are breached. However, this approach also delays the restoration of estuarine EFH, and potentially degrades existing EFH through operations of managed ponds.

The proposed Phase 1 Actions and O&M activities are the first component of the larger SBSP Restoration Project. Based on information provided in the SBSP Environmental Impact Statement/Report (EIR/EIS), Programmatic Biological Assessment (BA) and Phase 1 BAs, NMFS concludes that proposed Phase 1 Actions and O&M activities would adversely affect EFH for various federally managed species within the Pacific Groundfish, Coastal Pelagic, and Pacific Salmonid FMPs. Phase 1 Actions will also result in beneficial effects to EFH by restoring ponds to tidal habitat. Beneficial and adverse effects are described below within the context of the full SBSP Restoration Project.

A. Habitat Evolution

When tidal action is restored to subsided ponds, habitat will initially be open, subtidal or intertidal habitat. Over time, suspended estuarine sediments will deposit in the wave-protected areas of the restored area forming intertidal mudflats and tidal channels. Once tidal mudflats reach a high enough elevation, plant colonization can occur, and marsh plain will develop. With the proposed phased approach to restoration, ponds will be restored to full tidal action at different times within the 50-year project. So, across the action area, habitat types will be changing and evolving at different rates over different timelines. Models were used to predict habitat evolution over a decadal time series for the full SBSP project (PWA 2006).

Restoration of managed ponds to tidal habitats is expected to increase the availability of intertidal mudflat foraging area at low tide in the short-term, as most of the breached ponds are sufficiently subsided that they would provide large areas of intertidal mudflat habitat for several decades before accreting enough sediment for vegetation to colonize. For Phase 1 Actions after 50-years of habitat evolution, models predict an increase in approximately 108 acres of subtidal habitats and 240 acres of intertidal habitats.

However, in the long term, sedimentation patterns and sea level rise in the South San Francisco Bay are expected to result in a loss of intertidal mudflat (PWA 2006). Mudflat loss is expected to increase as ponds are breached and converted to tidal habitats since sediments from existing mudflats would be transported into the breached subsided ponds then colonized with vegetation (PWA 2006). For the full SBSP restoration project after 80 years of habitat evolution, models predict an increase of 2,300 acres of subtidal bay habitat and a loss of 2,700 acres of intertidal bay habitat. This mudflat loss is predicted to occur even in the absence of the SBSP Restoration Project, but mudflat loss is expected to be greater with the Project.

While abundance of outboard intertidal mudflat may decline, intertidal mudflats would be restored along the sloughs and channels in restored tidal marshes. PWA modeling predicts an increase of approximately 700-1,400 acres of intertidal and subtidal channels within tidal marsh after 80 years of habitat evolution (PWA 2006). In addition, mudflat productivity is expected to increase with tidal restoration due to detrital input from restored tidal marshes. As a result, marsh restoration is likely to result in increased productivity in the benthic invertebrate food chain, potentially increasing the density of the invertebrate prey base available to the various bird and fish species that forage on intertidal mudflats (Harvey *et al.* 1977, Day *et al.* 1989, Hughes 2004). The increase in subtidal habitat and intertidal and subtidal channels within tidal marsh, along with increased productivity from tidal marsh areas should help compensate for the loss in tidal mudflats.

Furthermore, the AMP includes a restoration target, monitoring parameter and management trigger focused on outboard mudflat, that should help minimize the loss of habitat. Potential management actions that could be implemented if significant decreases in outboard mudflat occur include adjusting restoration phasing and design to reduce net loss of tidal mudflats, removing bayfront levees to increase wind fetch, phase breaching to match sediment demand and supply, and breaching only high-elevation ponds to limit sediment demand.

B. Adverse Effects

While Phase 1 and future phases of the SBSP will increase the quantity and quality of EFH through restoration actions, construction and maintenance activities associated with restoration will impact EFH. Potential adverse effects and associated activities are summarized in Table 1.

Table 1. Summary Table of Adverse Effects to EFH from SBSP Phase 1 Actions

Effect	Actions Resulting in Effect	Duration of Effect	Spatial Scale of Effect[1]	Minimization Measures[2]	A6	A8	A16	E8A E8X E9	E12 E13	SF2	O/M	PG&E O/M	Effects Determination
Increased turbidity / suspended sediment concentration	Outboard levee breaching, lowering, removal, alteration, construction or set-back	Short-term, expect effects to occur through first rainy season following action.	>10 m to >100 m	Stormwater Management Plan (25) Seasonal restrictions where CCC steelhead present (11)	X			X					Minimal adverse effects
	Inboard levee breaching, lowering, removal, construction or alteration.	Short-term, expect effects to occur through first rainy season following action.	>10 m to >100 m	Stormwater Management Plan (25) Seasonal restrictions where CCC steelhead present (11)	X		X	X					Minimal adverse effects
	Armoring levees	Periodic activity, very short-term (days to weeks)	m to >10 m	None		X	X			X	X		Minimal adverse effects
	Improving (i.e., raising or repairing) outboard levees for pond management and recreational access.	Short-term, expect effects to occur through first rainy season following action	m to >100 m	Stormwater Management Plan (25) Seasonal restrictions where CCC steelhead present (11)		X	X	X	X	X	X	X	Minimal adverse effects
	Improving inboard levees for pond	Short-term, expect effects to	m to >10 m	Stormwater Management Plan (25)				X	X		X	X	Minimal adverse effects

Effect	Actions Resulting in Effect	Duration of Effect	Spatial Scale of Effect[1]	Minimization Measures[2]	A6	A8	A16	E8A E8X E9	E12 E13	SF2	O/M	PG&E O/M	Effects Determination
	management and recreational access.	occur through first rainy season following action		Seasonal restrictions where CCC steelhead present (11)									
	Excavating portions of outboard sloughs / pilot channels to sloughs or mudflats (SF2)	Short- to medium-term (months to <10 yrs)	m to >100 m	Seasonal restrictions where CCC steelhead present (11) Water level restrictions where CCC steelhead present (12)	X	X	X	X	X	X			***More** than minimal adverse effects if channel continue to scour and alter location*
	Construction of launch facility for kayaks (non-motorized)	Short-term, expect effects to occur through first rainy season following action	>10 to >100 m	Seasonal restrictions where CCC steelhead present (11) Water level restrictions where CCC steelhead present (12)					X				Minimal adverse effects
	Periodic dredging within managed ponds to maintain internal channels and canals and to replenish islands in managed ponds	Periodic, Short- to medium-term (months to <2 yrs)	>10 to >100 m	Seasonal restrictions where CCC steelhead present (11) Water level restrictions where CCC steelhead present (12)							X		Minimal adverse effects **depending on frequency of activity.**
	Maintenance of outboard levees	Short-term, expect	m to >10 m	Stormwater Management Plan							X		Minimal adverse effects

Effect	Actions Resulting in Effect	Duration of Effect	Spatial Scale of Effect[1]	Minimization Measures[2]	A6	A8	A16	E8A E8X E9	E12 E13	SF2	O/M	PG&E O/M	Effects Determination
	and ditch blocks (dredging from internal borrow ditches)	effects to occur through first rainy season following action		(25) Seasonal restrictions where CCC steelhead present (11) Water level restrictions where CCC steelhead present (12)									
	Maintenance of berms, canals, islands in managed ponds	Short-term, expect effects to occur through first rainy season following action	m to >10 m	Stormwater Management Plan (25) Seasonal restrictions where CCC steelhead present (11) Water level restrictions where CCC steelhead present (12)							X		Minimal adverse effects **depending on frequency of activity.**
	Removal, reconfiguration or addition of tide gates or other water control structures, fish screens, docks, and other structures	Short-term, expect effects to occur through first rainy season following action	m to >10 m	Stormwater Management Plan (25) Seasonal restrictions where CCC steelhead present (11, App. D 44) Water level restrictions where		X	X	X	X	X	X	X	Minimal adverse effects to existing EFH, **but restoration to full tidal provides more benefits to EFH than muted tidal.**

Effect	Actions Resulting in Effect	Duration of Effect	Spatial Scale of Effect[1]	Minimization Measures[2]	A6	A8	A16	E8A E8X E9	E12 E13	SF2	O/M	PG&E O/M	Effects Determination
				CCC steelhead present (12)									
	Use of water-based construction equipment (boats, barges, dredges, etc.)	Short-term, expect effects to occur through first rainy season following action	>10 to >100 m	Seasonal restrictions where CCC steelhead present (11) Water level restrictions where CCC steelhead present (12)							X	X	Minimal adverse effects
	Adjustments and removal of obstructions from water control structures	Days	<10 m	Seasonal restrictions where CCC steelhead present (11) Water level restrictions where CCC steelhead present (12) Water control structure operation limitations (7, 8)							X		Minimal adverse effects
	Use of small boats for monitoring and maintenance	Hours	m to <10 m	None							X	X	Minimal adverse effects
	Side-casting dredge spoils onto adjacent wetlands	Short-term, expect effects to occur through first rainy season	m to >10 m	Stormwater Management Plan (25) Seasonal restrictions where CCC steelhead							X		Minimal adverse effects

Effect	Actions Resulting in Effect	Duration of Effect	Spatial Scale of Effect[1]	Minimization Measures[2]	A6	A8	A16	E8A E8X E9	E12 E13	SF2	O/M	PG&E O/M	Effects Determination
		following action		present (11)									
	Breaking-up gypsum layer mechanically within ponds	Short-term, expect effects to occur through first rainy season following action	>10 to >100 m	Seasonal restrictions where CCC steelhead present (11) Water level restrictions where CCC steelhead present (12)				X					Minimal adverse effects
	Adding upper layer of clean sediment within ponds to address mercury contamination	Short-term, expect effects to occur through first rainy season following action	>10 to >100 m	Seasonal restrictions where CCC steelhead present (11) Water level restrictions where CCC steelhead present (12)							X		Minimal adverse effects
	Removal of mercury-contaminated sediment	Short-term, expect effects to occur through first rainy season following action	>10 to >100 m	Seasonal restrictions where CCC steelhead present (11) Water level restrictions where CCC steelhead present (12)		X							Minimal adverse effects
	Installing	Short-term,	m to >10	Seasonal							X		Minimal adverse

Effect	Actions Resulting in Effect	Duration of Effect	Spatial Scale of Effect[1]	Minimization Measures[2]	A6	A8	A16	E8A E8X E9	E12 E13	SF2	O/M	PG&E O/M	Effects Determination
	baffles to re-direct flow, installing re-aeration systems to address DO	expect effects to occur through first rainy season following action	m	restrictions where CCC steelhead present (11) Water level restrictions where CCC steelhead present (12)									effects
Reduced prey resources	Dewatering for removal, reconfiguration or addition of tide gates or other water control structures and fish screens	Hours to Days	m to <10 m	Seasonal restrictions where CCC steelhead present (11) Water level restrictions where CCC steelhead present (12)		X	X	X	X	X			Minimal adverse effects
	Excavating pilot channels and portions of outboard sloughs or mudflat (SF2)	Short- to medium-term (< 2 yr)	>10 to >100 m	Seasonal restrictions where CCC steelhead present (11) Water level restrictions where CCC steelhead present (12)	X	X	X	X		X			***More** than minimal adverse effects*
	Potential spill of hazardous materials during construction	Short-term, days to months	>10 to >100 m	Hazardous Spill Plan (21)	X	X	X	X	X	X	X	X	Minimal adverse effects **with implementation of Hazardous Spill Plan**
	Periodic dredging to	Periodic, short-term	>10 to >100 m	Seasonal restrictions where							X		***More** than minimal adverse*

Effect	Actions Resulting in Effect	Duration of Effect	Spatial Scale of Effect[1]	Minimization Measures[2]	A6	A8	A16	E8A E8X E9	E12 E13	SF2	O/M	PG&E O/M	Effects Determination
	maintain internal channels and canals and replenish islands	on the order of days to months		CCC steelhead present (11) Water level restrictions where CCC steelhead present (12)									*effects*
	Adjustments of water control structures to control water level, salinity.	Periodic, short-term on the order of days to months	m to >10 m	None							X		Minimal adverse effects
	Increased exposure to mercury associated with levee breach	Short-term, days to months	>10 to >100 m	None	X	X	X						Unknown addressed in Adaptive Management Plan
	Addition of layer of clean sediment to address mercury contamination	Short-term, days to months	>10 to >100 m	None							X		Minimal adverse effects
	Construction / relocating internal levees	Short-term, days to months	>10 to >100 m	Seasonal restrictions where CCC steelhead present (11) Water level restrictions where CCC steelhead present (12)		X		X	X	X			Minimal adverse effects

Effect	Actions Resulting in Effect	Duration of Effect	Spatial Scale of Effect[1]	Minimization Measures[2]	A6	A8	A16	E8A E8X E9	E12 E13	SF2	O/M	PG&E O/M	Effects Determination
	Spraying with herbicides for non-native plant removal	Short-term, days to months	m to <10 m	None							X		Minimal adverse effects
Degraded water quality (temp, DO)	Maintenance activities[3]	Short-term, hours to days	m to <10 m	Stormwater Management Plan (25)							X	X	Minimal adverse effects
	Muted tidal operations[4]	Short-term, months	>10 to >100 m	Water control structure operation limitations (7, 8)		X							Minimal adverse effects **with implementation of Adaptive Management Plan**
	Managed pond operations[5]	Short-term, days to months	>10 to >100 m	Water control structure operation limitations (7, 8)			X		X	X	X		Minimal adverse effects **with implementation of Adaptive Management Plan**
	Tidal marsh restoration[6]	Short-term, hours to days	>10 to >100 m	None	X			X					Minimal adverse effects
Degraded water quality (salinity)	Managed pond operations[5]	Permanent	230 acres	None					X				Minimal adverse effects **with implementation of Adaptive Management Plan**
Degraded water quality (mercury)	Improved tidal circulation / restoration of tidal marsh	Short-term, months	>10 to >100 m	None	X	X		X					Unknown addressed in Adaptive Management Plan

Effect	Actions Resulting in Effect	Duration of Effect	Spatial Scale of Effect[1]	Minimization Measures[2]	A6	A8	A16	E8A E8X E9	E12 E13	SF2	O/M	PG&E O/M	Effects Determination
	Removal of mercury contaminated sediment	Short-term, months	>10 to >100 m	None		X							Minimal adverse effects
Entrainment/ stranding	Muted tidal operations[4]	Seasonal to annual (months to years)	>100 m	Entrainment avoidance timing and operations (7, 8)		X					X		***More than** minimal adverse effects*
	Coffer dams used for removal, construction or alteration of water control structures, fish screens	Short-term, days	m to >10 m	Entrainment avoidance timing and operations (7, 8)		X	X	X	X	X			Minimal adverse effects
	Use of portable pumps within ponds[7]	Short-term, days	m to <10 m	None			X		X	X			Minimal adverse effects
	Providing temporary floodwater storage in managed ponds	Short-term, days to weeks	>10 to >100 m	None		X	X		X	X			Minimal adverse effects
Loss of spawning or foraging habitat from noise and vibration	Installation of water control structures, docks, and other structures	Short-term, days	>10 to >100 m	None		X	X	X	X	X		X	Minimal adverse effects
	Armoring levees	Periodic activity, very short-term (days to weeks)	m to >10 m	None		X	X			X	X		Minimal adverse effects
Gain of	Creating new	Permanent	115 acres[8]	None, but project	X	X		X					**Beneficial**

Effect	Actions Resulting in Effect	Duration of Effect	Spatial Scale of Effect[1]	Minimization Measures[2]	A6	A8	A16	E8A E8X E9	E12 E13	SF2	O/M	PG&E O/M	Effects Determination
subtidal feeding/ spawning area	tidal channels within tidal marsh by levee breaching			creates more habitat than it destroys									**effects**
	Creating interim subtidal areas by levee breaching	Long-term, 10-50 years	90 acres	None, but project creates more habitat than it destroys	X	X		X					**Beneficial effects**
Loss of subtidal feeding/ spawning area	Excavation of pilot channels and outboard sloughs or mudflats	Permanent	4.5 acres	None, but project creates more habitat than it destroys	X	X	X	X	X	X			***More** than minimal adverse effects*
	Relocating or constructing new levees	Permanent	2.3 acres	None, but project creates more habitat than it destroys				X	X	X			***More** than minimal adverse effects*
	Sedimentation in restored ponds after breaching	Long-term, 10-50 years	90 acres	None, but project creates more habitat than it destroys	X	X[9]		X					***More** than minimal adverse effects*
Gain of intertidal feeding/ spawning area	Creating tidal circulation / restoration of tidal marsh by levee breaching	Long-term, 10-50 years	960 acres[8]	None	X	X[9]		X					**Beneficial effects**
Loss of intertidal feeding/ spawning area	Excavation of pilot channels and outboard sloughs	Permanent	>10 to >100 m	None, but project creates more habitat than it destroys	X	X	X	X	X	X			***More** than minimal adverse effects*
	Formation of vegetated marsh in restored ponds after breaching	Permanent	720 acres	None	X	X[9]		X					***More** than minimal adverse effects*

Activities resulting in more than minimal adverse effects covered in this consultation include: (1) increase in turbidity or suspended sediment concentrations input to the water column; (2) reduction of prey resources; (3) degraded temperature and dissolved oxygen conditions to water quality; (4) increased availability of mercury; (5) modifications to habitat that result in entrainment or stranding of FMP managed species or prey species; and (6) loss of intertidal and subtidal feeding, rearing, or spawning areas. These adverse effects are discussed in more detail in the following paragraphs:

1. Elevated Turbidity and Suspended Sediment Concentration

Disturbance activities may result in greatly elevated levels of fine-grained mineral particles or suspended sediment concentration (SSC), usually smaller than silt, and organic particles in the water column. The associated turbidity plumes of suspended particulates may reduce light penetration and lower the rate of photosynthesis for subaquatic vegetation (Dennison 1987) and the primary productivity of an aquatic area if suspended for extended periods of times (Cloern 1987). If suspended sediments loads remain high, fish may suffer reduced feeding ability (Benfield and Minello 1996) and be prone to fish gill injury (Nightingale and Simenstad 2001a). The contents of the suspended material may react with the dissolved oxygen in the water and result in short-term oxygen depletion to aquatic resources (Nightingale and Simenstad 2001). In addition, any toxic metals and organics, pathogens, and viruses, absorbed or adsorbed to fine-grained particulates in the material, may become biologically available to organisms either in the water column or through food chain processes.

SBSP Phase 1 and O&M actions include several individual activities that result in elevated turbidity levels over a short duration and small geographic area. The exact frequency and timing of these various activities is unknown at this time, and will depend on the final timing of restoration construction and need for maintenance activities. If frequency of these multiple activities is high enough over large enough areas, cumulative adverse effects could occur.

2. Reduction of Prey Resources

Many EFH species forage on infaunal and bottom-dwelling organisms, such as polychaete worms, crustacean, and other EFH prey types (Newell *et al.* 1998, Van der Veer *et al.* 1985). Recolonization studies suggest that recovery may not be quite as straightforward, and can be regulated by physical factors including particle size distribution, currents, and compaction/stabilization processes following disturbance. Rates of recovery listed in the literature range from several months for estuarine muds to up to 2 to 3 years for sands and gravels. Recolonization can also take up to 1 to 3 years in areas of strong current but up to 5 to 10 years in areas of low current. Thus, forage resources for benthic feeders may be substantially reduced while recovery is achieved.

Within Phase 1, excavation of pilot channels through outboard sloughs or mudflats and construction or relocation of outboard levees could result in loss of prey resources across hundreds of meters of intertidal and subtidal habitat. Based on available literature, NMFS will assume recovery of prey resources will take 3 to 5 years within these areas. If the pilot channels continue to erode and alter their location, prey resources will continue to be affected and will take longer to recover. While these activities result in a net loss of prey resources within the first 3-5 years of project implementation, the loss will be offset by the gain of prey resources that colonize the 108 acres of new subtidal and intertidal habitat resulting from Phase 1, and the 300-1,000 acres of new subtidal and intertidal habitat from the full SBSP restoration project.

Any dredging within the bay or slough channels for levee maintenance will also remove prey resources until recolonization and recovery is achieved. Sloughs and tidal channels are a high source of productivity, so impacts to these areas will decrease the benefits for fish realized from tidal restoration.

3. Degraded Water Quality

Impounded water within muted or managed ponds can result in increased thermal loading which, in turn, can interfere with physiological processes, behavioral changes, and disease enhancement (Bell 1986). Increased thermal loading can also cause increased microbial activity and vegetative growth, which in turn can deplete levels of dissolved oxygen (Waldichuk 1993, Spence *et al.* 1996). These impacts may combine to affect entire aquatic systems by changing primary and secondary productivity, altering benthic and pelagic communities or killing marine organisms (especially juvenile fish), and changing biomass, and nutrient dynamics (Hall *et al.* 1978). Temperature also influences biochemical processes of the environment and the behavior (*e.g.*, migration) and physiology (*e.g.*, metabolism) of marine organisms (Blaxter 1969). These effects, while perhaps more acute in the managed and muted ponds, can nonetheless be manifested in San Francisco Bay where water from the muted or managed ponds is received.

During interim operations of managed ponds, USFWS and CDFG have had some difficulty with low dissolved oxygen (DO) concentrations in pond discharges. Reduction in DO has resulted in fish kills within managed ponds, particularly during very warm periods, and low-DO discharges have the potential to kill aquatic life in receiving waters. Early phases that restore salt ponds to managed ponds could continue to have these water quality problems. Future conversion of managed ponds to tidal habitats via the SBSP Restoration Project would reduce this potential impact.

Through adaptive management, USFWS and CDFG have developed methods for minimizing low DO discharges. The AMP includes restoration targets, monitoring parameters and management triggers for water quality and estuarine fish. Potential adaptive management actions that could be implemented if water quality becomes a problem include active management (*e.g.*, baffles, aerators), reduce pond residence time, accelerate conversion from managed ponds to tidal habitat, *etc.* Implementation of the AMP and potential management measures should help minimize adverse effects of degraded water quality within managed ponds, restored tidal areas and South San Francisco Bay.

4. Increased Methylmercury Bioaccumulation

The main concern over mercury, both in San Francisco Bay and in the Project area, is over methylmercury (MeHg), because MeHg is the primary mercury form that bioaccumulates. MeHg is converted from inorganic mercury (IHg) primarily by the metabolic activity of bacteria, especially sulfate reducing bacteria. DO is a factor that can increase net MeHg production. Because microbial activity is generally increased in productive wetlands and marshes, restoration of tidal marshes has the potential to increase the net production of MeHg. Mercury methylation is especially a concern for ponds within the Alviso complex where mercury concentrations are high.

MeHg bioaccumulation increases at increasing trophic levels and with increasing food web complexity. With every step up the food chain, mercury concentrations are found to increase, which is why large predators such as leopard sharks and striped bass have higher mercury concentrations than smaller fish like surf perch. Increasing food web complexity can also increase mercury concentrations at the top of the food web. Adding links to the food web increases the overall biomagnification of MeHg for top level predators. Therefore, Project activities that alter ecosystem structure can have significant impacts on mercury accumulation.

The AMP includes restoration targets, monitoring parameters and management triggers for mercury. Potential adaptive management actions that could be implemented if methylmercury bioaccumulation increases include adding an upper layer of clean sediment to decrease mercury concentrations in re-suspended sediments; placing berms within ponds to decrease fetch length to help decrease wind-driven resuspension; and/or removal of mercury-contaminated sediments. Implementation of the AMP and potential management measures should help minimize adverse effects of increased mercury availability.

5. Stranding/Entrainment of Managed Species and Prey

FMP species and their prey, especially early life stages may actively move into muted or managed ponds or may be passively entrained through water control structures. Once inside these ponds, fishes may be subjected to high water temperatures, low DO conditions within the ponds. Over the long-term, this stranding and entrainment may adversely affect fish and shellfish populations by adding another source of mortality to the early life stage which often determines recruitment and year-class strength (Travnichek *et al.* 1993).

Within Phase 1 Actions, ponds SF2, E12/E13, A16/A17 will be managed with inlet and outlet structures, and ponds A5/A7/A8 will be managed with muted tidal exchange through an open notch. The fish screen proposed for pond A16/A17 and the seasonal restrictions for ponds

A5/A7/A8 will also prevent entrainment and stranding of large individuals of MSA-managed species, such as starry flounder or leopard sharks. Smaller individuals and early life history stages likely could still enter ponds along with tidal flow.

Once inside the managed habitats, organisms are either permanently or temporarily stranded, depending on their ability and desire to find the outlet structures. With implementation of the AMP, as discussed above, water quality conditions generally should be adequate for survival of fish and invertebrates entrained and/or stranded within managed and muted tidal areas. Periodic die-offs may still occur, however. And, predation from high concentrations of birds within managed areas will also affect survival.

6. Loss of Habitat

Removal of intertidal or subtidal habitat eliminates habitat that supports important life stages of managed fishes and contributes to overall productivity of San Francisco Bay and sustainability of those species. At a minimum, individuals will be displaced from the areas that are removed. Phase 1 actions will result in a loss of more than 720 acres of intertidal and 97 acres of subtidal habitat. This habitat loss will be offset by gain of intertidal and subtidal habitat through restoration of ponds A6 and E8A/E8X/E9 during Phase 1. As discussed above, Phase 1 will result in a net gain of approximately 108 acres of subtidal habitat and 240 acres of intertidal habitat.

The following SBSP Phase 1 and O&M activities will result in no adverse effects to EFH: vehicular access, routine inspections, predator control activities, installation of interpretive signs, trail use by pedestrians, kayak use by public, installation of fencing and benches along trails, and removal of unused power lines.

VI. EFH CONSERVATION RECOMMENDATIONS

As described in the above effects analysis, NMFS has determined that the proposed action would adversely affect EFH for various federally managed fish species within the Pacific Groundfish, Coastal Pelagic, and Pacific Salmonid FMPs. Therefore, pursuant to section 305(b)(4)(A) of the MSA, NMFS offers the following EFH conservation recommendations to avoid, minimize, mitigate, or otherwise offset the adverse effects to EFH.

1. USFWS and CDFG should track frequency and location of O&M activities to evaluate cumulative impacts of activities. The location, timing, and type of activity should be compiled into an annual report and provided to the U.S. Army Corps of Engineers and NMFS in December of each year.

2. Whenever feasible, USFWS and CDFG should ensure all construction activities within ponds

should occur prior to breaching to San Francisco Bay to minimize turbidity and degraded water quality to bay waters.

3. Following implementation of restoration actions, USFWS and CDFG should provide NMFS with summary report of resulting water circulation patters within managed ponds to compare with and confirm model predictions. If circulation patters differ from model predictions, USFWS and CDFG should determine whether or not circulation patters (*e.g.*, residence time) provide conditions (*e.g.*, water depth, water temperature, dissolved oxygen, **etc.**) that support survival of organisms stranded within ponds. Summary reports should be provided within 3 months of completion of restoration actions within each pond.

4. Wherever possible, USFWS and CDFG should incorporate soft approaches, such as vegetative plantings, to shoreline modifications and levee maintenance to avoid additional loss of intertidal mudflats through conversion to artificial habitats (*e.g.*, rip rap).

5. To minimize loss of prey resources in productive tidal areas, USFWS and CDFG should avoid dredging from sloughs for levee maintenance. When dredging from sloughs is unavoidable, material should be dredged from the deepest possible depth to avoid impacts to intertidal habitats.

6. To minimize continued disturbance to prey resources in dredged areas, USFWS and CDFG should ensure that bankward slopes of all dredged areas are slanted to acceptable side slopes (*e.g.*, 3:1) to ensure that sloughing does not occur.

7. USFWS and CDFG should incorporate light transmission measures for construction of all docks to minimize potential shading (*e.g.*, aluminum grating, reflective tapes, increase height of dock, decrease width of dock).

8. When installation of pilings is necessary for Project activities, USFWS and CDFG should ensure pilings are installed at low tide to minimize potential noise impacts.

9. To reduce turbidity impacts to EFH, when feasible, USFWS and CDFG should incorporate use of cofferdams and/or silt curtains when conducting Phase 1 Actions or O&M activities that could result in increased turbidity levels.

VII. STATUTORY RESPONSE REQUIREMENT

Please be advised that regulations at section 305(b)(4)(B) of the MSA and 50 CFR 600.920(k) of the MSA require your office to provide a written response to this letter within 30 days of its receipt and at least 10 days prior to final approval of the action. A preliminary response is acceptable if final action cannot be completed within 30 days. Your final response must include a description of measures to be required to avoid, mitigate, or offset the adverse impacts of the activity. If your response is inconsistent with our EFH conservation recommendations, you must provide an explanation of the reasons for not implementing those recommendations. The reasons must include the scientific justification for any disagreements over the anticipated effects of the proposed action and the measures needed to avoid, minimize, mitigate, or offset such effects.

VIII. SUPPLEMENTAL CONSULTATION

Pursuant to 50 CFR 600.920(l), the U.S. Army Corps of Engineers must reinitiate EFH consultation with NMFS if the proposed action is substantially revised in a way that may adversely affect EFH, or if new information becomes available that affects the basis for NMFS' EFH conservation recommendations.

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