

MERIDIAN FARMS FISH SCREEN PROJECT

Action Specific Implementation Plan

Prepared for
Meridian Farms Water Company

February 2008

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8950 Cal Center Drive
Building 3, Suite 300
Sacramento, CA 95826
916.564.4500
www.esassoc.com

Los Angeles

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CHAPTER 1

Introduction

This document is an Action Specific Implementation Plan (ASIP) which analyzes the potential environmental effects on aquatic and terrestrial species of the Meridian Farms Water Company (MFWC) proposed plan to construct positive barrier fish screen diversions on the Sacramento River and to modify their distribution system to accommodate the changed intakes. The MFWC Fish Screen and Diversion Project is divided into two phases, which are described in detail in Chapter 2. The ASIP is a product of the CALFED Bay-Delta Program (CALFED) and is meant to streamline the regulatory process for CALFED Actions. The MFWC Fish Screen and Diversion Project is included as a CALFED Action.

The CALFED Bay-Delta Program is a collaborative effort of more than 20 Federal and State agencies that seek to resolve water supply and water quality issues as well as restore ecological health of the San Francisco Bay-Delta. After assessing the effects of potential CALFED Actions on the environment, the CALFED agencies developed initial conservation measures that, when implemented, would meet the overall CALFED Program objectives. These are contained within the Multi-Species Conservation Strategy (MSCS).

The MSCS explains how CALFED Program Actions will comply with the Federal Endangered Species Act (FESA), California Endangered Species Act (CESA), and Natural Communities Conservation Planning Act (NCCPA) requirements. The U.S. Fish and Wildlife Service (USFWS) and the National Oceanic and Atmospheric Administration (NOAA) Fisheries used the MSCS as the program-level biological assessment to develop the programmatic Biological Opinions (BOs) for the CALFED Preferred Program Alternative. The California Department of Fish and Game (CDFG) used the MSCS for compliance with the CESA and NCCPA.

The MSCS contains a two-tiered approach to FESA, CESA, and NCCPA compliance that corresponds to the CALFED Program's two-tiered approach to compliance with the National Environmental Policy Act (NEPA) and the California Environmental Quality Act (CEQA). The first tier of compliance is embodied in the MSCS itself. For the CALFED Program's Project Actions identified in the Programmatic Environmental Impact Statement / Environmental Impact Report (PEIS/EIR) and Record of Decision (ROD), an ASIP is developed to address the FESA, CESA, and NCCPA consultation requirements of Federal and State agencies. As a second tier document, this ASIP focuses on issues specific to MFWC's Fish Screen and Diversion Project (Proposed Project/Action). Therefore, this ASIP addresses the biological assessment requirements related to the Proposed Project/Action described in Chapter 2. The USFWS and NOAA Fisheries may use this ASIP for informal consultation and/or to develop action-specific BOs relative to the Proposed Project/Action. The CDFG will use this ASIP to address compliance with the CESA and NCCPA.

1.1 Project Background

The MFWC is located in Sutter County, between Interstate 5 and Highway 99, east of the Sacramento River and southwest of the Sutter Bypass. **Figure 1-1** depicts the approximate limits of the MFWC Service Area. MFWC provides irrigation water to three distinct Service Areas encompassing approximately 9,150 acres, with an estimated annual water delivery of 35,000 acre-feet (af). The water service is provided by surface water diversions from the Sacramento River, drain water reuse, and groundwater pumping. Both lined and unlined canals are used for water conveyance. As irrigation water circulates through the canals and laterals, drainage water is collected and pumped into the conveyance facilities via re-lift pumps, providing a blend with better quality irrigation water from the Sacramento River.

MFWC diverts surface water from the Sacramento River under the provisions of a License for Diversion and Use of Water with a priority date of September 10, 1918. Presently MFWC diversions are at three locations on the Sacramento River: Meridian, Drexler, and Grimes. These diversions utilize unscreened intakes which likely entrain juvenile Chinook salmon, steelhead trout, green sturgeon, and other anadromous fish species that pass by the intake. Improvements to these diversions would fulfill conservation goals established by the CVPIA, which passed in 1992 for the protection and recovery of fisheries and fish habitat.

1.1.1 Project Overview

The primary purpose of the Proposed Project/Action is to prevent entrainment of migrating, at-risk, native fish species at MFWC's existing diversion facilities by removing one intake and installing fish screen structures at the other two intakes. Each existing pump utilizes an unscreened intake which likely entrains juvenile Chinook salmon and steelhead trout, green sturgeon and other fish species. Consequently, the continued operation of the MFWC diversion facilities likely remove some of the salmonid and sturgeon out-migrants from the mainstem of the Sacramento River. Under the CVPIA, the diversion pumps are now required to operate without causing detrimental effects to migrating fish; therefore, it is essential that fish screens be installed at the water intakes. As the existing diversion or pump station facilities cannot be retrofitted with a fish screen that would comply with CDFG and NOAA Fisheries criteria, MFWC will construct new positive barrier fish screen diversions that meet these criteria. Positive barrier fish screens will physically prevent fish from passing through the intake; these differ from behavioral barrier fish screens which encourage fish to swim away from a structure.

The Proposed Project/Action will allow migrating Chinook salmon, steelhead trout, and green sturgeon to pass by the intake without risk of entrainment and, thus, contribute to the recovery of the anadromous and resident fish populations in the Sacramento River. The Proposed Project/Action will also allow MFWC to continue the diversions even while listed species are present in the vicinity of the diversion, enabling MFWC to provide a reliable long-term water supply to the MFWC Service Area in a manner that complies with present regulatory requirements.

The Proposed Project/Action is composed of several components, which were defined through a March 2002 Feasibility Study and subsequently selected as part the preferred project alternative by the MFWC Board of Directors. MFWC proposes to implement these components, which include the fish screen improvements and other associated conveyance improvements, in two separate phases. Each phase is independent of the other, and each will benefit fish species. The implementation of the Proposed Project/Action in two separate phases is more economically feasible and would coordinate better with MFWC operations. The components of these phases are listed in **Table 1-1** and each component is detailed in Chapter 2.

The Proposed Project/Action Area (Action Area) is defined to include all components of the Proposed Project/Action plus a 200' buffer of these components. On the landward side of the levee along the Sacramento River, no direct or indirect effects are anticipated outside this 200' zone due to the localized and temporary disturbance of the Proposed Project/Action upon the habitat. Similarly, on the riverside of the levee along the Sacramento River, no direct or indirect effects are anticipated within this 200' zone. The benefits resulting from implementation of the Proposed Project/Action, however, extend beyond the Action Area to include the entire Sacramento River migration corridor for fishes, from the Delta to spawning areas upstream from the Action Area. Implementation of the Proposed/Action would benefit fish populations by decreasing fish entrainment in diversions on the Sacramento River.

**TABLE 1-1
MFWC PROPOSED PROJECT/ACTION
COMPONENTS**

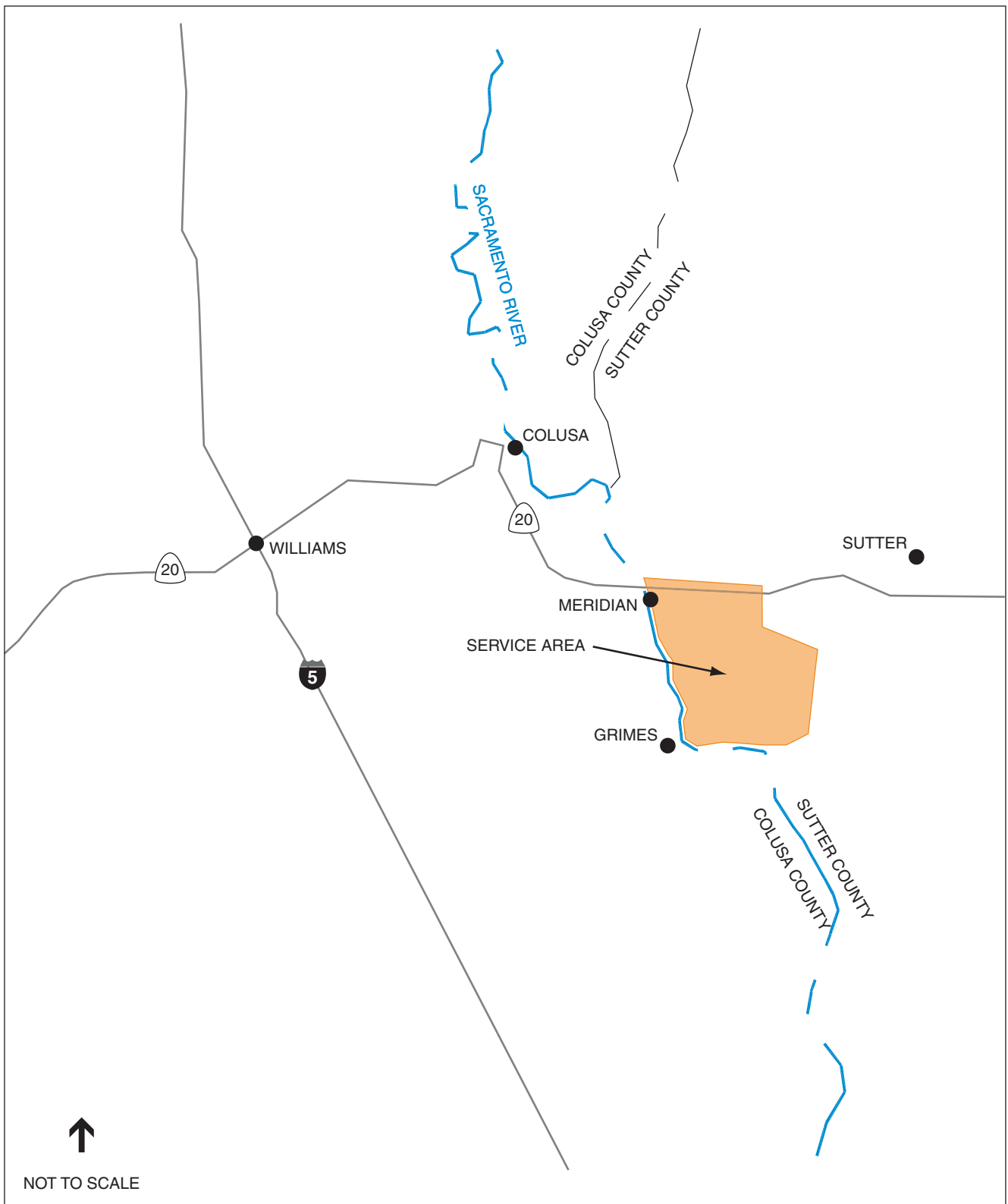
PHASE 1
New Grimes Diversion/Pumping Plant
New Grimes Pipeline and Canal Modifications
Removal of Existing Grimes Diversion/Pumping Plant
Drexler Pipeline
PHASE 2
New Meridian Diversion/Pumping Plant
Removal of Existing Meridian Diversion/Pumping Plant
Main Canal Modifications
Drexler Pipeline (option)
New Drexler Re-lift Pumping Plant
Removal of Existing Drexler Diversion/Pumping Plant

1.1.2 Current Management Direction

Currently, MFWC provides water to farmers for irrigation of their crops. There are 146 individual fields within the MFWC water Service Area. In the year 2000, approximately 63 percent of the irrigated area comprised of rice, which was the predominant grain crop. Safflower and tomatoes are also important crops with each comprising approximately 10 percent of the cropping pattern during

the same year. Permanent tree crops (orchards) encompass about eight percent of the planted area, with walnuts being the predominant crop. In 2007, the predominant crops were wheat, rice, walnuts, and tomatoes. Other crops included beans, alfalfa, hay, and persimmon and chestnut orchards.

MFWC's goals are to be able to maintain water diversion operations while avoiding entrainment of listed fish species present near the water intake. MFWC will achieve this goal by decommissioning and relocating the existing Grimes pumping plant and replacing the existing Meridian and Drexler facilities with a newly consolidated facility that complies with CDFG and NOAA Fisheries fish screen standards. The amount of water diverted from the Sacramento River will not increase as a result of the Proposed Project/Action to construct new facilities, as the existing facilities will be removed.



SOURCE: MWH, 2004; and ESA, 2007

Meridian Farms Water Company – Fish Screen Project . 203104

Figure 1-1
Project Location Map

1.1.3 Implementing Entities

Both Federal and State agencies are involved in administering the MFWC Fish Screen Project. The U.S. Bureau of Reclamation (Reclamation) is the federal agency under NEPA, and the California Department of Fish and Game (CDFG) is the state lead under CEQA. The Project/Action may involve the use of federal funds from Reclamation, and Reclamation would be responsible for administering those funds.

The State and Federal agencies – USFWS, NOAA Fisheries, and CDFG – act as regulatory agencies and are responsible for making recommendations for actions to be taken to protect fish populations and special status wildlife and plant species. Reclamation, as the lead agency implementing CALFED, helps to coordinate agency consultation throughout the ASIP process. As MFWC would construct, own, and operate the new facilities in the Project, MFWC would be responsible for implementing operational changes based on the recommendations.

1.1.4 ASIP Contents

To fulfill the requirements of FESA Section 7 and California Fish and Game Code Sections 2835 and 2081, as applicable, the MFWC Fish Screen ASIP includes the following information pursuant to the November 2001 Guide to Regulatory Compliance for Implementing CALFED Actions (CALFED, 2001b).

- A detailed project description (Proposed Project/Action – Chapter 2);
- A list of covered species and any other special-status species that may occur in the Action Area (Chapter 3);
- A discussion of essential habitat (Chapter 3);
- The analysis identifying the direct, indirect, and cumulative impacts on the covered species, other special-status species occurring in the Action Area (along with an analysis of impacts on any designated Critical Habitat) likely to result from the Proposed Fish Screen Project, as well as actions related to and dependent on the Proposed Project/Action (Chapter 4);
- The analysis identifying the direct, indirect, and cumulative impacts on Natural Community Conservation Planning (NCCPA) communities occurring in the Action Area likely to result from the Proposed Fish Screen Project, as well as actions related to and dependent on the Proposed Project/Action (Chapter 5);
- The conservation measures that the Proposed Project/Action agencies will undertake to minimize adverse effects to species (Chapters 2 and 4), and as appropriate, measures to enhance the condition of NCCPA communities (Chapters 2 and 6) and covered species along with a discussion of:
 - A plan to monitor the impacts and the implementation and effectiveness of these measures (Chapter 7), and
 - The procedures to address changed circumstances (Chapter 8);

- The measures that the Proposed Project/Action agencies will undertake to provide commitments to cooperating landowners that the Proposed Project/Action will not alter their land classification (Chapter 9);
- The alternative Actions considered by the Proposed Project/Action agencies that would not result in adverse effects, and the reasons why such alternatives are not being utilized (Chapter ?);
- The additional measures USFWS, NOAA Fisheries, and CDFG may require as necessary or appropriate for compliance with FESA, CESA, and NCCPA; and a description of how and to what extent the action or group of actions addressed in the ASIP will help the CALFED Program to achieve the MSCS's goals for the affected species (Chapters 4, 6, and 8).

1.2 ASIP Process

The ASIP process is directly related to the relationships between the FESA, CESA, and State NCCPA. If neither the programmatic BOs nor the programmatic NCCPA determination for the CALFED Program authorizes incidental take of MSCS-covered species, ASIPs, which serve as individual consultation documents, are required for each Project or Action. Take authorization for implementing CALFED Program Actions follow a simplified compliance process that tiers from the MSCS and programmatic determinations. CDFG may authorize incidental take of State-listed Endangered, Threatened, or Candidate species through a CDFG Consistency Determination (Fish and Game Code 2081(b)). The entity implementing CALFED Program Actions (Reclamation) will coordinate the development of the ASIP with USFWS, NOAA Fisheries, and CDFG to ensure that the ASIP incorporates appropriate conservation measures for the Proposed CALFED Program Actions consistent with the MSCS.

The CALFED Program MSCS evaluates 244 species and 20 natural communities. Included within the MSCS are species identified by USFWS, NOAA Fisheries, and CDFG that are covered under BOs and NCCPA determination. An ASIP is prepared for FESA-, CESA-, and NCCPA-covered species. In the case of the MFWC Project, the ASIP will be used for informal or formal consultation on CESA species. Effects to FESA- and CESA-covered species are addressed in this ASIP, and typically the species evaluated will be a subset of the overall 244 species included in the MSCS.

1.2.1 Informal and Formal Consultation Processes

ASIPs are developed for individual CALFED Program Actions or groups of Actions when enough detailed information about the actions is available to fully analyze their impacts on covered species and habitats. Informal consultation is conducted in coordination with the development of an ASIP. Pursuant to the FESA, the Fish and Wildlife Coordination Act, and the Magnuson-Stevens Fisheries Conservation and Management Act (MSFCMA) regarding Essential Fish Habitat (EFH), the lead Project agency (Reclamation) has organized meetings throughout the development of the ASIP to (1) identify covered species and endangered, threatened, and proposed or candidate species that may occur in the Action Area; (2) develop an appropriate approach for assessing species listed and proposed for listing as part of the Section 7 consultations required by FESA; and (3) determine to what extent the action may affect any of the identified species, including impacts to EFH.

The MFWC Project ASIP is submitted on behalf of Reclamation to USFWS, NOAA Fisheries, and CDFG to consult with these agencies on the potential for the Proposed Project/Action to affect special-status species. USFWS and NOAA Fisheries will review the ASIP for compliance with FESA, under Section 7. NOAA Fisheries will also review the ASIP for compliance with the MSFCMA. The conclusion of the formal consultation process is for USFWS and NOAA Fisheries to prepare BOs on the species that the action is likely to adversely affect. As part of these BOs, USFWS and NOAA Fisheries may authorize incidental take of endangered and threatened species. For this project, a NCCP is not required by CDFG because the project would not result in a change in land use within the Water District Service Area. The ASIP will be used to meet its requirements under CESA, including consideration of species listed for protection under CESA and NCCPA. Acceptance of the ASIP will fulfill CDFG's requirements for a Consistency Determination under Fish and Game Code Section 2081.

1.2.3 Consultation to Date

An official list of threatened and endangered species that may occur within the Action Area and vicinity was generated online from the Sacramento Fish and Wildlife Office website. The California Natural Diversity Database (CNDDB) and California Native Plant Society (CNPS) Inventory of Rare and Endangered Plants were also queried for special-status species that may occur in the Proposed Project/Action and surrounding area. The USGS 7.5-minute quadrangles that were considered include: Grimes, Kirkville, Dunnigan, Arbuckle, Colusa, Wildwood School, Tisdale Weir, Sutter Buttes, and Meridian, CA. The USFWS custom list and consultation letter (USFWS, 2007), and the CNDDB (CDFG, 2007) and CNPS (CNPS, 2007) species lists are included in **Appendix A**. There has been informal consultation with both USFWS and NOAA Fisheries throughout the development of the ASIP.

For implementation of the Proposed Project/Action to be economically feasible and for ease of coordination, consultation on the project will occur separately for each phase. This ASIP analyzes Phase 1 effects in the level of detail necessary for consultation on Phase 1. Consultation for Phase 2 will require more project specific analysis and will occur at a later date. No consultation on Phase 2 is requested at this time.

1.2.4 Compliance with Federal Endangered Species Act

USFWS and NOAA Fisheries share responsibility for administering FESA. NOAA Fisheries is primarily responsible for implementing FESA on behalf of marine fishes and mammals, including migratory or anadromous fish species such as salmon, steelhead, and green sturgeon. USFWS is primarily responsible for non-marine species. The FESA section 7(a)(2) consultation requirement is meant to ensure that any action authorized, funded, or carried out by any Federal agency is not likely to jeopardize the continued existence of any covered species or result in the destruction of Critical Habitat. Typically, in order to comply with this regulation, a biological assessment (BA) is prepared to analyze effects on listed and proposed species and designated and proposed Critical Habitat. This ASIP is intended to function as a BA and fulfill the requirements of the MFWC Action agencies pursuant to the FESA as amended.

1.2.5 Compliance with Magnuson-Stevens Fisheries Conservation and Management Act

Public Law 104-297, the Sustainable Fisheries Act of 1996, amended the MSFCMA to establish new requirements for EFH descriptions in federal Fisheries Management Plans (FMPs). The MSFCMA, which was reissued in 2006, requires all fishery management councils to amend their FMPs to describe and identify EFH for each managed fishery. The EFH assessment is meant to determine whether a Proposed Project/Action may adversely affect a designated EFH for federally managed species in the Action Area. In California, there are three FMPs that cover coastal pelagic species, groundfish, and Pacific salmon. In consideration of the Proposed Project/Action, the Pacific Chinook salmon and steelhead have potential to be affected. These effects will be addressed in this document.

In addition, the MSFCMA requires federal agencies to consult with NOAA Fisheries on activities that may adversely affect EFH. The MSFCMA contains procedures to identify, conserve, and enhance EFH. NOAA Fisheries is required to provide EFH conservation and enhancement recommendations to Federal and State agencies for actions that adversely affect EFH. This ASIP will meet all the compliance requirements that have been identified for consulting with NOAA Fisheries on effects to EFH.

1.2.6 Compliance with California Endangered Species Act and Natural Community Conservation Plan

The CESA (CDFG Code Sections 2050-2097) is similar to the FESA. The California Fish and Game Commission is responsible for maintaining lists of threatened and endangered species under the CESA, which prohibits the “take” of listed and candidate species. “Take” as defined under California law is to “hunt, pursue, catch, capture, or kill, or attempt to hunt, pursue, catch, capture, or kill” (CDFG Code Section 86). To this date, there are several State-listed species – primarily salmonid fish species – that may occur within the Action Area; therefore, a CDFG Consistency Determination (CDFG code 2081) authorizing incidental take of State-listed species may be required for the Proposed Project/Action.

The California Natural Community Conservation Planning Act (NCCPA) (California Fish and Game Code, section 2800, et seq.) was enacted to form a basis for broad-based planning to provide for effective protection and conservation of the State’s wildlife heritage, while continuing to allow appropriate development and growth. State of California NCCPA General Process Guidelines define an NCCPA as “...a plan for the conservation of natural communities that takes an ecosystem approach and encourages cooperation between private and governmental interests. The plan identifies and provides for the regional or area-wide protection and perpetuation of plants, animals, and their habitats, while allowing compatible land use and economic activity. An NCCPA seeks to anticipate and prevent the controversies caused by species’ listings by focusing on the long-term stability of natural communities” (CDFG, 2000b).

The purpose of natural community conservation planning is to sustain and restore those species and their habitat identified by CDFG that are necessary to maintain the continued viability of biological communities impacted by human changes to the landscape. An NCCPA identifies and provides for those measures necessary to conserve and manage natural biological diversity within the plan area while allowing compatible use of the land.

On February 2, 2002, SB 107 was signed by Governor Gray Davis, which repealed and replaced the NCCPA with a new NCCPA. Although SB 107 became effective on January 1, 2003, the MSCS will continue to be in-effect as an approved NCCP, in accordance with Section 2830 (c) of the same bill.

This ASIP is a multi-purpose project-level document that is intended to streamline the environmental regulatory process for CALFED Program Actions. The Proposed Project/Action is such an action, as it will protect species covered under the MSCS. This ASIP provides all the information necessary to initiate project-level compliance with the FESA and NCCPA. Not only will this ASIP fulfill CDFG's requirements under Fish and Game Code Sections 2835 and 2081, it will also include appropriate conservation measures relevant to the Proposed Project/Action.

1.3 Relationship to CALFED Program

The CALFED Program's purpose is to develop and implement a comprehensive, long-term plan that will restore ecological health to the Bay-Delta system and improve management of water for beneficial uses. The MFWC Project falls within one component of the overall CALFED Program strategy. CALFED agencies plan to address issues of the Bay-Delta region within the following categories: ecosystem quality, water quality, water supply reliability, and levee system integrity. CALFED agencies must consider important physical, ecological, and socioeconomic linkages between the problems and potential solutions in each of these resource categories. The CALFED planning effort was therefore divided into a three-phase cooperative planning process in order to facilitate determining the most appropriate strategy and actions to reduce conflicts in the Bay-Delta system.

The construction of fish screens that use the best available technology will eliminate fish passage barriers. The fish screens will be funded with federal funds from the CALFED Bay-Delta Authority (CBDA) and Reclamation would be responsible for administering those funds. Implementation of the Proposed Project/Action will help MFWC continue to draw water from the Sacramento River without entraining native fish species that may reside in the Sacramento River near, or which may pass by, the existing diversions.

1.4 Species Addressed in this ASIP

To comply with FESA, CESA, and NCCPA requirements, a list of special-status species is evaluated and presented in this ASIP. The following table (**Table 1-2**) lists the species with potential to occur in the Action Area, their Federal and State status, and how likely they are to occur in the Proposed Project/Action Area. Those species with potential to be affected by the Proposed Project/Action are shown in bold text and are addressed in more detail in Chapter 3.

**TABLE 1-2
SPECIES WITH POTENTIAL TO OCCUR IN THE ACTION AREA**

Scientific Name Common Name	Federal Status	State Status	CNPS Listing	Habitat Description / Blooming Period	Potential to Occur in the Action Area
Fish					
<i>Acipenser medirostris</i> North American green Sturgeon (Southern DPS)	FT	CSC	--	Spawns in large cobble in deep and turbulent river mainstem. The Southern DPS spawns in the Sacramento River basin and in the Sacramento-San Joaquin Delta and Estuary.	High. Migratory route in the Sacramento River; also provides suitable rearing habitat in riparian bank areas.
<i>Hypomesus transpacificus</i> Delta smelt	FT	CT	--	Found in the Sacramento-San Joaquin delta, Suisun bay, Carquinez Straight, and San Pablo Bay.	Unlikely. Project outside area designated as Critical Habitat project site does not have Critical Habitat for reproduction or cover. Project site likely outside of the upstream migratory extent.
<i>Oncorhynchus tshawytscha</i> Central Valley fall/late fall-run Chinook	FSC	CSC	--	Spawning in Sacramento River and associated tributaries, and in the San Joaquin River tributaries.	High. Migratory route in the Sacramento River; also provides suitable rearing habitat in riparian bank areas.
<i>Oncorhynchus mykiss</i> Central Valley steelhead	FT	--	--	Spawns in Sacramento River and tributaries where gravelly substrate and suitable water conditions occur.	High. Migratory route in the Sacramento River; also provides suitable rearing habitat in riparian bank areas.
<i>Oncorhynchus tshawytscha</i> Central Valley spring-run Chinook	FT	CT	--	Spawns in Sacramento River and few select tributaries where gravelly substrate and suitable water conditions occur.	High. Migratory route in the Sacramento River; also provides suitable rearing habitat in riparian bank areas.
<i>Oncorhynchus tshawytscha</i> Sacramento River winter-run Chinook	FE	CE	--	Spawns primarily in upper reaches of the mainstem Sacramento River.	High. Migratory route in the Sacramento River; also provides suitable rearing habitat in riparian bank areas.
<i>Pogonichthys macrolepidotus</i> Sacramento splittail	FSC	CSC	--	Endemic to the Central Valley. Spawns in freshwater in areas with submerged vegetation. Tolerant of moderate salinities, adults are found primarily in the Delta and Suisun Bay and Marsh, but have been found as far upstream as Red Bluff Diversion Dam on the Sacramento River.	Moderate. May migrate through project area during years of high flows.

**TABLE 1-2
SPECIES WITH POTENTIAL TO OCCUR IN THE ACTION AREA**

Scientific Name Common Name	Federal Status	State Status	CNPS Listing	Habitat Description / Blooming Period	Potential to Occur in the Action Area
Reptiles					
<i>Thamnophis gigas</i> Giant garter snake	FT	CT	--	Generally inhabits marshes, sloughs, ponds, slow-moving streams, ditches, and rice fields which have water from early spring through mid-fall, emergent vegetation (such as cattails and bulrushes), open areas for sunning, and high ground for hibernation and escape cover.	Moderate. Limited aquatic habitat in the Main Canal, in adjacent Reclamation drains, or within adjacent seasonally inundated rice fields. Potential upland habitat in unpaved areas up to 200' from aquatic habitat.
Amphibians					
<i>Ambystoma californiense</i> California tiger salamander	FT	CSC	--	Annual grassland and grassy understory of valley-foothill hardwood habitats in central and northern California. Needs underground refuges and vernal pools or other seasonal water sources.	Unlikely. No suitable habitat within or adjacent to the project site.
<i>Rana aurora draytonii</i> California red-legged frog	FT	CSC	--	Breeds in slow moving streams with deep pools, ponds, and marshes with emergent vegetation.	Unlikely. No suitable habitat within or adjacent to the project site.
<i>Spea (=Scaphiopus) hammondii</i> Western spadefoot toad	--	CSC	--	Occurs seasonally in grasslands, prairies, chaparral, and woodlands, in and around wet sites. Breeds in shallow, temporary pools formed by winter rains. Takes refuge in burrows.	Unlikely. No suitable habitat within or adjacent to the project site.
Birds					
<i>Agelaius tricolor</i> Tricolored blackbird	--	CSC	--	Nests in dense thickets of cattails, tules, willow, blackberry, wild rose, wheat and barley crops, and other tall herbs near fresh water.	Unlikely. Marginal riparian nesting habitat along Sacramento River banks. However, no suitable nesting habitat in the immediate vicinity of the project.
<i>Ardea alba</i> (nesting) Great egret	--	--	--	Colonial nester in large trees. Rookery sites located near marshes, tidflats, irrigated pastures and margins of rivers and lakes.	Unlikely. No suitable nesting habitat in the immediate vicinity of the project.
<i>Ardea herodias</i> (nesting) Great blue heron	--	--	--	Colonial nester in tall trees, cliff sides and isolated marsh habitats.	Unlikely. No suitable nesting habitat in the immediate vicinity of the project.

**TABLE 1-2
SPECIES WITH POTENTIAL TO OCCUR IN THE ACTION AREA**

Scientific Name Common Name	Federal Status	State Status	CNPS Listing	Habitat Description / Blooming Period	Potential to Occur in the Action Area
<i>Athene cunicularia</i> Western burrowing owl	--	CSC	--	Utilizes ground squirrel (or other mammal) burrows within open grasslands, prairies, savanna, or agricultural fields.	Moderate. Potential nesting habitat along the perimeter of agricultural fields and along the banks/levees of the Sacramento River.
<i>Branta hutchinsii leucopareia</i> Cackling (=Aleutian Canada) Goose	FD	--	--	Breeds in open or forested areas near water. Often found in wetlands, grasslands, or cultivated fields during migration.	Moderate. The CNDDDB (2006) records an occurrence near the project site. Marginal foraging habitat occurs in agricultural fields adjacent to project.
<i>Buteo swainsoni</i> Swainson's hawk	--	CT	--	Breeds in California's Central Valley. Winters primarily in Mexico. Typically nests in scattered trees or along riparian systems adjacent to agricultural fields or pastures.	Moderate. The CNDDDB (2006) records an occurrence near the project site. Suitable nesting habitat occurs within trees along the Sacramento River and within the Action Area. The Action Area also provides foraging for this species.
<i>Carduelis lawrencei</i> Lawrence's goldfinch	--	--	--	Dry grassy slopes with weed patches, chaparral, and open woodlands; nests in trees or shrubs.	Unlikely. No suitable habitat within or adjacent to the project site.
<i>Charadrius montanus</i> Mountain plover (wintering)	--	CSC	--	In California, winters in open short grasslands and plowed agricultural fields in the Central Valley and in foothill valleys west of San Joaquin Valley, and in Imperial Valley. Winters below 1000 m (3200 ft).	Unlikely. Project area is outside of known species range.
<i>Coccyzus americanus occidentalis</i> Western yellow-billed cuckoo	FC	CE	--	Nests in extensive riparian forests (at least 40 hectares).	Unlikely. Riparian area surrounding project site is highly fragmented.
<i>Grus canadensis tabida</i> Greater sandhill crane	--	CSC	--	Open habitats, shallow lakes, and emergent wetlands. In winter also uses dry grasslands and croplands near wetlands.	Unlikely. No suitable habitat within or adjacent to the project site.
<i>Plegadis chihi</i> White-faced ibis	--	CSC	--	Nest and forages in freshwater marshes and rivers, respectively.	Unlikely. No suitable nesting habitat within or adjacent to the project site.
<i>Riparia riparia</i> (nesting) Bank swallow	--	CT	--	Nests in holes dug in sandy cliffs and river banks near water.	Low. Potential nesting habitat along the banks of the Sacramento River in the vicinity of the project.

Mammals

**TABLE 1-2
SPECIES WITH POTENTIAL TO OCCUR IN THE ACTION AREA**

Scientific Name Common Name	Federal Status	State Status	CNPS Listing	Habitat Description / Blooming Period	Potential to Occur in the Action Area
<i>Antrozous pallidus</i> Pallid bat	--	CSC	--	Prefers caves, crevices, hollow trees, or buildings in areas adjacent to open space for foraging. Associated with lower elevations in California.	Unlikely. No suitable roost or maternity sites occur in the immediate vicinity of the project.
<i>Dipodomys californicus eximius</i> Marysville California kangaroo rat	--	CSC	--	Needs friable soil, grass stages of chaparral. Only found in the area of the Sutter Buttes.	Unlikely. No suitable habitat within or adjacent to the project site.
<i>Lasiurus blossevillii</i> western red bat	--	--	--	Roosts primarily in trees, 2-40 feet above ground, from sea level up through mixed conifer forests. Prefers habitat edges and mosaics with trees that are protected from above and open below with open areas for foraging.	Unlikely. No suitable roost or maternity sites occur in the immediate vicinity of the project.
<i>Lasiurus cinereus</i> hoary bat	--	CSC	--	Prefers open habitats or habitat mosaics, with access to trees for cover and open areas or habitat edges for feeding. Roosts in dense foliage of medium to large trees. Feeds primarily on moths; requires water.	Unlikely. Limited roosting habitat within forested areas along the Sacramento River; however, dense foliage for roosting is not available in the Action Area.
<i>Myotis ciliolabrum</i> western small-footed myotis	--	--	--	In association with steep limestone outcrops and talus slopes. Forages over a wide range of habitats, mostly open, arid wooded and brushy uplands near water. Seeks cover in caves, buildings, mines and crevices.	Unlikely. No suitable roost or maternity sites occur in the immediate vicinity of the project.
<i>Perognathus inornatus inornatus</i> San Joaquin Pocket Mouse	--	--	--	Uses arid annual grassland, savanna, and desert scrub, with sandy washes, fine soils, and scattered vegetation between 1,100 and 2,000 feet in elevation.	Unlikely. Marginal vegetation along irrigation ditch and not within the required elevation range.
Invertebrates					
<i>Branchinecta conservatio</i> Conservancy fairy shrimp	FE	--	--	Lifecycle restricted to large, cool-water vernal pools with moderately turbid water.	Unlikely. No suitable habitat within or adjacent to the project site.
<i>Branchinecta lynchi</i> Vernal pool fairy shrimp	FT	--	--	Lifecycle restricted to vernal pools.	Unlikely. No suitable habitat within or adjacent to the project site.

**TABLE 1-2
SPECIES WITH POTENTIAL TO OCCUR IN THE ACTION AREA**

Scientific Name Common Name	Federal Status	State Status	CNPS Listing	Habitat Description / Blooming Period	Potential to Occur in the Action Area
<i>Cicindela hirticollis abrupta</i> Sacramento Valley (Hairy-necked) tiger beetle	--	--	--	Larvae and usually adults occur on sand bars, sandy shores, flood scours etc. immediately associated with rivers. Requires fine sand that is damp at, or a few centimeters below, the surface, and sparse or absent vegetation. Habitats must also not be subject to inundation for more than a few days at a time.	Unlikely. The project site habitat conditions are not suitable for this species.
<i>Desmocerus californicus dimorphus</i> Valley elderberry longhorn beetle	FT	--	--	Breeds and forages exclusively on blue elderberry shrubs (<i>Sambucus mexicana</i>) below 3,000 feet in elevation.	Unlikely. No elderberry shrubs with stems measuring at least one inch in diameter occur within 100 feet of the Proposed Project/Action.
<i>Lepidurus packardii</i> Vernal pool tadpole shrimp	FE	--	--	Found in vernal pools, swales, ephemeral drainages, stock ponds, reservoirs, or ditches.	Unlikely. No suitable habitat within or adjacent to the project site.
Vascular Plants					
<i>Astragalus tener</i> var. <i>ferrisiae</i> <i>Ferris's milk-vetch</i>	--	--	1B / (3-3-3)	Vernally mesic meadow and seeps, and sub alkaline flats in valley and foothill grasslands. 5-75 meters elevation. / April – May.	Unlikely. No suitable habitat within the immediate vicinity of the project site.
<i>Atriplex depressa</i> Brittlescale	--	--	1B / (2-2-3)	Chenopod scrub, valley and foothill grasslands, meadows and seeps / May – October.	Unlikely. No suitable habitat within the immediate vicinity of the project site.
<i>Atriplex joaquiniana</i> San Joaquin saltbrush	--	--	1B / (2-2-3)	Chenopod scrub, valley and foothill grasslands, meadows and seeps / April – October.	Unlikely. No suitable habitat within the immediate vicinity of the project site.
<i>California macrophylla</i> Round-leaved filaree	--	--	2 / (2-3-1)	Valley grasslands and foothill woodlands, 0-3937 feet in elevation. / March – May.	Unlikely. No suitable habitat within the immediate vicinity of the project site.
<i>Cordylanthus palmatus</i> Palmate-bracted bird's beak	FE	CE	1B / (3-3-3)	Chenopod scrub, valley and foothill grasslands (alkaline) / May – October.	Unlikely. No suitable habitat within the immediate vicinity of the project site.
<i>Hibiscus lasiocarpus</i> Rose mallow	--	--	2 / (2-2-1)	Marshes and freshwater swamps / June – September.	Unlikely. No suitable habitat within the immediate vicinity of the project site.
<i>Lasthenia glabrata</i> ssp. <i>coulteri</i> Coulter's goldfields	--	--	1B / (2-3-2)	Annual herb occurring in coastal salt marshes and swamps, playas, and vernal pools. 1-1220 m elevation. / February – June.	Unlikely. No suitable habitat within the immediate vicinity of the project site.

**TABLE 1-2
SPECIES WITH POTENTIAL TO OCCUR IN THE ACTION AREA**

Scientific Name Common Name	Federal Status	State Status	CNPS Listing	Habitat Description / Blooming Period	Potential to Occur in the Action Area
<i>Layia septentrionalis</i> Colusa layia	--	--	1B / (2-2-3)	Annual herb occurring in chaparral, cismontane woodland, and valley and foothill grassland on sandy, serpentine substrate. 100-1095 m elevation / April – May.	Unlikely. No suitable habitat within the immediate vicinity of the project site.
<i>Navarretia leucocephala</i> ssp. <i>bakeri</i> Baker's navarretia	--	--	1B / (2-2-3)	Annual herb occurring in cismontane woodland, lower montane coniferous forest, meadows and seeps, Valley and foothill grassland, and vernal pools / May – July.	Unlikely. No suitable habitat within the immediate vicinity of the project site.
<i>Silene verecunda</i> ssp. <i>verecunda</i> San Francisco campion	--	--	1B / (3-2-3)	Perennial herb occurring in coastal bluff scrub, chaparral, coastal prairie, coastal scrub, and in Valley foothill grassland in sandy substrate. 30-645 m elevation / March – June (uncommon in August).	Unlikely. No suitable habitat within the immediate vicinity of the project site.
<i>Trichocoronis wrightii</i> var. <i>wrightii</i> Wright's Trichocoronis	--	--	2 / (3-3-1)	Primarily associated with alkali floodplains of the San Jacinto River in association with Willows, Domino, and Traver soils.	Unlikely. No suitable habitat within the immediate vicinity of the project site.

SOURCE: USFWS (07/2007), CDFG (07/2007), CNPS (07/2007).

Notes:

The "Potential for Effect" category is defined as follows:

- Unlikely: The project site and/or immediate area do not support suitable habitat for a particular species. Project site is outside of the species known range.
- Low Potential: The project site and/or immediate area only provide limited habitat for a particular species. In addition, the known range for a particular species may be outside of the Proposed Project/Action Area.
- Moderate Potential: The project site and/or immediate area provide suitable habitat for a particular species.
- High Potential: The project site and/or immediate area provide ideal habitat conditions for a particular species.

Species that have medium or high potential to be impacted by the proposed project are shown in boldface type.

STATUS CODES:

FEDERAL:

- FE = Listed as "endangered" under the federal Endangered Species Act
- FT = Listed as "threatened" under the federal Endangered Species Act
- FSC = NOAA Fisheries designated "species of concern"
- FPD = Proposed delisted
- FD = Delisted

STATE:

- CE = Listed as "endangered" under the California Endangered Species Act
- CT = Listed as "threatened" under the California Endangered Species Act
- CSC = California Department of Fish and Game designated "species of special concern"
- CFP = California Department of Fish and Game designated "fully protected"

CNPS:

- List 1B = Plants rare, threatened, or endangered in California and elsewhere
- List 2 = Plants rare, threatened, or endangered in California, but more common elsewhere
- List 3 = Plants about which we need more information--a review list
- List 4 = Plants of limited distribution--a watch list

1.4.1 Identification of Species Analyzed in Detail in the ASIP

Pursuant to Section 7(c) of FESA, a species list was requested from USFWS regarding any species listed or proposed for listing as Threatened or Endangered, including designated or proposed Critical Habitats under FESA, that may be present in the Action Area (USFWS, 2007). Additionally, a list of special-status species known to occur or with the potential to occur within the Action Area was compiled from a query of the California Natural Diversity Database (CNDDDB) (CDFG, 2007) and the California Native Plant Society's Inventory of Rare and Endangered Plants (CNPS, 2007). Special-status fish, wildlife, and plant species considered in the MSCS (CALFED, 2001c) combined with the results from the species request lists and the database searches were used to generate a preliminary species list.

Initial screening of the overall species list eliminated from further consideration those species that only inhabited areas outside of the general Action Area. The second level of screening was based on species that occasionally visited (their life cycles are not dependent on) habitats affected by the MFWC Project/Action. These included mostly migratory species that may be observed infrequently in areas where the Proposed Project will occur. Finally, a focused list of Federal- or State-listed, Special-concern, or CALFED MSCS-covered species was compiled for detailed analysis in this ASIP and is included in Chapter 3. There are no candidate species potentially occurring in the Action Area.

1.4.2 Critical Habitat

Critical Habitat is designated in the Sacramento River within the project area for the listed Sacramento River winter-run Chinook salmon, Central Valley spring-run Chinook salmon, and Central Valley steelhead, which are presented in this ASIP. Although the Southern Distinct Population Segment (DPS) of the North American Green Sturgeon is federal-listed Threatened, Critical Habitat for this species has not yet been determined. Critical Habitat for vernal pool tadpole shrimp is designated within the region, but it is not included within the Action Area. The nearest Critical Habitat Unit for vernal pool tadpole shrimp is located approximately 3 miles northwest of shrimp in the Action Area. Details on the Critical Habitat designations are included in the species the Meridian Farms Service Area boundary. There is no suitable habitat for vernal pool tadpole descriptions in Chapter 3.

1.4.3 Essential Fish Habitat

The Action Area is within the region identified as Essential Fish Habitat (EFH) for Pacific salmon, including all Chinook salmon runs, in Amendment 14 of the Pacific Salmon FMP. This ASIP addresses potential effects of the MFWC Project on delineated EFH in the Sacramento River within the Action Area.

1.5 NCCPA Habitats

A total of 20 natural communities were analyzed on a broad, programmatic level in the MSCS – 18 habitats and 2 ecologically based fish groups. The term “NCCPA communities” refers to both habitats and fish groups. Of the 20 community types and fish groups, four are included in the Action Area and are evaluated in this ASIP. The others were not considered either because there was no such habitat in the Action Area or because the Proposed Project/Action would not affect the habitat. Although there is no estuarine habitat within the Action Area, this NCCPA Fish Group is included in the analysis in order to consistently analyze effects to a few estuarine fish species which may migrate through the Action Area. Descriptions of the two NCCPA Habitats and two NCCPA fish group are listed below (**Table 1-3**) and detailed in Chapter 5.

**TABLE 1-3
NCCPA COMMUNITIES ANALYZED IN THIS ASIP**

NCCPA Habitats	NCCPA Fish Groups
Valley Riverine Aquatic	Anadromous Fish Species
Valley/Foothill Riparian	Estuarine Fish Species

CHAPTER 2

Description of the Proposed Project/Action

The objective of the Proposed Project/Action is to ensure that no fish species are entrained in MFWC's diversion pumps, so that MFWC is in compliance with present regulatory requirements, including ESA compliance, and is able to continue to divert water for agricultural irrigation, avoiding effects to listed fisheries species that may be present near the diversions. Needed conveyance improvements related to the fish screen improvements are included within the Proposed Project/Action. This chapter describes the two phases of the Proposed Project/Action and existing conditions of Action Area, including the existing intake facilities. A description of the regulatory authorities that set the regulatory framework for the Proposed Project/Action is included. Conservation measures included with the Proposed Project/Action are described as well.

2.1 Authorities

2.1.1 Central Valley Improvement Act and Anadromous Fish Screen Program

On October 30, 1992, a multipurpose water law which contained 40 separate titles providing for water resource projects throughout the Western United States was established. Title 34, the CVPIA, mandates changes in management of the Central Valley Project, particularly for the protection, restoration, and enhancement of fish and wildlife. Under the CVPIA, a program dedicated to screening agricultural water diversions to protect anadromous fish in California's Central Valley was developed. The U.S. Department of the Interior established the Anadromous Fish Screen Program (AFSP) which satisfies section 3406(b)(21) of the CVPIA. CVPIA section 3406 (b)(21) states that the AFSP will "assist the State of California in efforts to develop and implement measures to avoid losses of juvenile anadromous fish resulting from unscreened or inadequately screened diversions on the Sacramento-San Joaquin Delta, and the Suisun Marsh. Such measures shall include but shall not be limited to construction of screens on unscreened diversions, rehabilitation of existing screens, replacement of existing non-functioning screens, and relocation of diversions to less fishery-sensitive areas. The Secretary's share of costs associated with activities authorized under this paragraph shall not exceed 50 percent of the total cost of any such activity."

The Proposed MFWC Project is consistent with the CVPIA Anadromous Fish Screen Program.

2.1.2 Endangered Species Acts

This ASIP is intended to provide all the necessary elements to comply with the FESA and CESA. Currently, there are eight species addressed within this ASIP that are identified as a listed species

or a candidate for listing, and two that have been delisted. The Central Valley steelhead is federal-listed threatened, and the Central Valley spring-run Chinook is both federal- and state-listed threatened. The Sacramento River winter-run Chinook salmon is federal- and state-listed endangered. The North American green sturgeon (Southern DPS) is federal-listed threatened. The giant garter snake is both federal- and state-listed threatened, and the Swainson's hawk is state-listed threatened. The bank swallow is state-listed threatened. The Central Valley fall/late fall-run Chinook salmon is a candidate for listing. The cackling goose and Sacramento splittail have been federally delisted, but the species still remain under scrutiny, and are therefore included in this ASIP. All of these species are covered in the MSCS.

2.2 Proposed Project/Action Area

The MFWC is located in Sutter County, between Interstate 5 and Highway 99, east of the Sacramento River and southwest of the Sutter Bypass. The approximate limits of MFWC Service Area are shown in **Figure 1-1**. MFWC provides irrigation water to three distinct Service Areas encompassing approximately 9,150 acres of mostly agricultural land, with an estimated annual water delivery of 35,000 acre-feet (af). Small areas of riparian forest, grassland, wetland and open water, as well as the small urban area of Meridian, are also included in the Service Area.

The Action Area includes the existing MFWC diversion facilities, locations of the proposed new and improved facilities, conveyance improvements, proposed construction equipment staging areas, and proposed grading and in-water construction locations. Areas within 200 feet of these project components are also included within the Action Area. Most of this area will not be affected by the Proposed Project/Action, but is included in order to analyze all potential effects resulting from the Proposed Project/Action. The Action Area is depicted in **Figure 2-1**.

Biological communities in the Action Area include valley riparian/Cottonwood riparian forest, annual grassland, and valley riverine habitat (Sacramento River). Agricultural land also provides habitat for wildlife. The Sacramento River provides freshwater habitat for fish, amphibians, reptiles, and waterfowl. Roads, levees, and agricultural activities have modified the adjacent riparian habitat. Inland project areas, beyond the Sacramento River and associated habitats, are characterized as agricultural (field crops and orchards). Human presence within the Action Area is minimal based on the surrounding land use, however river recreation activities increase during the late spring, summer and fall. **Figure 2-2**, **Figure 2-3**, and **Figure 2-4** depict the vegetation communities, including crop types, within the Action Area.

2.2.1 General Habitat

Valley Riparian/Cottonwood Riparian Forest

The valley riparian and riparian forest habitats are located adjacent to the Sacramento River system as it winds south along the western boundary of the MFWC Service Area, and much of the habitat is located within the flood plain of the levee system. Riparian areas with less mature canopy cover are dominated by narrow-leaf willow (*Salix exigua*) and black willow (*Salix gooddingii*), with occurrences of valley oak (*Quercus lobata*) and cottonwood (*Populus*

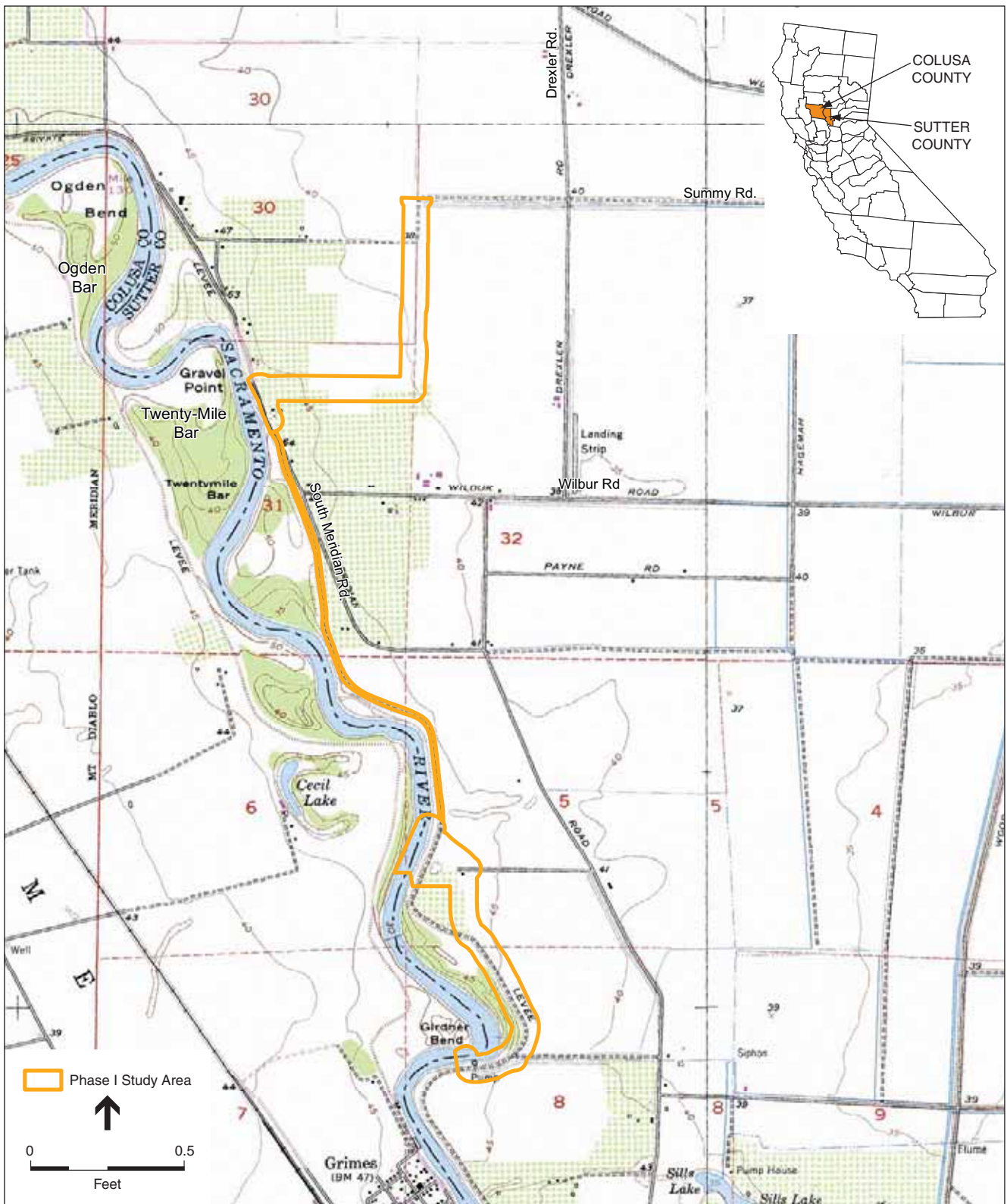
fremontii). Himalayan blackberry (*Rubus discolor*), California rose (*Rosa californica*), nutsedge (*Cyperus* spp.), curly dock (*Rumex crispus*), poison oak (*Toxicodendron diversilobum*) and several species of exotic grass characterize the shrub and herbaceous layers. Mature cottonwood stands dominate the closed canopy overstory and characterize the riparian forest areas adjacent to and within (during high flow season) the riverine environment. See **Photo 1** in **Appendix B** for a view of riparian habitat in the Action Area.

Valley Riparian/Cottonwood Riparian Forest habitats provide food, water, migration and dispersal corridors, and escape, nesting, and thermal cover for an abundance of wildlife. At least 50 amphibians and reptiles and 147 bird species occur in lowland riparian systems. Additionally, 55 species of mammals are known to use California's Central Valley riparian communities.

Valley Riparian/Cottonwood Riparian Forest occurs along the Sacramento River within the general vicinity of the Proposed Project/Action. Within the Action Area, riparian habitat is included along a portion of the proposed Grimes conveyance improvements and the existing diversion facility. In addition, a few non-contiguous patches of mixed willow riparian habitat occur approximately 440 feet north of the proposed New Grimes Diversion location. Riparian areas provide food, cover, and nesting for a variety of birds, mammals, amphibians, and even reptiles and fish. Riparian vegetation along the banks of the Sacramento River provide shaded aquatic riverine habitat for fish species.

Sacramento River

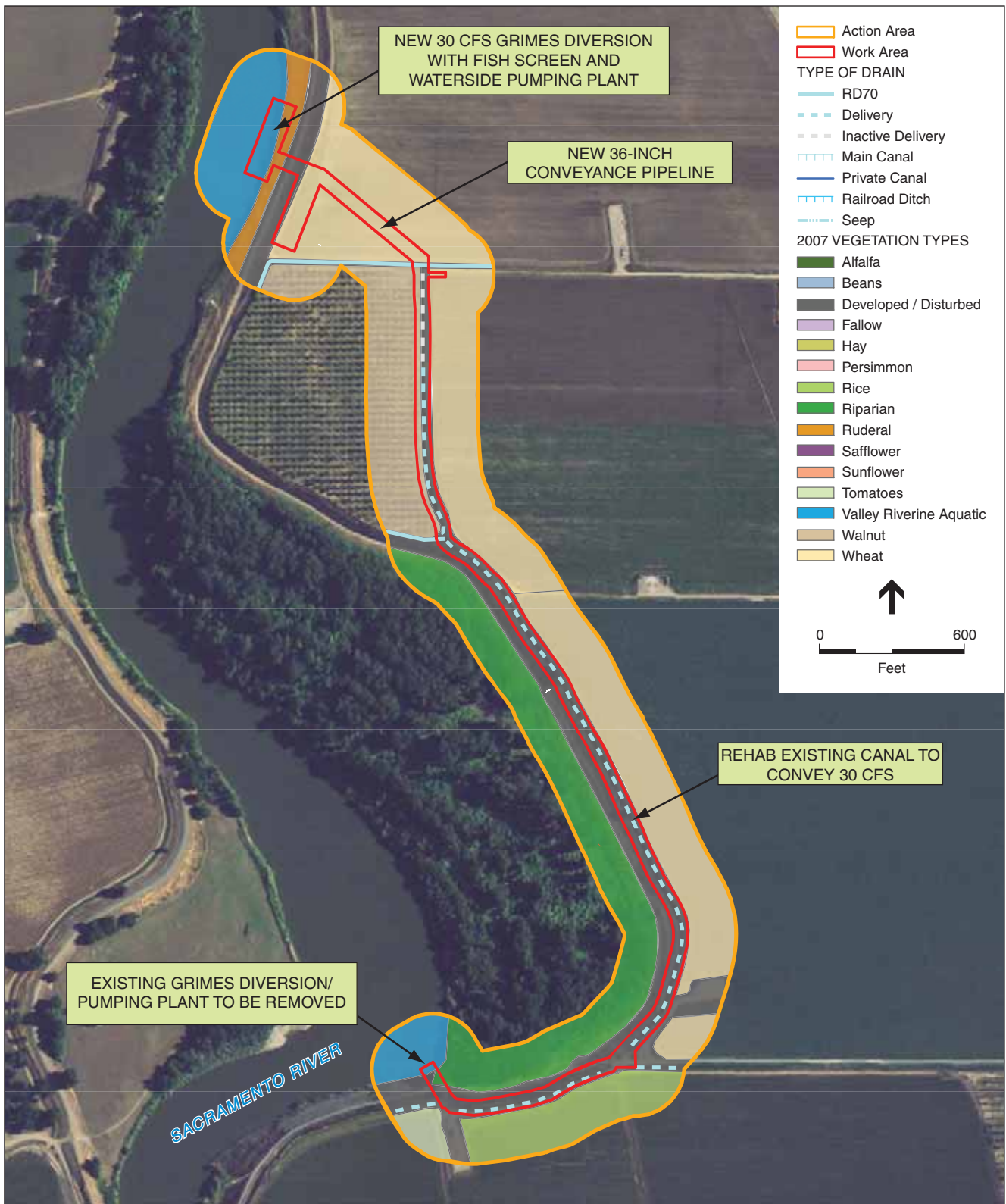
Within the vicinity of the Action Area the Sacramento River riverine habitat is characterized by freshwater aquatic and shaded riparian habitats. The adjacent riparian habitat has been modified by trails (both paved and unpaved), levees, and general recreation activities. Flows are relatively slow within the Action Area, exhibiting deep channel characteristics with levied banks. Channel substrate generally consists of fine sandy-loam with sparse areas imported rip-rap along the banks used to reinforce the adjacent levees. At both the proposed new diversion locations (Meridian and Grimes) the river is channelized, exhibiting a deep, cold and slow moving flow. The Sacramento River in the vicinity of the both proposed diversions is channelized and lacks aquatic vegetation and has minimal streambank vegetative cover. The river bank in the vicinity of the proposed Grimes Diversion is generally considered ruderal, with few sparsely distributed medium-sized shrubs. The levee banks are regularly maintained by the local Reclamation District to remove weedy vegetation. This area is burned every year in the late summer, leaving the banks free of vegetation (**Photo 2** and **Photo 3, Appendix B**). On the land-side the levee near the Grimes Diversion, slopes are maintained by dragging a chain across the face of slope. This reduces unwanted vegetation and leaves only low-growing groundcover for erosion protection. The value of shaded riverine aquatic habitat in the Action Area of both diversions is minimal for fish. The area around the proposed Meridian Diversion is more vegetated with annual grasses, but still offers limited shaded riverine aquatic habitat for fish.



SOURCE: USGS 7.5' Topographic Map (Grimes, CA - T 14N, R 1E, Sec. 5, 8, 30, 31 [1973]); MWH, 2007; and ESA, 2008

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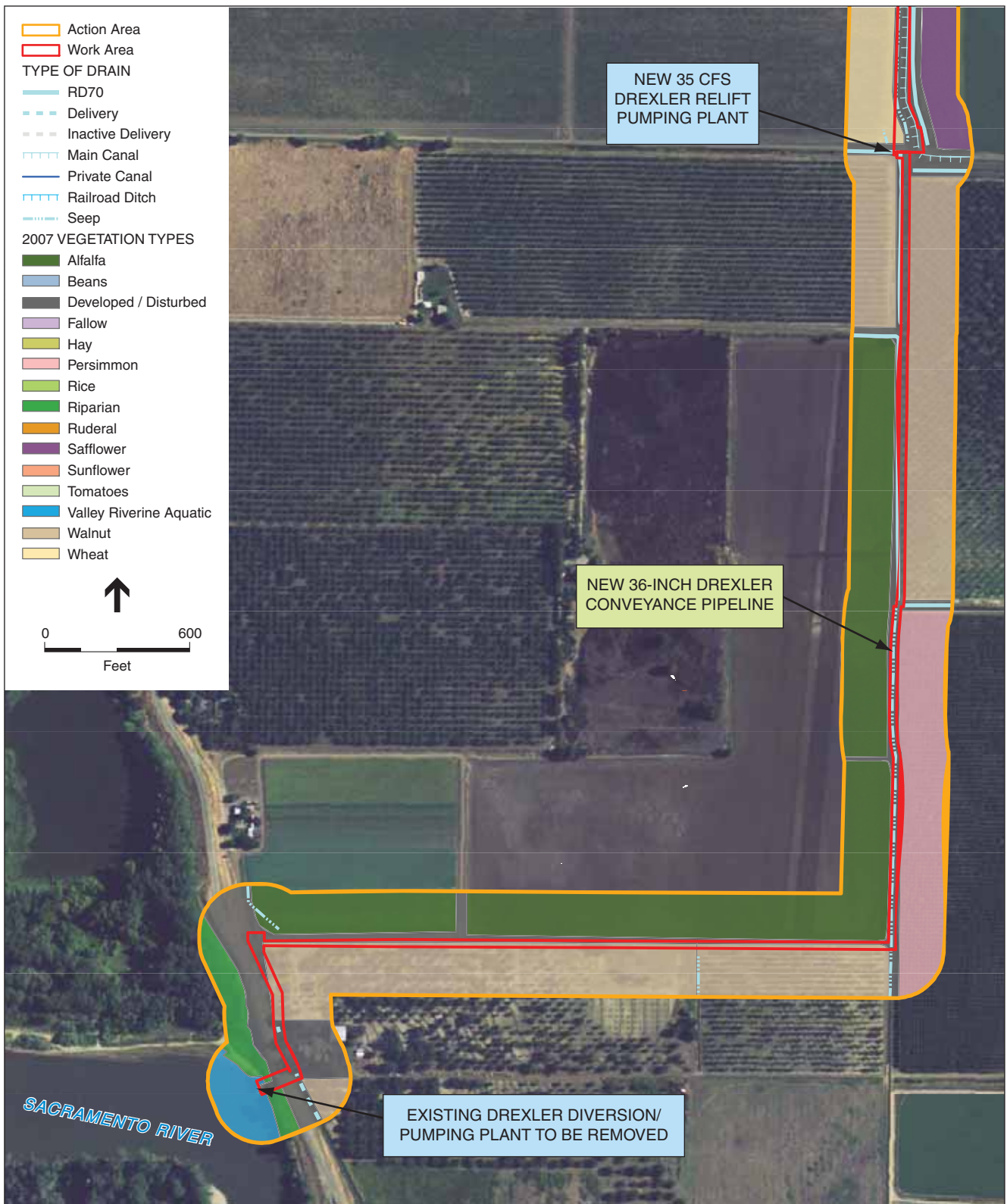
Figure 2-1
Wetland Delineation Study Area



SOURCE: USDA, 2005; MWH, 2007; MFWC, 2007; and ESA, 2007

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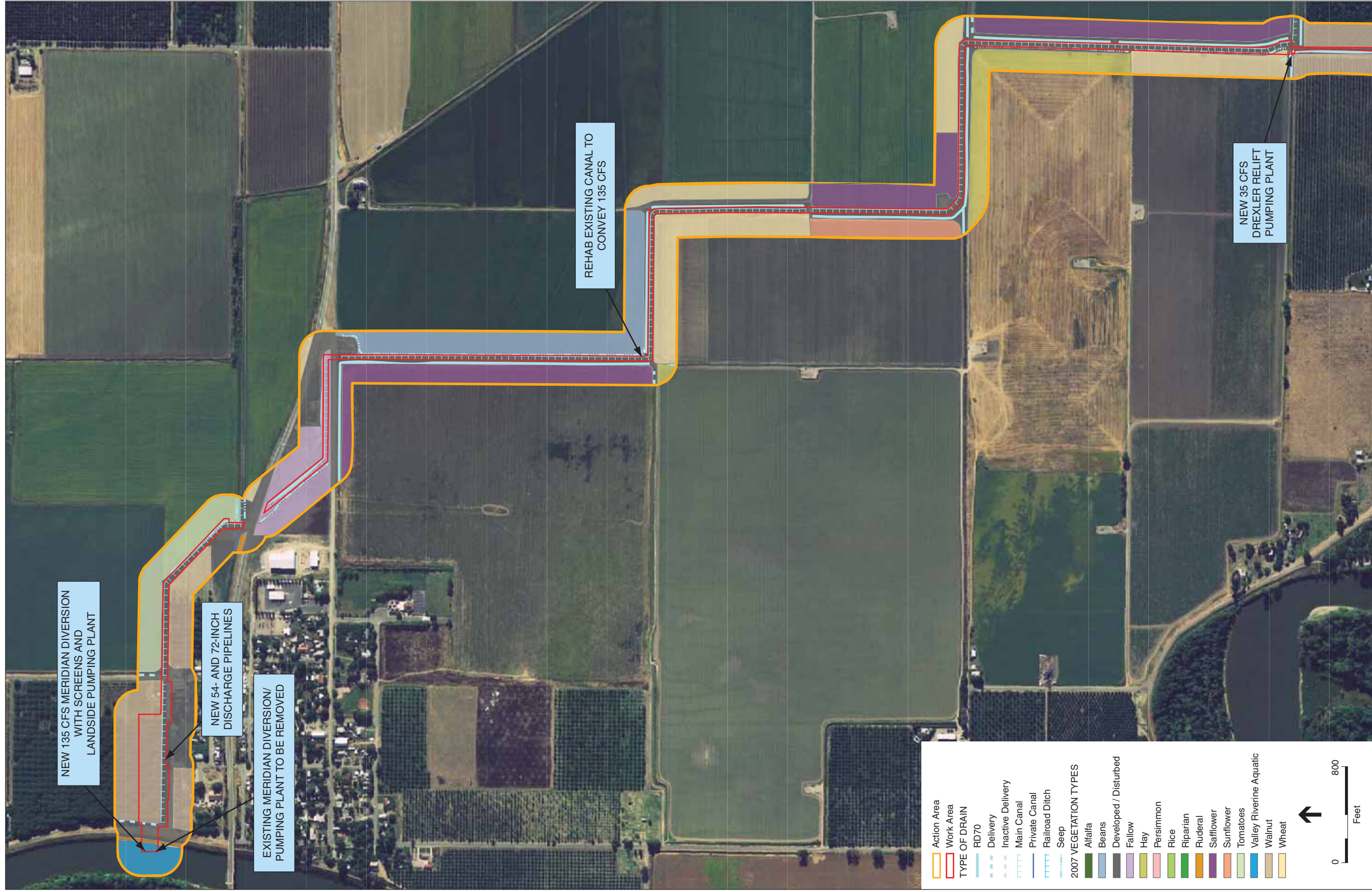
Figure 2-2
Vegetation Communities within the Action Area – South



SOURCE: USDA, 2005; MWH, 2007; MFWC, 2007; and ESA, 2007

Meridian Farms Water Company – Fish Screen Project . 203104

Figure 2-3
Vegetation Communities within the Action Area – Central



SOURCE: USDA, 2005; MWH, 2007; MFWC, 2007; and ESA, 2007

Meridian Farms Water Company – Fish Screen Project . 203104
Figure 2-4
 Vegetation Communities within the Action Area – North

The Sacramento River in the vicinity of the proposed intake locations serves as a migratory corridor for the upstream migration of adult salmon and steelhead, and the downstream migration of juvenile salmon and steelhead. North American green sturgeon and Sacramento splittail may also utilize the Action Area as migratory habitat. Other fish species common in the Sacramento River near the proposed intake locations include striped bass, threadfin shad, American shad, catfish, Sacramento pikeminnow, tule perch, sculpin, bullhead, and a variety of other resident fish species. The Sacramento River near Sacramento also provides habitat for a variety of invertebrates, including planktonic species such as copepods, and epibenthic species such as crawfish and amphipods.

Agriculture

Agriculture, irrigated with water drawn from the Sacramento River, dominates the surrounding landscape. Although the specific crop cultivated on a parcel of land may vary annually, the general types of crops grown in the region remain relatively consistent. The major crops include rice, safflower, sunflower, tomatoes, and beans. Hay crops, such as alfalfa, are widely grown, and orchards in the area grow walnuts and persimmons. These crops are irrigated by a series of canals that deliver water from the Sacramento River. The delivery canals within the Action Area are generally well maintained and concrete lined, support minimal vegetation. There are unlined overflow ditches characterized by emergent aquatic vegetation such as cattails (*Typha latifolia*) and tules (*Scirpus californicus*) that occur within the study area, adjacent or perpendicular to the Main Canal. All ditches owned and managed by MFWC are maintained annually, and generally lack dense upland or aquatic vegetation. A few ditches that are owned by the local Reclamation District are not maintained as regularly, and support denser stands of tules and cattail. Agricultural crops and irrigation drainages provide foraging and cover habitat for a variety of wildlife such as birds, mammals, and some reptiles.

All Proposed Project/Action components are located in or adjacent to agriculture. The Main Canal and other delivery canals that are proposed for widening (increased conveyance) are surrounded by lands in active crop production. These canals are generally concrete-lined; although, in some locations, the concrete bed is damaged and there are places where the canals are unlined. The proposed Drexler Re-Lift Station is adjacent to existing canals and ditches. Irrigation ditches lateral to the Main Canal in the vicinity of the Proposed Project/Action support emergent aquatic vegetation. The proposed Drexler and Grimes pipelines will extend through agricultural orchards and, in some instances, through existing ditches. Canals and ditches may provide habitat for fish, aquatic invertebrates, and aquatic snakes.

Ruderal

In the study area, ruderal or disturbed habitats generally occur in narrow stretches adjacent to levees, roads, and along canals, ditches, river banks and agricultural land boundaries. Ruderal areas within the Action Area are located along the banks of the Sacramento River and are characterized by non-native annual grassland (**Photo 4, Appendix B**). Non-native annual grassland includes ripgut brome (*Bromus diandrus*), and wild oats (*Avena barbata*), and other common species including Johnson grass (*Sorghum halepense*), Leymus (*Leymus triticoides*),

thistle (*Sonchus asper*), and filaree (*Erodium moschatum*). This habitat is also present in the understory of the riparian woodland habitat, and within the Action Area, represents much of the vegetation growing within and along the banks of drainage ditches and irrigation canals. Ruderal grasslands provide important foraging, breeding, and resting habitat for many species of wildlife.

Developed / Disturbed

Developed and disturbed areas include major roads, highways, and buildings and structures within more urban areas, but also facilities and access roads which are located throughout agricultural areas within the Action Area. Also included within this category are the unpaved turnouts and shoulders of dirt access roads, and the regularly maintained banks of the levee, adjacent to the Sacramento River. As mentioned previously, the vegetation on these levees is removed through burning or by dragging a chain across its slopes.

2.2.2 Current Facilities

MFWC currently operates three surface water diversion/pumping plants on the Sacramento River at Meridian, Drexler, and Grimes in Sutter County. The diversions use pumps with unscreened intakes which likely entrain juvenile Chinook salmon, steelhead trout, and other native fishes that pass by the intake. Current facilities and improvements are described in more detail the following section which describes the Proposed Project/Action. The locations of the existing facilities are shown in **Figure 2-1**, and in **Photo 5** and **Photo 6** in **Appendix B**.

2.3 Proposed Project/Action Characteristics

2.3.1 Project Components

The MFWC Proposed Project/Action includes several components which are divided into two project phases (**Table 1-1**). The purpose for the phasing is to be able to implement the Proposed Project/Action in a way that is both economically feasible and practical for MFWC. Each phase is independent of the other and each will benefit fish species. Both Phase 1 and Phase 2 improvements will allow MFWC to more efficiently deliver water to its service areas. Consultation for each phase will occur independently of each other.

Phase 1 includes construction of the New Grimes Diversion/Pumping Plant, the New Grimes Pipeline and Canal Modifications, and constructing up to 6,500 lineal feet of Drexler Pipeline, as feasible, dependent upon funding. Phase 1 also includes the removal of the Existing Grimes Diversion/Pumping Plant. Phase 1 conveyance modifications will improve service in the Grimes Service Area, while the new diversion with fish screen will reduce fish entrainment in the pumps. Construction of the Drexler Pipeline will provide MFWC with the added ability to provide uninterrupted service to its customers in this service area. Currently, the existing Drexler Diversion is partially silted in, and may become inoperable within the next few years. Implementation of Phase 1 will provide redundancy in the MFWC system to be able to deliver water if the existing Drexler Diversion becomes inoperable.

Phase 2 includes the construction of the New Meridian Diversion/Pumping Plant, removal of the Existing Meridian Diversion/Pumping Plant, modifications to the Main Canal, construction of the New Drexler Re-lift Pumping Plant, additional improvements to the Drexler Pipeline (if needed), and removal of the Existing Drexler Diversion/Pumping Plant. The new diversion with fish screen will increase diversion capacity to compensate for the abandonment and removal of the existing Drexler Diversion while reducing fish entrainment in the pumps. The Main Canal modifications will increase conveyance capacity in order to handle increased flows resulting from the consolidation of the existing Drexler and Meridian diversions. A relift pump station will be constructed to deliver flows to the Drexler Service Area via the Drexler Pipeline. If the total 6,500 lineal feet of Drexler Pipeline is not constructed in Phase 1, then in Phase 2 the remaining length of pipeline would be completed in order to tie into the Main Canal at the new relift station.

The following is a summary of the Project facilities and proposed improvements (also shown in **Figure 2-1**):

PHASE 1

- **New Grimes Diversion/Pumping Plant.** A new 30-cubic feet per second (cfs) diversion with fish screen and pumping plant will be located north of the existing Grimes Diversion/Pumping Plant.
- **New Grimes Pipeline and Canal Modifications.** Approximately 650 lineal feet of 36-inch diameter pipeline and modifications to 3,800 lineal feet of the existing earthen canal to deliver flows from the New Grimes Diversion/Pumping Plant to the Grimes Service Area. Approximately 1,200 linear feet of ditch will be concrete lined. Approximately 3,250 feet of earthen ditch will remain.
- **Drexler Pipeline.** Approximately 3,000 up to 6,500 lineal feet of a 36-inch diameter pipeline will begin at the Drexler Re-lift Pumping Plant and will terminate at the intersection of Summy Road and the Main Canal. The length of pipeline constructed is dependent upon available funds, but any length of pipeline constructed will be an improvement to existing conditions.
- **Removal of the Existing Grimes Diversion/Pumping Plant.** The existing pumping facility will be removed after the new pumping plant is constructed.

PHASE 2

- **New Meridian Diversion/Pumping Plant.** A new 135 cfs diversion with fish screen and pumping plant will be located adjacent to and will replace the existing Meridian Diversion.
- **Main Canal Modifications.** Increase the capacity of approximately 15,200 lineal feet of the Main Canal to convey flows over to the Drexler Service Area in order to accommodate the consolidation of the Meridian and Drexler diversions.
- **New Drexler Re-lift Pumping Plant.** A new 35 cfs pumping plant will be located at the end of the Main Canal modifications to deliver flows to the Drexler Service Area via the new Drexler Pipeline.

- **Drexler Pipeline Extension (optional).** The Drexler Pipeline may be extended to a total length of 6,500 lineal feet, if not already constructed in Phase 1. The end of the pipeline would tie-in to the existing Main Canal at Summy Road.
- **Removal of Existing Meridian Diversion/Pumping Plant.** The existing diversion/pumping facility will be removed after the new pumping plant is constructed.
- **Removal of Existing Drexler Pumping Plant.** The existing pumping facility will be removed after the new pumping plant is constructed.

2.4 Proposed Project/Action Specifics – Phase 1

2.4.1 New Grimes Diversion/Pumping Plant

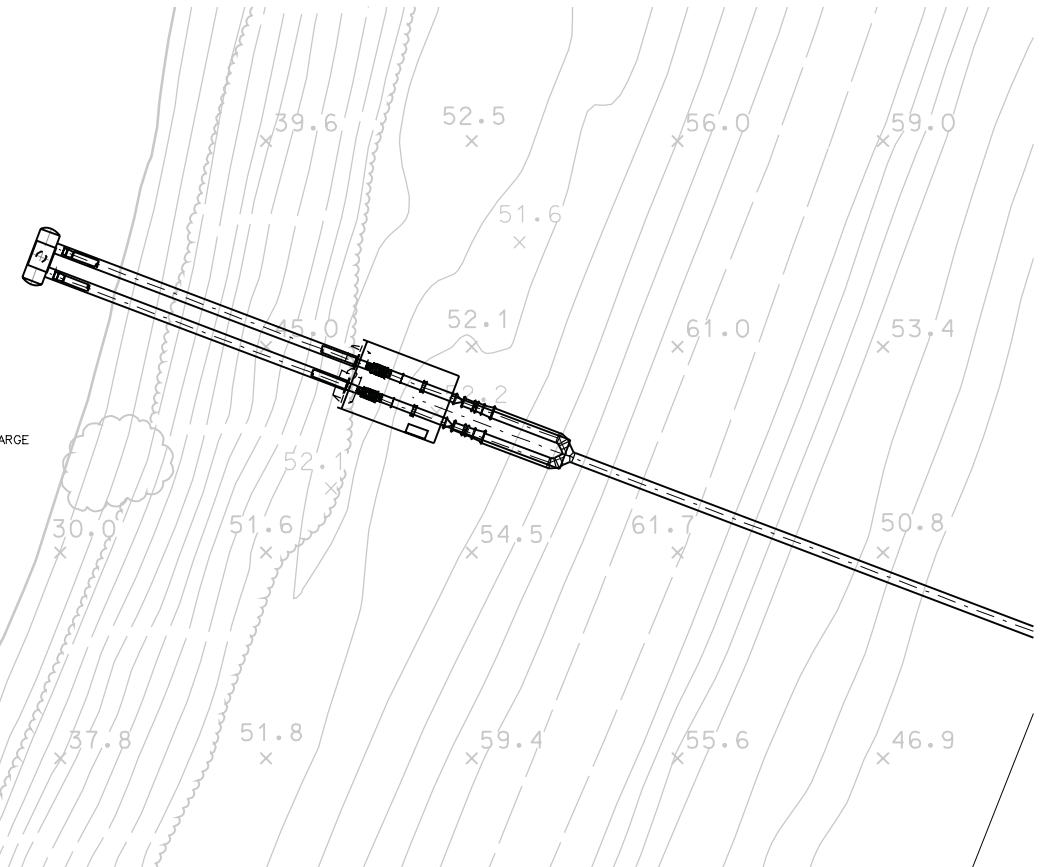
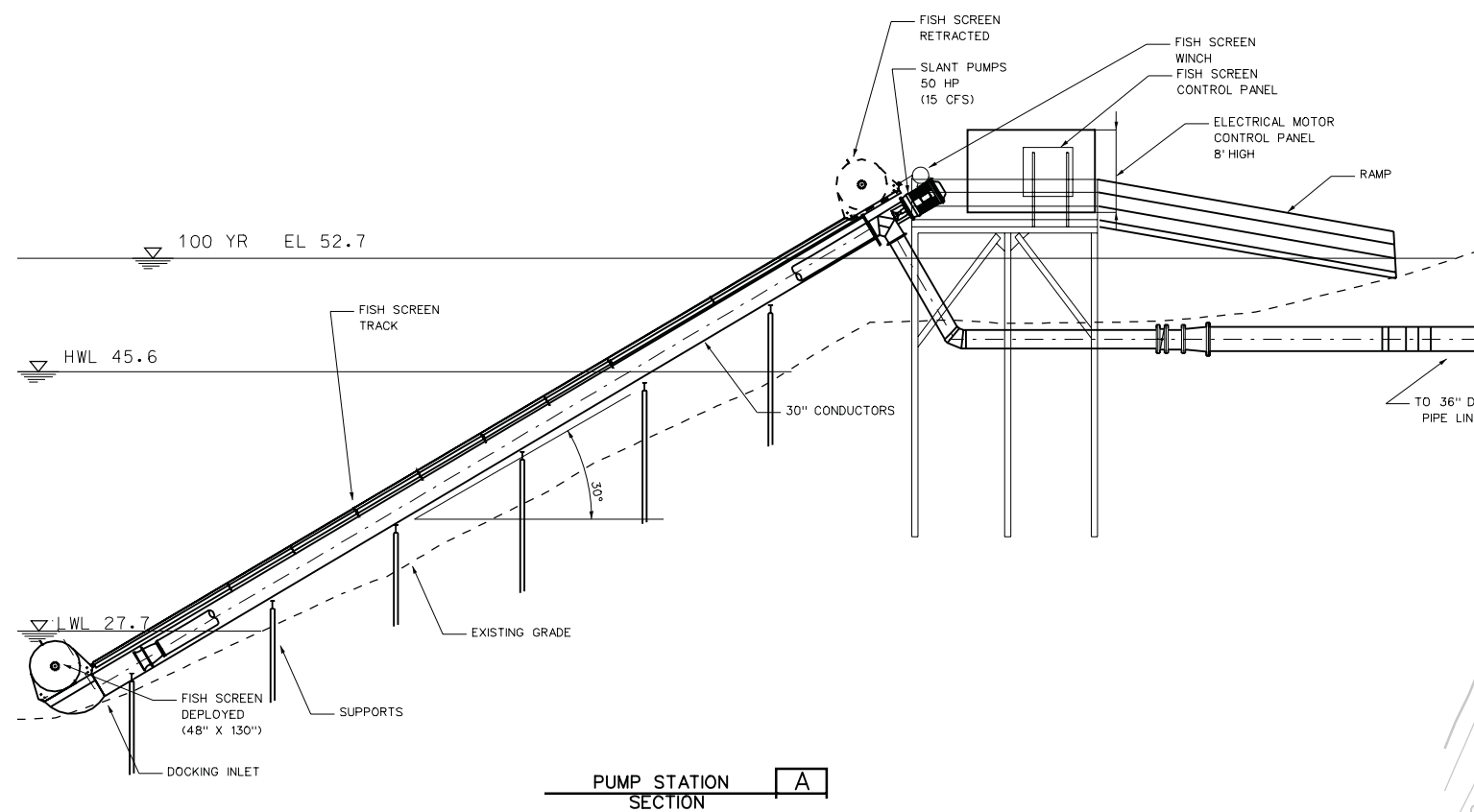
A new 30-cfs diversion with fish screen and pumping plant will be constructed north of the existing Grimes Diversion/Pumping Plant. A general schematic of the facility is provided in **Figure 2-5**. The New Grimes Diversion will consist of two 15 cfs mixed flow inclined pumps mounted along the slope of the levee that will operate from a common fish screen in the Sacramento River. Two 30-inch parallel conductor pipes, five feet on center, will house the inclined pump columns. The conductor piping will lie parallel to the incline of the riverbank, at an angle of roughly 30-degrees. The conductor piping will attach to a fabricated sheet metal docking inlet at the river intake, into which the fish screen will dock.

2.4.1.1 Fish Screen

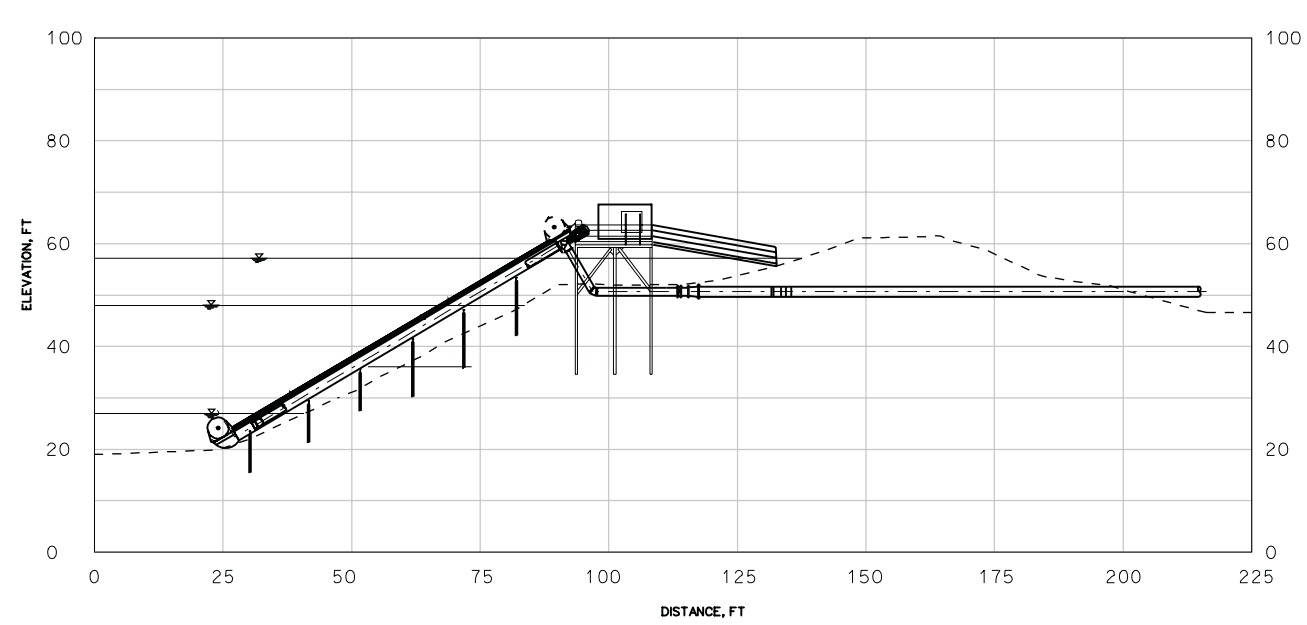
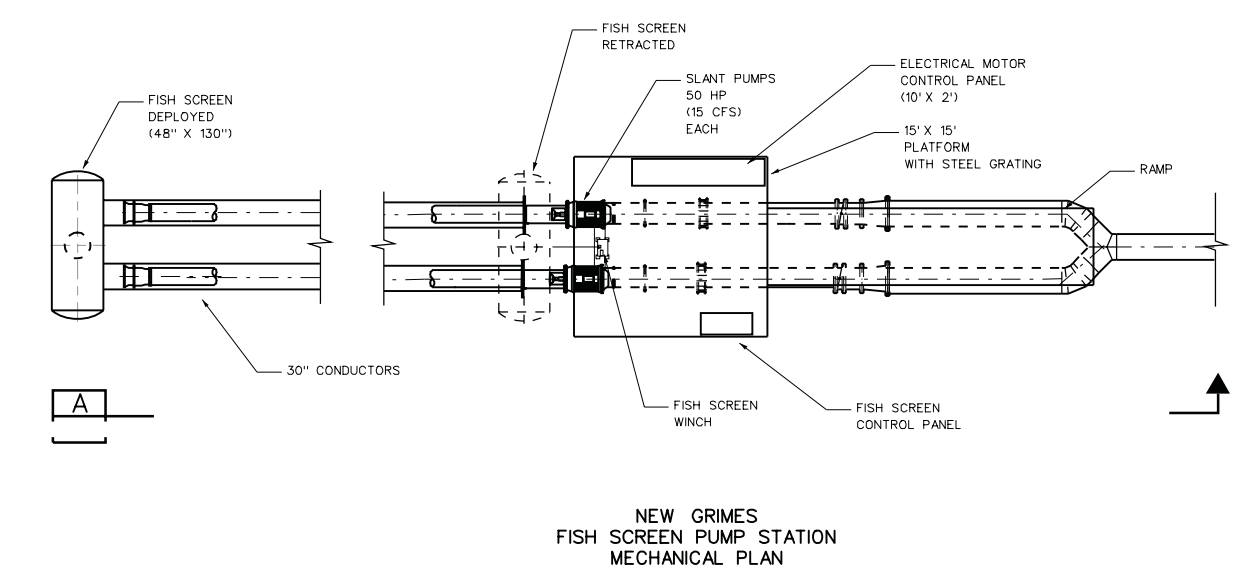
The fish screen will be a 48-inch diameter by 148-inch long cylinder at the river intake. The top of each fish screen will be submerged 3 feet under water at the 90 percentage exceedance elevation (elev. 27.7).

The actual intake screen is comprised of the last 44 inches of each end of the cylinder. It is fabricated from a mesh of wedge shaped stainless steel wire that is resistance welded to support bars. This produces a mesh screen of continuous 1.75 mm wide slots that will provide the 0.33 fps approach velocity limitations set by the CDFG. The center portion of the screen is fabricated sheet metal and will attach to the docking inlet. Steel wheels on the under carriage of the fish screen will allow it to track down rails that are welded to the tops of the conductor pipes and attach to the docking inlet. An electric or hydraulic powered winch will allow the operator to raise or lower the fish screen between deployment in the water and the pump platform.

The fish screen uses a stationary brush bar cleaning system in which a hydraulic power-pack (1.5 HP, 2 gpm, 900 in-lb torque) of pump and motor rotate the screen on a timed basis. The hydraulic motor rotates the screen at four rpm against internal and external stationary brushes. The cleaning cycle is five minutes and the cleaning interval is adjustable. The control panel will handle the cleaning cycle interval for the Fish Screen as well providing the power and control for the winch. The cleaning cycle will be initiated by either a high water level differential across the screens, elapsed time period, or manual actuation.



SITE PLAN



SOURCE: MWH Americas, Inc., 2004; and ESA, 2007

2.4.1.2 Docking Inlet and Conductor Pipe

Each pump column will reside in a 30-inch conductor pipe that extends down into a common intake manifold, or docking inlet. The docking inlet is a fabricated steel box that will sit on the river bottom and provides the fish screen with a simple locking mechanism to attach to. The conductor pipe will slant back to the river bank and up to the pump platform. The slant angle will not be less than 30 degrees from the horizontal. The distance from the river intake and the pump platform will require that the conductor piping to be at least 80-feet long. This allows the pump platform to be at a height that will clear the 100-year water elevation.

2.4.1.3 Incline Pumps

Two air-cooled, 50 HP, mixed flow slant pumps will provide 15 cfs each to the 36-inch discharge piping. The pumps chosen for this application are the Prime Pump Company Model 24M14. Additional names of pump manufacturers will be included in the specifications during detailed design. This selection will need to be verified once the pipeline length and routing have been determined. The electric motors will be premium efficiency, designed specifically for vertical pump applications with a totally enclosed, fan-cooled, enclosure rating.

The inclined pumps proposed for this project are vertical pumps, with mixed flow type impellers mounted in the inclined position. For a typical vertical pump, the rotating assembly is vertically suspended thereby all of the weight and thrust are axially absorbed by the motor thrust bearing. The bearings on the pump bell, pump shaft and column shafts are designed as guides and they are not meant to be subjected to radial load. In case of pumps mounted in an inclined position, all of the bearings will be subjected to radial load including the lower bearing of the motor.

If inclined pumps are the type of pumps to be used for this project, the pump manufacturer selected shall have proven experience in the design and manufacture of inclined pumps of this size length. The pump bearings, shafts and column shall be designed for the loading imposed on them. The conductor pipe and support where the pumps are to be installed shall be designed to have a minimum deflection suitable for the type of bearings used. The shaft enclosing tube and seal shall be designed to contain the lubrication oil and prevent the pumped liquid and grit to enter inside the shaft and bearing compartment.

The pumps shall require cast-iron bowls with stainless steel shafting. The pump impellers will be a bronze alloy and of the semi-enclosed design. The impeller will not include a wear ring.

2.4.1.4 Flow Measurement

The pumped river water will be measured with a 36-inch ultrasonic, multi-path flowmeter located in a vault somewhere just upstream of the discharge outlet. The meter will consist of two wetted transducers inserted into the pipe. The meter will be housed into a concrete vault with a galvanized access hatch.

The selected meter for this application is the GE Panametric, Aquatrans AT868. These meters are accurate to within plus or minus one (1) percent of reading, and are designed for insertion in raw or other water containing sand or grit. They will require five straight pipe diameters upstream, and two downstream to smooth the flow profile and maintain reading accuracy.

The flow meter will be equipped with an indicator-totalizer. The indicator shall have four digits and measure flow from 0 – 50 cfs. The totalizer shall have six digits and shall measure total flow in units of acre-feet. The MFWC and the U.S. Bureau of Reclamation will use the flow measurements to log and report diversions.

2.4.2 New Grimes Pipeline and Canal Modifications

The Proposed Project/Action includes the addition of approximately 650 lineal feet of 36-inch diameter pipeline and 3,800 lineal feet of modifications to the existing canal will be constructed to deliver flows from the New Grimes Diversion/Pumping Plant to the Grimes Service Area. The New Grimes Pipeline will be 36-inches in diameter, 650 feet in length, and extend from the New Grimes Pumping Plant to a transition structure that discharges to the Grimes Canal. Upon exiting the levee, on the landside, the pipeline heads east and south along the walnut orchard (**Figure 2-2**). The pipeline crosses an existing irrigation ditch and then turns due east and parallels the drainage-ditch. The pipeline will discharge to a transition structure that will feed the re-graded Grimes Canal.

The existing Grimes Canal is an earthen canal, and will be partially concrete-lined and re-graded to direct flow to the south. (Flow is presently from south to north.) Approximately 3,800 linear feet of earthen canal will be modified to tie-into the existing canals that deliver irrigation flows from the existing Grimes Diversion/Pumping Plant. Approximately 1,200 linear feet of ditch will be concrete lined. Approximately 3,250 feet of earthen ditch will remain.

2.4.3 Drexler Pipeline

The Drexler pipeline will consist of a 36-inch pipeline that will extend approximately 6,500 lineal feet south from the Drexler Re-lift Pumping Plant location, at Summy Road and just west of where the Main Canal intersects Summy Road. The pipeline will extend south parallel to a walnut orchard and then alfalfa field to the west, approximately 3,360 feet, then turn due west just north of the Chesney property walnut orchard (**Figure 2-3**). The pipeline will continue approximately 2,490 feet to the west where it will discharge into a turnout structure. The structure will consist of two turnouts. One turnout will service the Cusick field to the north and one turnout will feed into a 35 cfs capacity gravity pipeline that will extend south through the Chesney Orchard and roughly parallel the river levee. The 36-inch gravity pipeline will be approximately 600 feet in length and is required by the Reclamation Board regulations to be offset 10 feet from the toe of the levee. The gravity pipeline will be capable of supplying a maximum flow of 35 cfs to the Drexler Canal just south of the Chesney House and adjacent to the old Drexler Pumping Plant. Permanent and temporary easements will be needed for the construction and maintenance of the Drexler Pipeline.

2.4.4 Removal of Existing Grimes Diversion/Pumping Plant

Once the New Grimes Diversion/Pumping Plant is constructed, the existing Grimes Diversion/Pumping Plant will be removed. At a minimum, this will include the removal of the pumps, equipment platforms, electrical equipment, gauging stations, pile supports to required level, river side-piping, and placement of grout/concrete inside levee piping.

2.5 Proposed Project/Action Specifics – Phase 2

2.5.1 New Meridian Diversion/Pumping Plant

The New Meridian Diversion/Pumping Plant will consist of a new 135 cfs diversion and fish screen pumping plant that will be located upstream of the existing Meridian Diversion. The pumping plant will be located on the land-side of the levee. **Figures 2-6 and 2-7** show the site plan for the Meridian Diversion and Pumping Plant.

2.5.1.1 Fish Screens

The Meridian Diversion will consist of four 54-inch cylindrical tee fish screens. The fish screens will be made of stainless steel wedgewire with 1.75 millimeter (mm) slot size and a minimum of 50 percent open space. At the design flow of 135 cfs, the approach velocity is 0.33 feet per second (fps), which results in a minimum cylinder length of 14.5 feet. The outlet size for each fish screen is 36 inches. The top of the fish screen will be submerged three feet under water at the 90 percent exceedance elevation (elev. 32.6) as required in navigable waterways.

2.5.1.2 Fish Screen Cleaning System

The fish screens at this facility will be cleaned via an airburst system. The airburst cleaning system will consist of a 100 horsepower (hp) air compressor and 1,500 gallon steel pressure tank located at the pump station site. The fish screens are each connected to the tank via 6-inch stainless steel air feeder line. The air will be released and shut off by 6-inch motorized actuated butterfly valves. The air will move through the pipe and through the levee and exit through the air nozzles located inside the screens. Each screen will be cleaned once every 20 minutes. However, included in the CDFG design criteria is a cleaning cycle every five minutes. Based on recent experience at similar facilities along the Sacramento River, a five minute cleaning cycle is too conservative and results in an oversized and more costly cleaning system. Therefore, CDFG, as lead agency for this Proposed Project/Action, will be requested to grant a variance to extend the cleaning cycle to 20 minutes. The cleaning cycle will be initiated by either a high water level differential across the screens, elapsed time period, or manual actuation.

2.5.1.3 Deflection Piles

Approximately ten galvanized steel deflection piles will be installed just upstream and downstream of the fish screens in the river. The purpose of the deflection piles will be to protect the fish screens from large debris floating down the river. The top of the piles will be submerged a minimum of three-feet as required for navigable waterways. Steel beam will be used over the top of the fish screens to prevent debris from lying directly over them.

2.5.1.4 Conveyance from River Inlet to Sump

The inlet structure consists of two 72-inch tees, each with two screens mounted on top. The tees are then connected to a short segment of 84-inch pipeline. The 84-inch pipeline is then reduced to a 72-inch pipeline, which will then run through the levee and underneath North Meridian Road to the pump station wet-well. The tees and the segment of 84-inch pipe will be connected to a concrete pad approximately 40 feet by 25 feet. The concrete pad will be placed on piles.

2.5.1.5 Gate Structure

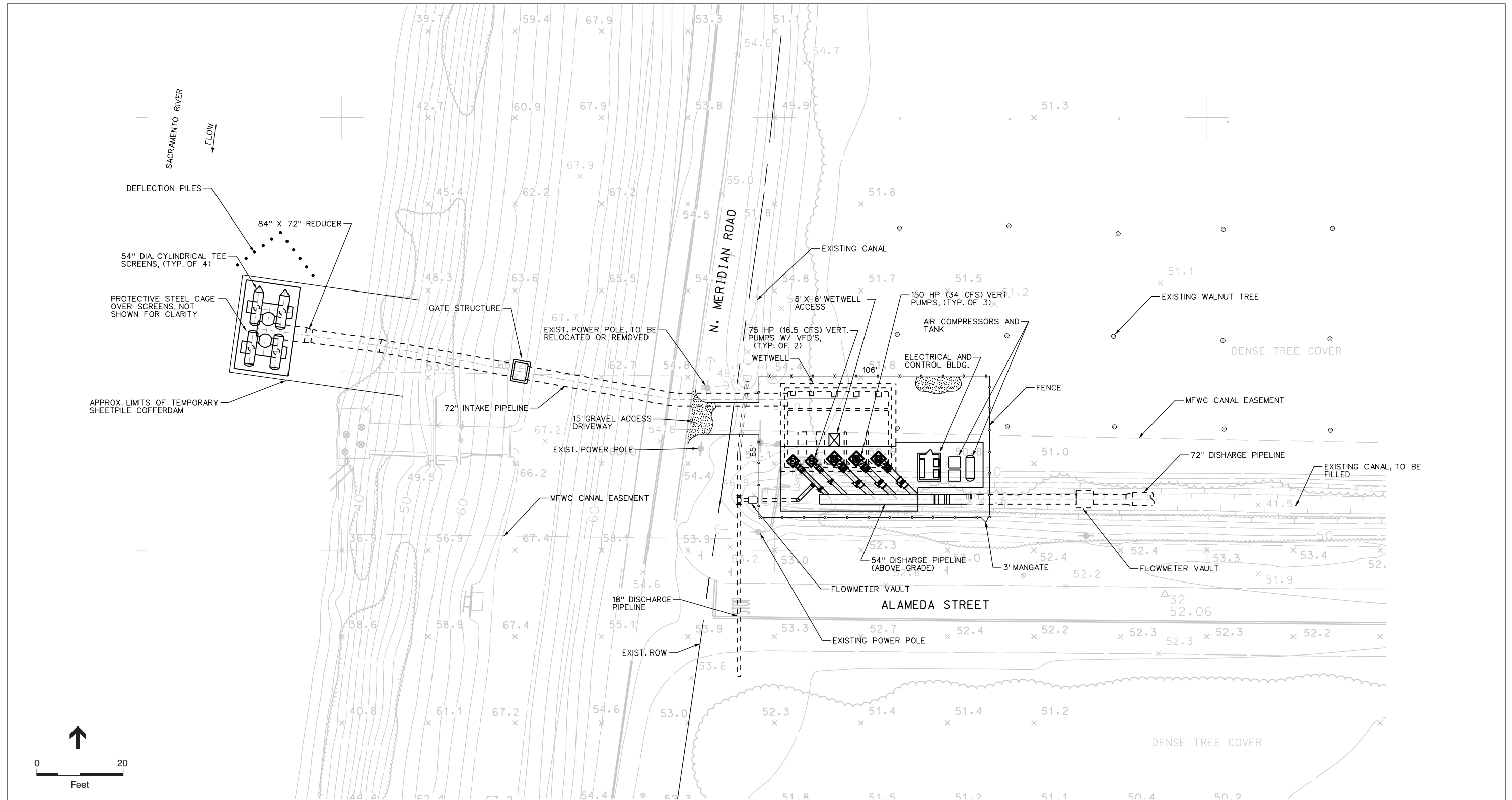
The gate structure provides a means for positive closure of the levee penetration by the 72-inch inlet pipeline. A sluice gate with 72-inch diameter thimbles will be mounted in a concrete structure on the water-side of the levee.

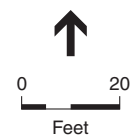
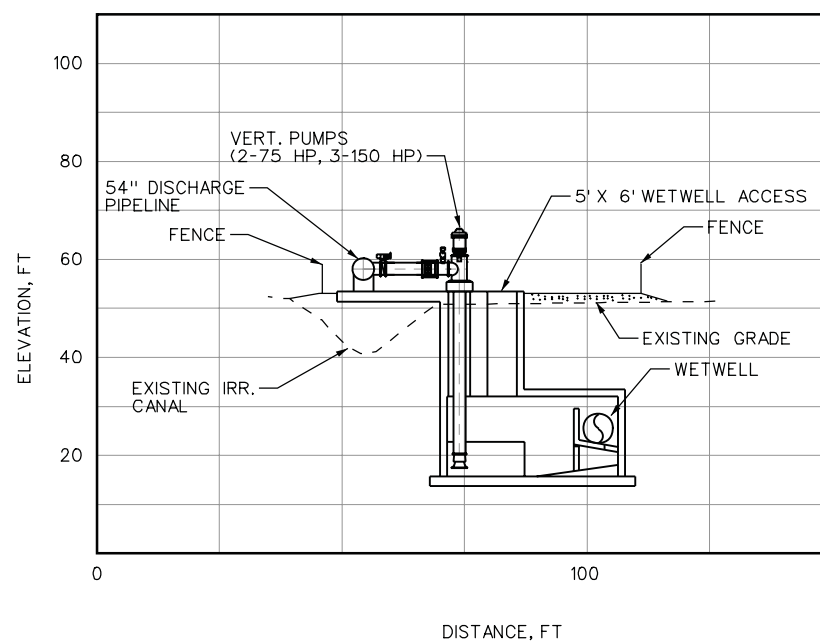
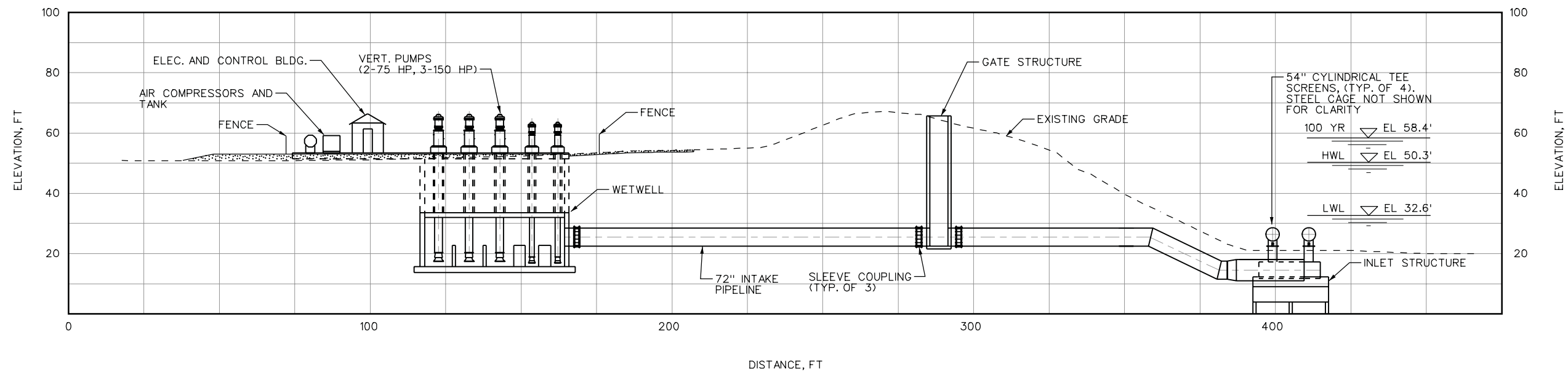
2.5.1.6 Sump

The sump structure will be located on the east side of the Sacramento River at the northeast corner of North Meridian Road and Alameda Street. The inside dimensions of the sump are 35-foot wide by 46-foot long. The inlet pipeline will enter the sump perpendicular to the 35-foot wide westerly wall at invert elevation 22.5 feet above mean sea level (fmsl). The sump is designed so that water enters the sumps inlet chamber and impinges on a baffle wall located parallel to the inlet pipe and eight-feet from the sump's north (front) wall.

The inlet chamber has bottom outlets that restrict the flow and thus provide time for air to escape. The bottom outlets for the low capacity pumps (16.5 cfs) and high capacity pumps (34 cfs) are sized respectively at 2-feet by 2-feet and at 2-feet, 8-inches by 2-feet, 8-inches to provide a maximum velocity of 5 cfs through the openings. The bottom outlets are located below the minimum water level in the pump chamber and are in line with the pumps – one outlet for each pump. Just beneath the bottom outlets, the floor of the sump will be sloped from the inlet wall to the baffle wall at eight degrees from horizontal. This will carry sediment towards the pumps and out of the sump structure.

The centerline of the pumps are located seven pump bell diameters away from the baffle wall to allow time for the flow to transition fully out of its turbulent state. The Hydraulic Institute Standards recommend that this distance be at least 4 pump bell diameters. However, propeller type pumps tend to be more sensitive to irregular flowlines at the pump inlet than other vertical turbine pumps. Partition walls between the pumps have also been added per the recommendations of the Hydraulic Institute Standards. The distance between the partition walls is two pump bell diameters. The top of the partition walls are set at elevation 22.7 fmsl which is one-foot, four-inches higher than the pump shut off elevation of 21.3 fmsl. A six by eight foot access will be provided between the baffle wall and the end of the partition walls just in front of the center pump for access into the sump. The invert of the sump is set at elevation 15.7 fmsl and is based on providing complete submergence for the inlet pipeline when the Sacramento River is at elevation 32.6 fmsl.





2.5.1.7 Pumping Plant

The pumping plant site will be located at the northeast corner of North Meridian Road and Alameda Street. The pumping plant will be equipped with two (2) 16.5 cfs and three (3) 34 cfs mixed flow pumping units will be provided to pump the total design flow of 135 cfs into MFWC's Main Canal. The pumps will be mixed flow pumps with Open-drip-proof WP1 enclosed electric motors and will sit outdoors on top of the concrete sump structure described above. The top of slab elevation for the pumping plant is 53.5 fmsl. Refer to **Figure 2-7**.

The pumping plant site will be surrounded by a galvanized steel mesh wire fence/masonry wall and encompass approximately 0.16 acres. The wet-well, pumping pad, pumps, air compressor, air tank, and an electrical control building will be located within the fenced site. The electrical control building will need to be air conditioned to keep the variable frequency drives (VFD) from overheating. A 15-foot access gate will be located on the west side just off North Meridian Road. A three-foot man-gate will be located at the southeast corner of the site just off Alameda Street. The entire site will be covered with eight-inches of aggregate base.

2.5.1.8 Pumps

Two (2) 16.5 cfs and three (3) 34 cfs mixed flow pumping units will be provided to pump the total design flow of 135 cfs into MFWC's Main Canal. The pumps selected for this application are Cascade Pump Company Model MF 16 and MF 24. The low capacity and high capacity pumps will operate at a maximum speed of 880 rpm and 700 rpm respectively. The low capacity pumps will be provided with variable frequency drives. At minimum speed, the low capacity pumps will be able to pump at a rate of 8.3 cfs. This provides MFWC the same pumping flexibility they have at their existing Meridian and Drexler pumping plants.

The pumping plant will need to operate up to capacity when the Sacramento River water surface elevations vary between 32.6 – 50.3 fmsl and with a pump discharge elevation of 57.6 fmsl (centerline of pump discharge piping).

The design point for each of the pumps will be a total dynamic head (TDH) of 29-feet at their respective design capacities (16.5 cfs and 34 cfs). The TDH was determined by assuming an average water surface elevation in the Sacramento River of 36.3 fmsl and a discharge elevation of 54.6 fmsl, and friction losses in the suction and discharge piping. The water surface elevation of 36.3 fmsl in the Sacramento River is the average water level for the month of July from 1947 to 2002. The month of July is typically when MFWC will have their heaviest pumping requirements for the year.

2.5.1.9 Discharge Piping

The 16.5 cfs pumps and 34 cfs pumps discharge into their respective 20-inch and 30-inch, above ground, pump discharge header pipes. Each discharge header is equipped with a combination air/vacuum valve and isolation valve. The water is then pushed from the discharge header into a common 54-inch, above ground, manifold pipeline. The 54-inch pipeline drops underground just before exiting the fenced area of the pumping plant site. Underground, the pipeline transitions to a 72-inch discharge pipeline that eventually discharges into the Main Canal near Mawson Road.

A separate 18-inch discharge will be connected to the most westerly 16.5 cfs pump. This 18-inch pipeline will branch off and head both north and south to existing irrigation ditches. The north branch will serve the existing walnut orchard located next to the pumping plant. The south branch will serve the property located immediately south of the pumping plant on the other side of Alameda Street.

2.5.1.10 Flow Measurement

The pumped Sacramento River water will be measured with a 54-inch multi-path, ultrasonic flowmeter just downstream from the pumping plant and an 18-inch ultrasonic flowmeter located just west of the most westerly 16.5 cfs pump. The 54-inch flowmeter will measure the amount of water being diverted and pumped into the Main Canal. The 18-inch meter will be used to measure the water being pumped into the 18-inch waterline serving the north and south properties. Each meter will consist of two wetted transducers inserted into the pipe. The meter will be housed into a concrete vault with a galvanized access hatch. The indicator-totalized will be housed outside the box for easy access.

The selected meter for this application is the GE Panametric, Aquatrans AT868. These meters are accurate to within plus or minus one (1) percent of reading, and are designed for insertion in raw or other water containing sand or grit. They will require five straight pipe diameters upstream, and two downstream to smooth the flow profile and maintain reading accuracy.

The flow meter will be equipped with an indicator-totalizer. The indicator shall have four digits and measure flow from 0 – 150 cfs. The totalizer shall have six digits and shall measure total flow in units of acre-feet. Flow measurements will be used by MFWC and Reclamation to log and report diversions.

2.5.2 Main Canal Modifications

The Proposed Project/Action will include an increase in the capacity of approximately 15,200 lineal feet of the Main Canal to convey flows to the Drexler Service Area needed as a result of the consolidation of the Meridian and Drexler diversions. **Table 2-1** provides a summary of the canal modifications proposed.

The current maximum capacity of the Main Canal is estimated at 120 cfs from the outlet of the existing pumping plant to Siphon 2 (State Highway 20). The existing canal is not large enough to convey the new maximum flow (135 cfs) from the new Meridian Pumping Plant. The canal will be widened and relined as detailed in **Figure 2-1** and **Table 2-1** to facilitate the new maximum flow rate.

The close proximity of the open canal to traffic on Alameda Street between the discharge inlet and Mawson Road presents a safety hazard. Two options were considered to address this safety hazard. The first option is to discharge the water into a 72-inch pipeline that will extend from the discharge inlet to Siphon 1 at Mawson Road. The second option is to extend the new Siphon 1 box structure back to the new discharge inlet. This Proposed Project/Action proposes the use of the 72-inch pipe option to address the safety hazard.

**TABLE 2-1
PROPOSED CANAL MODIFICATIONS**

Description	Existing Bottom Width (ft)	Proposed Bottom Width (ft)	Flow (cfs)	Velocity (ft/s)
End of 54-inch Manifold pipe to Siphon 1	6.0–6.5	6' Pipe	135	4.8
Check Structure (moved from original location before Siphon)	5.2–7.9	6.0	135	2.5
Siphon 2 to Siphon 3	1.7–3.6	5.5	120	2.9
Siphon 3 to Bend Transition	2.6–3.5	5.5	120	2.7
Bend Transition to Check Structure	2.6–3.1	5.5	70	2.0
Check Structure to Siphon 4	3.1–3.3	3.5	70	2.0
Siphon 4 to Siphon 5	2.6–3.4	3.5	70	2.2

Source: Montgomery Watson Harza, 2004

2.5.2.1 Typical Canal Section

The concrete lined canal will have a trapezoidal shape and side slopes of 1.5 horizontal to 1 vertical (1.5:1). The canal section will be lined with 2.5-inch-thick un-reinforced, cast-in-place concrete. The maximum bottom width will be six feet and the minimum bottom width will be 3.5 feet depending on the capacity requirements of the reach. The new canal invert elevation will be the same as the current elevation in order to continue utilizing existing siphons wherever hydraulic capacity is available. **Figure 2-8** illustrates the general cross-section.

2.5.2.2 Freeboard

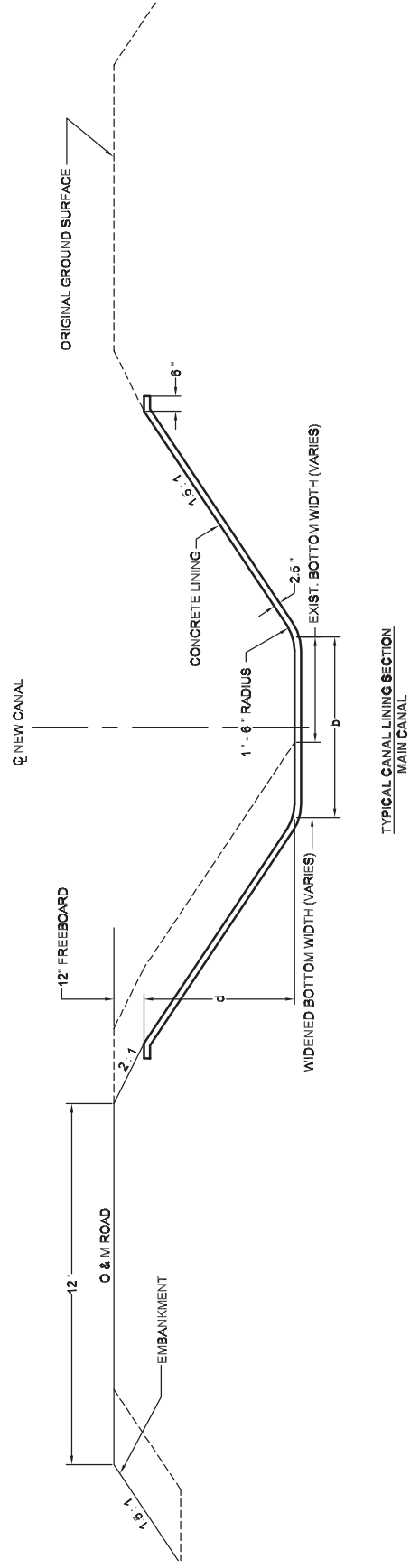
Portions of the existing canal run full (i.e., no concrete freeboard) during periods of maximum delivery. Reclamation design criteria recommend 6 inches of concrete freeboard at minimum. The Main Canal modifications will only be designed to accommodate the maximum flows without concrete freeboard. The earthen freeboard will be 12 inches from the top of the concrete to the elevation of the maintenance access road. The existing earthen freeboard varies slightly along the alignment, but is approximately 12 inches.

2.5.2.3 Embankment & Excavation

The existing canal will be demolished from one side or the other depending on the needed expanded width and the availability of right-of-way. Existing embankments will be excavated to the required canal width. The location of the widening will be determined on a reach by reach basis. Excavated material will be re-compacted to meet the requirements of the Operations and Maintenance (O&M) road. The widened canal will require an O&M access road on at least one side of the canal.

HYDRAULIC PROPERTIES

REACH	Q (cfs)	b (ft.)	d (ft.)
Start to Siphon 2	135	6.0	5.0
Siphon 2 to Sta. 73+35	120	5.5	4.0
Sta. 73+35 to End	70	3.5	4.0



The sides of the canal will rest on either a re-compacted embankment or neat excavation lines. Embankment materials will be specified as placed and spread evenly in uniformly compacted layers. Each horizontal layer will not exceed six inches in compacted thickness. Material will be homogeneous, free from lenses, pockets, streaks, laminations, or other deleterious materials. Prior to and during compaction operations, the materials will be specified to have a moisture content of no greater than two percent wet or less than five percent dry of optimum moisture for compaction.

All excavation or compacted embankment lines will have a tolerance limit of plus or minus 0.1-foot unless the governing concrete tolerance is more restrictive. Specified material thickness will have a tolerance limit of +10 percent or -5 percent. Transverse contraction joints will be placed at a maximum 10-foot spacing, on center, along the entire length of the new lining. Expansion joints will be provided at 50-foot spacing.

2.5.2.4 Check Structures

Reinforced concrete check structures exist at seven locations along the existing Main Canal between the Meridian Pumping Plant and Siphon 5. The check structure immediately upstream of Siphon 1 will be replaced downstream of Siphon 1. A check structure currently exists approximately 800-ft upstream of Siphon 5. This check structure is no longer used and will not be re-established upon widening. A new check structure will be installed immediately upstream of Siphon 5 to facilitate operation of the new Drexler Re-lift Pumping Plant in Phase 2.

A center post will be installed in the canal to allow for slots and stop logs (typically 2-inch by 12-inch pressure treated boards) to be inserted by operators between the reinforced concrete center post and the reinforced concrete stop log walls.

2.5.2.5 Turnouts

There are presently ten turnouts along the Main Canal from the Meridian Pumping Plant to Siphon 5. One of the turnouts is a safety overflow weir, and one is a 42-inch pass through culvert leading to two off-canal 24-inch turnouts. Six of the turnouts are pre-cast concrete structures notched into the side of the canal with slide gates. Upon completion of the canal widening, the turnouts will be reestablished. One 18-inch turnout between Siphon 2 and Siphon 3 is no longer useful and will not be reestablished upon canal widening. The turn-out gates will be reused and the gate frames will be refurbished if they are deemed useable by MFWC. If the gates have deteriorated beyond usefulness, they will be replaced with new gates and frames. It will be determined later if new pre-cast concrete structures will be procured. Approximately 2,625 feet due south of Siphon 3, at Sta. 74+50, the canal turns from due south to due east. At the turn, a 42-inch corrugated metal pipe (CMP) pass-through delivers flow to two turnouts. Upon widening of the canal, the 42-inch CMP will be reestablished and replaced in-kind.

2.5.2.6 Canal Buoyancy Control (Weep Holes)

It will be necessary to provide weep holes along some portions of the canal that have high groundwater in the winter months. Typically, the Main Canal has no flow in the winter months, but depending on Sacramento River levels, the ground water table can rise high enough to float the canal in some areas. A buoyancy condition would create non-uniform loads on the unreinforced

canal and lead to cracking, spalling, and failure of the canal system. Recommendations for weep holes will be finalized once the Geotechnical Report is completed.

2.5.2.7 Siphons

Two siphons will need to be replaced as part of the canal modifications. Siphon 1 will be removed and replaced by a 72-inch diameter RCP, designed for H-20 loading. The replacement of this siphon will require a shutdown and replacement of Mawson Road and will be subject to Sutter County Public Works' design standards.

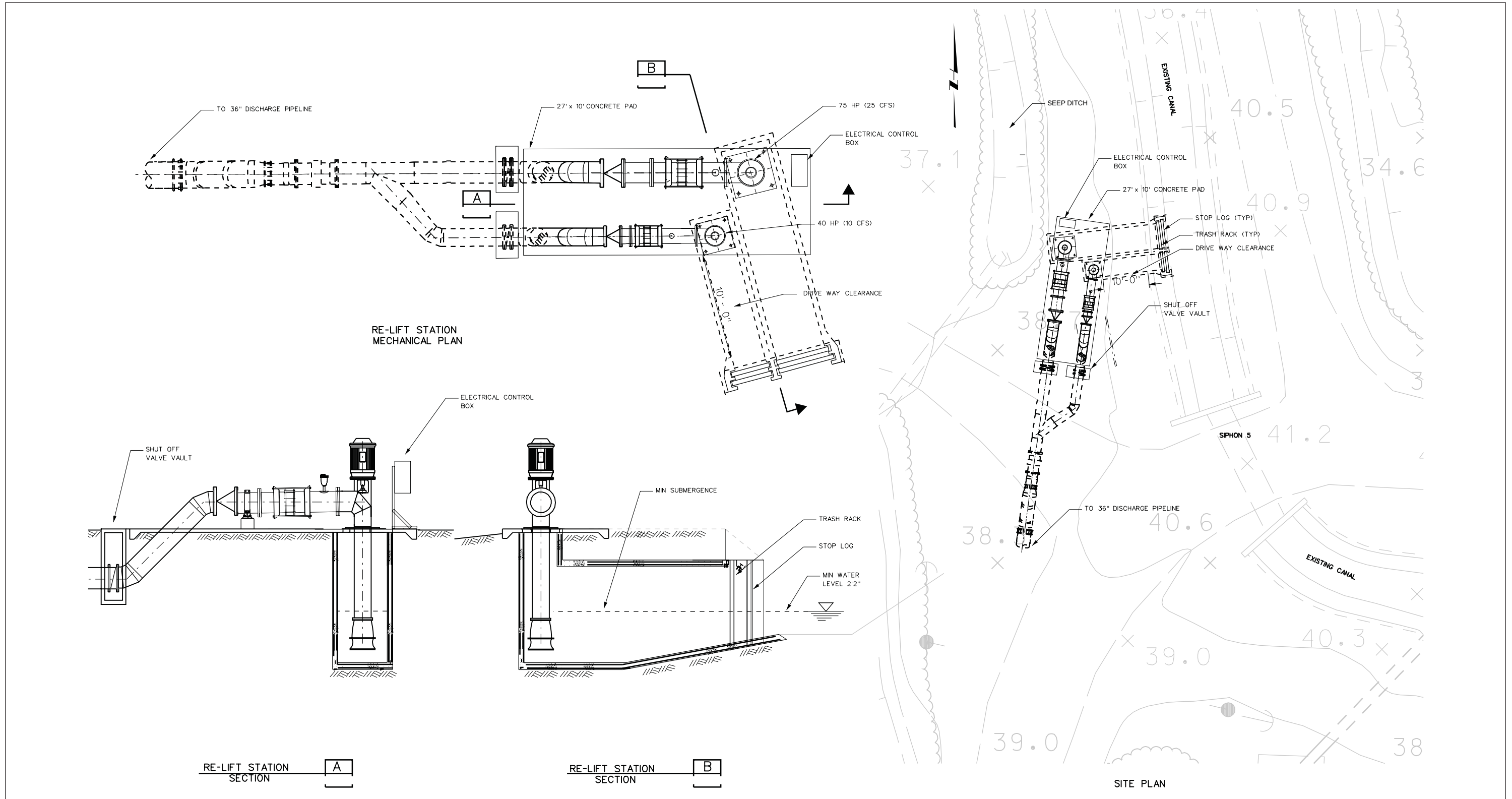
Siphon 3 will also be replaced by a 72-inch diameter RCP, designed for H-20 loading. Replacement of Siphon 3 will require a shutdown and replacement of Central Road and will be subject to Sutter County Public Works' design standards. Siphon 3 is currently 44 feet long. It is proposed that this siphon be lengthened to 200 feet to extend it past a home on Central Road that is situated next to the canal.

The remaining siphons (2, 4, and 5) provide adequate capacity and will be left in-place. Upstream and downstream transitions at each siphon will be constructed of 2.5-inch thick cast-in-place concrete or shotcrete.

2.5.3 Drexler Re-Lift Pumping Plant

The Drexler Re-Lift Pumping Plant will be located on the main canal, just upstream of the existing siphon 5 and pump #10. The purpose of the pumping plant will be to divert 35 cfs from the Main Canal to the Drexler Service Area due to the abandonment of the existing Drexler Diversion. The water will be pumped up to a new turnout structure via a new 36-inch diameter pipeline whose total length after all improvements will be approximately 6,500 lineal feet. From the turnout structure, the water will flow by gravity to the original Drexler canal outfall via approximately 600 feet of 36-inch pipe.

Figure 2-9 provides a general schematic of the proposed Drexler Re-Lift Pumping Plant. As shown, the Re-Lift station will be comprised of two vertical turbine pumps that will deliver 25 cfs and 10 cfs of canal water to a 36-inch discharge pipeline. The pumping plant will pump from a new two-channel sump on the irrigation canal.



2.5.3.1 Civil Site

The site will need to be re-graded to provide a suitable area for the 27 by 10 foot concrete pad that will house the pumps and the exposed piping. Since the pump pad will be at the same elevation as the existing canal berm (approximately elev. 40.5-feet), the berm will need widening to accommodate the pump pad and the need to provide vehicular access around the pumping plant. This requires that pump pad be located approximately 10–12 feet from the side-board of the canal to allow vehicle passage between the canal and the pumps. A small part of the seep drainage ditch on the western side of the canal will be impacted by the berm widening and the placement of the pump pad.

2.5.3.2 Pumps

Both pumps will discharge into separate, above ground, piping that will include a buried butterfly shutoff valve and a check valve. The 25-cfs pumps and 10-cfs pumps discharge into their respective 24-inch and 16-inch, above ground, piping. Each discharge header will be equipped with a combination air/vacuum valve and check valve. The two discharge headers then drop underground and transition into the main 36-inch pipeline, which extends to the Drexler canal. A buried butterfly shutoff valve allows isolation of each line. The concrete pad will extend out to include the pumps, the exposed piping, and the electrical power and control panel.

The pumps chosen for this application are the Prime Pump Company, Model 16P12 and Model M18. This selection will need to be verified once the pipeline layout is determined. The vertical turbine pumps will be standard clear water pumps. A 150 HP motor will drive the 25-cfs pump. The 10-cfs pump will require a 60 HP motor. The pumps will have 12-foot long columns and a required minimum submergence of 4.33 feet.

2.5.3.3 Sump

A new sump will be constructed just north of Siphon 5 to house the intake channels and the two new pumps. The conditions of the canal at the proposed intake site and the requirements of MFWC affect the general layout and orientation of the sump. The entrance to the sump will include a stop log and trash rack grate. Separate channels will serve each pump.

The channel dimensions will be governed by the Hydraulic Institute recommendations for sidewall and back wall clearance. For the 25-cfs pump, the channel will require 28 inches from the pump center line to the side wall (one pump column diameter). This will create a 54-inch wide channel. The back wall clearance from the center-line of the pump will be 21 inches (3/4 of pump column diameter). For the 10-cfs pump, side-wall clearance will be 18 inches (36-inch wide channel) and the back wall clearance will be 14-inches.

In order to get the proper submergence for the pumps at low water intervals, the floor at the entrance to the sumps will be sloped 10 degrees. The sloping floor will extend for 12 feet where the level bottom begins. The channel for the larger pump will be 24-feet long. The two pumps are off set in order to orient the discharge elbows to the pipeline and to save space. This makes for the channels to be of unequal lengths. Keeping the channels the same length would require that the discharge elbows to go up and out the back of the channel, requiring more piping and taking up more space.

2.5.3.4 Flow Measurement

The pumped water from the Main Canal will be measured with a 36-inch ultrasonic, multi-path flowmeter located in a vault somewhere just downstream of the pumping plant. The meter will consist of two wetted transducers inserted into the pipe. The meter will be housed into a concrete vault with a galvanized access hatch.

The selected meter for this application is the GE Panametric, Aquatrans AT868. These meters are accurate to within plus or minus one (1) percent of reading, and are designed for insertion in raw or other water containing sand or grit. They will require five straight pipe diameters upstream, and two downstream to smooth the flow profile and maintain reading accuracy.

The flow meter will be equipped with an indicator-totalizer. The indicator shall have four digits and measure flow from 0 – 50 cfs. The totalizer shall have six digits and shall measure total flow in units of acre-feet. The MFWC will use the flow measurements to track the amount of water being diverted to the Drexler Service Area.

2.5.4 Removal of Existing Meridian and Drexler

Diversion/Pumping plants

Once the New Meridian Diversion/Pumping Plant is constructed, the existing Meridian Diversion/Pumping Plant will be removed. Similarly, once the Drexler Relift pumping plant is operational, the existing Drexler Diversion/Pumping Plant will be removed. At a minimum, this will include the removal of the pumps, equipment platforms, electrical equipment, gauging stations, pile supports to required level, river side-piping, and placement of grout/concrete inside levee piping.

2.6 General Construction Considerations

The following construction methods and best management practices (BMPs) will be incorporated into the Proposed Project/Action where feasible. These measures will comply with the requirements set by the Central Valley Regional Water Quality Control Board to minimize construction-related impacts to water quality as well as minimize potential adverse impacts to sensitive biological resources.

- Silt screens and/or silt fences would be used where construction activities could possibly cause sediment to enter the river.
- All water-side construction activities for construction of the Meridian Diversion, including riprap installation, would be confined within a sheet-pile cofferdam, which would be put in place and removed during the “dry” season from June 1 to October 1. The season may be extended to November 1 with approval from NOAA Fisheries.
- Project construction and operations will result in no net loss of wetland resources.

- All construction contracts would specify a fish salvage program for all dewatered areas as part of construction. The Department of Fish and Game will be contacted to determine the proper disposition of salvaged aquatic organisms, including trapped fish and aquatic species.

Additional measures to avoid impacts to sensitive biological resources, including special-status fish and the giant garter snake, are included in Chapter 4.

2.7 Actions Contributing to MSCS Goals

The MSCS contains a list of conservation goals for each species and NCCPA community evaluated in the MSCS. The three alternative goals for species are recovery (“R”), contribute to recovery (“r”), and maintain (“m”). The goal of “recovery” was assigned to those species whose recovery is dependent on restoration of the Delta and Suisan Bay/Marsh ecosystems and for which CALFED could reasonably be expected to undertake all or most of the actions necessary to recover the species. Recovery is achieved when the decline of a species is arrested or reversed, threats to the species are neutralized, and the species long-term survival in nature is assured. The goal “contribute to recovery” was assigned to species for which CALFED Actions affect only a limited portion of the species range and/or have limited effects on the species. To achieve the goal of contributing to a species recovery, CALFED is expected to undertake some of the actions under its control and within its scope that are necessary to recover the species. When a species has a recovery plan, CALFED may implement both plan measures that are within the CALFED Solution Area and some measures that are outside the Solution Area. For species without a recovery plan, CALFED will need to implement specific measures that will benefit the species. The goal “maintain” was assigned to species expected to be affected minimally by CALFED Actions. For this category, CALFED will avoid, minimize, and compensate for any adverse effects to the species commensurate with the level of effect on the species. Actions may not actually contribute to the recovery of the species; however, at a minimum, they will be expected to not contribute toward the need to list the species or degrade the status of a listed species. CALFED also will, to the extent practicable, improve habitat conditions for these species.

The CALFED Ecosystem Restoration Program (ERP) has adopted the CALFED MSCS goals related addressing “recovery”, “contribute to recovery”, and “maintain” for MSCS covered species as described above. The ERP has also adopted the MSCS conservation measures and would build upon those measures during the process of completing ERP studies and actions. The ERP focuses on measures to enhance NCCPA communities and has a goal related to the need to “enhance and/or conserve biotic communities” (“E”). A final ERP goal is to “maintain and/or enhance harvested species” (“H”), which relates to commercial/recreational use of native and non-native biological resources. The MFWC Project will fulfill the following milestone of the CALFED ERP to the benefit of all MSCS “R” and “r” covered fish:

- Install positive barrier fish screens on all diversions greater than 250 cfs in all Ecological Management Zones (EMZs) and 25% of all smaller unscreened diversions in the Sacramento River Basin.

2.8 Conservation Measures

The CALFED MSCS presents the basis for conservation measures developed to address CALFED Actions overall, as outlined in the Programmatic CALFED EIS/EIR. The CALFED MSCS follows the two-tiered approach to FESA, CESA, and NCCPA compliance initiated by the CALFED Programmatic EIS/EIR and MSCS. The MSCS provides the CALFED programmatic compliance with FESA, CESA, and NCCPA while this MFWC ASIP provides the project-level compliance with these acts. As such, this ASIP represents the project-level biological assessment for initiating consultation with USFWS and NOAA-Fisheries under the Section 7 of the FESA and the project-level NCCPA compliance.

The following conservation measures are from a USFWS Programmatic Biological Opinion and will be incorporated into the Project Description. Conservation measures, as defined in this ASIP, include avoidance and minimization, compensation, and mitigation measures for giant garter snake. The following tables list the CALFED MSCS species specific conservation goals and measures, and habitat conservation measures for NCCPA habitats.

- For Phases 1 and 2, the contractor shall use vibrational pile driving to the greatest extent feasible. If percussive pile driving is necessary, its use shall be minimized to the maximum extent possible and comply with the following *Interim Criteria for Injury of Fish to Pile Driving Operations* (Popper et al., 2006):
 - The Sound Exposure Level (SEL) shall not exceed 187 dB (re: 1 $\mu\text{Pa}^2 \cdot \text{sec}$) in any single strike, measured at a distance of 32.8 ft from the source;
 - The peak sound pressure level should not exceed 208 dB (re: 1 $\mu\text{Pa}_{\text{peak}}$) in any single strike, measured at a distance of 32.8 ft from the source.
- For Phase 2 only, pump(s) used for dewatering the construction site will be screened according to NMFS fish screening criteria for anadromous salmonids (NMFS, 1997b). A qualified biologist will be on-site during such pumping activities to ensure that any fish that may be present within the construction area are relocated to suitable habitat near the project area.
- For Phases 1 and 2, during construction operations, the number of access routes, number and size of staging areas, and the total area of the proposed project activity will be limited to the minimum necessary. Routes and boundaries will be clearly demarcated. Movement of heavy equipment to and from the project site will be restricted to established roadways to minimize habitat disturbance. Project-related vehicles shall observe a 20-mile-per-hour speed limit within construction areas, except on County roads and on State and Federal highways. This is particularly important during periods when the snake may be sunning or moving on roadways. All heavy equipment, vehicles, and supplies will be stored at the designated staging area at the end of each work period.
- For Phases 1 and 2, during construction operations, stockpiling of construction materials, portable equipment, vehicles, and supplies will be restricted to the designated construction staging areas and exclusive of the Environmentally Sensitive Areas (ESAs). The applicant will ensure contamination of habitat does not occur during such

operations. All workers will be informed of the importance of preventing spills and appropriate measures to take should a spill occur.

- For Phases 1 and 2, at most 24-hours prior to the commencement of construction activities, the ESA shall be surveyed for giant garter snakes by a USFWS-approved biologist. The biologist will provide the USFWS with a written report that adequately documents the monitoring efforts within 24-hours of commencement of construction activities. The project area shall be re-inspected by the monitoring biologist whenever a lapse in construction activity of two weeks or greater has occurred.
- Construction activity within giant garter snake habitat (*e.g.* aquatic, upland, and rice habitat) shall be conducted between May 1 and October 1. This is the active period for the snake and direct mortality is lessened, because snakes are expected to actively move and avoid danger. If it appears that construction activity may go beyond October 1, the project proponents shall contact the USFWS as soon as possible, but not later than September 15 of the year in question, to determine if additional measures are necessary to minimize take. Construction activities within 200 feet from the banks of snake aquatic habitat will be avoided during the snake's inactive season. **If this is not feasible, the Project Proponent must consult with USFWS to determine measures to avoid impacts to giant garter snake.**
- For Phase 1, a USFWS-approved biologist shall inspect construction-related activities at the ESA to ensure that no unauthorized take of federally listed species or destruction of their habitat occurs. The biologist shall be available for monitoring throughout all phases of construction that may result in adverse effects to the giant garter snake. This includes clearing and grubbing activities and installation of exclusion fence in giant garter snake upland habitat. Furthermore, the biologist shall have the authority through communication with the resident engineer to stop construction activities in the immediate area if a giant garter snake is encountered during construction until appropriate corrective measures have been completed or until the snake is determined to be unharmed. Snakes encountered during construction activities shall be allowed to move away from the area on their own volition. The biologist shall notify the USFWS immediately if any listed species are found on-site, and will submit a report, including date(s), location(s), habitat description, and any corrective measures taken to protect the species found. The biologist shall be required to report any take of listed species to the USFWS immediately by telephone at 916/ 414-6600 and by electronic mail or written letter addressed to the Chief, Endangered Species Division, within three (3) working days of the incident. The Service does not authorize any handling or moving of a giant garter snake by other than a USFWS-permitted biologist.
- For Phases 1 and 2, a Worker Environmental Awareness Training Program for construction personnel shall be conducted by the USFWS-approved biologist for all construction workers, including contractors, prior to the commencement of construction activities. The program shall provide workers with information on their responsibilities with regard to the snake, an overview of the life-history of this species, information on

take prohibitions, protections afforded this animal under the Act, and an explanation of the relevant terms and conditions of this biological opinion. Written documentation of the training must be submitted to the Sacramento Fish and Wildlife Office within 30 days of the completion of training. As needed, training shall be conducted in Spanish for Spanish language speakers.

- For Phases 1 and 2, prior to the commencement of construction activities, high visibility fencing will be erected around the habitats of federally listed species to identify and protect these designated ESAs from encroachment of personnel and equipment. These areas will be avoided by all construction personnel. The fencing shall be inspected by the Contractor before the start of each work day and maintained by the Contractor until completion of the project. The fencing may be removed only when the construction of the project is completed. Fencing will be established in upland immediately adjacent to aquatic snake habitat and extending up to 200 feet from construction activities. Silt fencing, if properly installed, may serve as suitable snake exclusion fencing.
- For Phases 1 and 2, signs will be posted by the Contractor every 50 feet along the edge of the ESAs, with the following information: “This area is habitat of federally-threatened and/or endangered species, and must not be disturbed. These species are protected by the Endangered Species Act of 1973, as amended. Violators are subject to prosecution, fines, and imprisonment.” The signs should be clearly readable from a distance of 20 feet, and must be maintained by the Contractor for the duration of construction.
- For Phases 1 and 2, Best Management Practices (BMPs), including a Storm Water Pollution Prevention Plan (SWPPP) and Water Pollution Control Program (WPCP), will be implemented to minimize effects to the snake during construction. Best management practices will be implemented to prevent sedimentation from entering ESAs and to reduce erosion, dust, noise, and other deleterious aspects of construction related activities. These BMPs may include, but are not limited to, silt fencing, temporary berms, restrictions on cleaning equipment in or near ESAs, installation of vegetative strips, and temporary sediment disposal. Runoff from dust control and hazardous materials will be retained on the construction site and prevented from flowing into the ESAs.
- For Phases 1 and 2, tightly woven fiber netting (mesh size less than 0.25 inch) or similar material shall be used for erosion control and other purposes at the ESA to ensure that the giant garter snake is not trapped or becomes entangled. This limitation shall be communicated to the contractor using special provisions included in the bid solicitation package.
- For Phases 1 and 2, to eliminate an attraction to predators of the snake, all food-related trash items, such as wrappers, cans, bottles, and food scraps, must be disposed of in closed containers and removed at the end of each workday from the entire project site.
- For Phases 1 and 2, the Contractor shall provide documentation that aggregate, fill, or borrow material provided for the proposed project was obtained in compliance with the State Mining and Reclamation Act (SMARA). Evidence of compliance with the Act

shall be demonstrated by providing the resident engineer with one of the following: 1) a letter from the USFWS stating that the use of the borrow pit will not result in the incidental take of species; 2) an incidental take permit for contractor-related activities issued by the USFWS pursuant to section 10(a)(1)(B) of the Act; 3) a biological opinion or letter concurring with a “not likely to adversely affect” determination issued by the USFWS to the Federal agency having jurisdiction over contractor-related services’ 4) a letter from the USFWS concurring with the “no effect” determination for contractor-related activities; or 5) contractor submittal of information to the resident engineer indicating compliance with the SMARA and provision of County land use permits and California Environmental Quality Act (CEQA) clearance.

- For Phases 1 and 2, after construction activities are complete, any temporary fill or construction debris shall be removed and disturbed areas restored to their pre-project conditions. An area subject to “temporary” disturbance includes any area that is disturbed during the project, but that, after project completion, will not be subject to further disturbance and has the potential to be re-vegetated. All ESA snake habitats subject to temporary ground disturbances, including storage and staging areas and temporary roads, will be restored to pre-project conditions. If appropriate, these areas shall also be re-contoured to pre-project conditions. A written report shall be submitted to the USFWS within ten (10) working days of the completion of construction at the project site and restoration of the site to pre-project conditions.
- For Phases 1 and 2, an inspection of the site, with a photo documentation report showing pre- and post-project area photos, will be conducted and photos and a brief report will be submitted to USFWS one year from implementation of restoration to pre-project conditions.
- For Phases 1 and 2, the Contractor shall minimize the potential for harm, harassment, and direct mortality of the snake resulting from project-related activities by implementation of the project. The Contractor shall ensure that the temporary loss of giant garter snake habitat is confined to the proposed project site.
- For Phase 2, aquatic habitat for the snake will be dewatered 15 days prior to the initiation of construction activities. If complete dewatering is not possible, potential snake prey (*i.e.*, fish and tadpoles) will be removed so that giant garter snakes and other wildlife are not attracted to the construction area.
- For Phase 2, a USFWS-approved biologist shall inspect construction-related activities at the proposed project site to ensure that no unauthorized take of federally listed species or destruction of their habitat occurs. The biologist shall be available for monitoring throughout all phases of construction that may result in adverse affects to the giant garter snake. This includes clearing and grubbing and other construction activities in the areas of wetland vegetation/aquatic habitat, adjacent upland habitat, and during exclusion fence installation. Furthermore, the biologist shall have the authority through communication with the resident engineer to stop construction activities in the immediate area if a giant garter snake is encountered during construction until appropriate corrective measures

have been completed or until the snake is determined to be unharmed. Snakes encountered during construction activities shall be allowed to move away from the area on their own volition. The biologist shall notify the USFWS immediately if any listed species are found on-site, and will submit a report, including date(s), location(s), habitat description, and any corrective measures taken to protect the species found. The biologist shall be required to report any take of listed species to the USFWS immediately by telephone at 916/ 414-6600 and by electronic mail or written letter addressed to the Chief, Endangered Species Division, within three (3) working days of the incident. The Service does not authorize any handling or moving of a giant garter snake by other than a USFWS-permitted biologist.

- Prior to the commencement of construction activities, the project proponent shall compensate for the temporary and permanent loss habitat of the giant garter snake according to the Programmatic Guidelines.

**TABLE 2-2
CALFED MSCS SPECIES GOAL AND CONSERVATION MEASURES
FOR SPECIAL-STATUS SPECIES OCCURRING IN THE ACTION AREA**

Species (Scientific Name / Common Name)	Listing Status Federal/ State	MSCS Species Goal	Applicable MSCS Species Specific Conservation Measures
Fish			
<i>Acipenser medirostris</i> North American green sturgeon	FT/CSC	R	<ol style="list-style-type: none"> 1. Coordinate and maximize water supply system operations flexibility consistent with seasonal flow and water temperature needs of the green sturgeon; pursue opportunities to operate new and existing diversions to avoid and minimize adverse effects on green sturgeon, and, to the extent consistent with CALFED objectives, locate the diversion points to avoid the primary distribution of green sturgeon. 2. For all construction activities, limit construction to windows of minimal species vulnerability and implement best management practices (BMPs), including a stormwater pollution prevention plan (SWPPP), toxic materials control and spill response plan, and vegetation protection plan. 3. CALFED actions that have impacts on shallow water habitat will protect and restore in-kind habitat, including habitat features that minimize colonization by undesirable non-native species. 4. Avoid or minimize restrictions on the upward movement of green sturgeon to suitable spawning habitat. 5. Implement applicable conservation measures to avoid, minimize, and compensate for impacts on green sturgeon listed in MSCS Attachment D, "Summary of Potential Beneficial and Adverse Program Effects and Conservation Measures", Table D-19, "Anadromous Fish Group: Summary of Potential Beneficial and Adverse CALFED Effects and Conservation Measures".
<i>Oncorhynchus mykiss</i> Central Valley steelhead	FT/--	R	<ol style="list-style-type: none"> 1. Implement applicable conservation measures to avoid, minimize, and compensate for impacts on Central Valley steelhead listed in MSCS Attachment D, "Summary of Potential Beneficial and Adverse Program Effects and Conservation Measures", Table D-19, "Anadromous Fish Group: Summary of Potential Beneficial and Adverse CALFED Effects and Conservation Measures". 2. For all in-channel and near-channel construction activities, implement construction BMPs (such as erosion and sediment control measures) and conservation measures in the 404 NWP, GPs, and PL84-99 USACE flood relief BOs: <ol style="list-style-type: none"> a. Avoid or minimize channel modifications during time periods when steelhead are vulnerable to the direct and indirect adverse effects of construction activities. b. Avoid or minimize channel modifications in important natal, rearing, and migratory habitats that may result in habitat degradation and diminished habitat connectivity.

**TABLE 2-2
CALFED MSCS SPECIES GOAL AND CONSERVATION MEASURES
FOR SPECIAL-STATUS SPECIES OCCURRING IN THE ACTION AREA**

Species (Scientific Name / Common Name)	Listing Status Federal/ State	MSCS Species Goal	Applicable MSCS Species Specific Conservation Measures
<i>Onchorhynchus tshawytscha</i> Central Valley spring-run Chinook salmon	FT/CT	R	<ul style="list-style-type: none"> c. Avoid, minimize, and compensate for all adverse impacts on instream, shallow-water, riparian, and shaded riverine aquatic habitats resulting from CALFED Actions, including bank protection of in-channel islands, construction of attached berms, and levee program actions. d. Compensate for adverse impacts on habitats by in-kind, onsite replacement of habitats and their functional values. Compensation shall result in a net increase in the extent and connectivity of these habitats for migrating, rearing, and spawning steelhead. <ul style="list-style-type: none"> 3. Implementation of offsite, out-of-kind mitigation that reestablishes access to historical steelhead spawning and rearing habitat may be considered appropriate compensation: <ul style="list-style-type: none"> a. Remove or modify artificial barriers and diversion structures. 4. Fish screens shall be installed in accordance with NMFS/DFG fish screening criteria on any new diversions, consolidated diversions, or on the intake of any existing diversions as a compensation measure. 5. Fully adhere to the terms and conditions of all applicable CESA and FESA biological opinions and permits for CVP and SWP operations. 6. Implement construction BMPs including stormwater pollution prevention plans, toxic materials control and spill response plans, vegetation protection plans, and restrictions on materials used in channel and on levee embankments: <ul style="list-style-type: none"> a. All materials that are used for construction of in-channel structures must meet applicable State and federal water quality criteria. Avoid or minimize the use of such materials that are deleterious to aquatic organisms.
			<ul style="list-style-type: none"> 1. Implement applicable conservation measures to avoid, minimize, and compensate for impacts on Central Valley spring-run Chinook salmon listed in MSCS Attachment D, Table D-19. 2. For all in-channel and near-channel construction activities, implement construction BMPs (such as erosion and sediment control measures) and conservation measures in the 404 NWP, GPs, and PL84-99 USACE flood relief BOs: <ul style="list-style-type: none"> a. Avoid or minimize channel modifications during time periods when spring-run Chinook are vulnerable to the direct and indirect adverse effects of construction activities. b. Avoid or minimize channel modifications in important natal, rearing, and migratory habitats that may result in habitat degradation and diminished habitat connectivity. c. Avoid, minimize, and compensate for all adverse impacts on instream, shallow-water, riparian, and shaded

**TABLE 2-2
CALFED MSCS SPECIES GOAL AND CONSERVATION MEASURES
FOR SPECIAL-STATUS SPECIES OCCURRING IN THE ACTION AREA**

Species (Scientific Name / Common Name)	Listing Status Federal/ State	MSCS Species Goal	Applicable MSCS Species Specific Conservation Measures
			<p>riverine aquatic habitats resulting from CALFED Actions, including bank protection of in-channel islands, construction of attached berms, and levee program actions.</p> <p>d. Compensate for adverse impacts on habitats by in-kind, onsite replacement of habitats and their functional values. Compensation shall result in a net increase in the extent and connectivity of these habitats for migrating, rearing, and spawning spring-run Chinook salmon.</p> <p>3. Implementation of offsite, out-of-kind mitigation that reestablishes access to historical spring-run Chinook salmon spawning and rearing habitat may be considered appropriate compensation:</p> <p>a. Remove or modify artificial barriers and diversion structures.</p> <p>4. Fish screens shall be installed in accordance with NMFS/DFG fish screening criteria on any new diversions, consolidated diversions, or on the intake of any existing diversion that is either enlarged, modified, relocated, or for which the season of use is changed as a result of a CALFED action within the range of spring-run Chinook salmon. CALFED may also install fish screens on existing diversions as a compensation measure.</p> <p>5. Fully adhere to all terms and conditions in all applicable CESA and FESA biological opinions and permits for CVP and SWP operations.</p> <p>6. Implement construction BMPs including stormwater pollution prevention plans, toxic materials control and spill response plans, vegetation protection plans, and restrictions on materials used in channel and on levee embankments:</p> <p>a. All materials that are used for construction of in-channel structures must meet applicable State and federal water quality criteria. Avoid or minimize the use of such materials that are deleterious to aquatic organisms.</p>
<i>Onchorhynchus tshawytscha</i> Central Valley fall/late-fall-run Chinook salmon	FSC/CSC	R	<p>1. Implement applicable conservation measures to avoid, minimize, and compensate for impacts on Central Valley fall-/late-fall-run Chinook salmon listed in MSCS Attachment D, Table D-19.</p> <p>2. For all in-channel and near-channel construction activities, implement construction BMPs (such as erosion and sediment control measures) and conservation measures in the 404 NWP, GPs, and PL84-99 USACE flood relief BOs:</p> <p>a. Avoid or minimize channel modifications during time periods when steelhead are vulnerable to the direct and indirect adverse effects of construction activities.</p> <p>b. Avoid or minimize channel modifications in important natal, rearing, and migratory habitats that may result in</p>

**TABLE 2-2
CALFED MSCS SPECIES GOAL AND CONSERVATION MEASURES
FOR SPECIAL-STATUS SPECIES OCCURRING IN THE ACTION AREA**

Species (Scientific Name / Common Name)	Listing Status Federal/ State	MSCS Species Goal	Applicable MSCS Species Specific Conservation Measures
			<p>habitat degradation and diminished habitat connectivity.</p> <ul style="list-style-type: none"> c. Avoid, minimize, and compensate for all adverse impacts on instream, shallow-water, riparian, and shaded riverine aquatic habitats resulting from CALFED Actions, including bank protection of in-channel islands, construction of attached berms, and levee program actions. d. Compensate for adverse impacts on habitats by in-kind, onsite replacement of habitats and their functional values. Compensation shall result in a net increase in the extent and connectivity of these habitats for migrating, rearing, and spawning steelhead. <p>3. Implementation of offsite, out-of-kind mitigation that reestablishes access to historical fall-/late-fall-run Chinook salmon spawning and rearing habitat may be considered appropriate compensation:</p> <ul style="list-style-type: none"> a. Remove or modify artificial barriers and diversion structures. <p>4. Fish screens shall be installed in accordance with NMFS/DFG fish screening criteria on any new diversions, consolidated diversions, or on the intake of any existing diversion that is either enlarged, modified, relocated, or for which the season of use is changed as a result of a CALFED action within the range of fall-/late-fall-run Chinook salmon. CALFED may also install fish screens on existing diversions as a compensation measure.</p> <p>5. From April through June, avoid increasing the Delta export rate above the currently permitted instantaneous diversion capacity, as described in USACE Public Notice No. 5820A Amended.</p> <p>6. Implement construction BMPs including stormwater pollution prevention plans, toxic materials control and spill response plans, vegetation protection plans, and restrictions on materials used in channel and on levee embankments:</p> <ul style="list-style-type: none"> a. All materials that are used for construction of in-channel structures must meet applicable State and federal water quality criteria. Avoid or minimize the use of such materials that are deleterious to aquatic organisms.
<i>Onchorhynchus tshawytscha</i> Sacramento River winter-run Chinook salmon	FE/CE	R	<ul style="list-style-type: none"> 1. Implement applicable conservation measures to avoid, minimize, and compensate for impacts on Sacramento River winter-run Chinook salmon listed in MSCS Attachment D, Table D-19. 2. For all in-channel and near-channel construction activities, implement construction BMPs (such as erosion and sediment control measures) and conservation measures in the 404 NWP, GPs, and PL84-99 USACE flood relief BOs: <ul style="list-style-type: none"> a. Avoid or minimize channel modifications during time periods when winter-run Chinook are vulnerable to the direct and indirect adverse effects of construction activities.

**TABLE 2-2
CALFED MSCS SPECIES GOAL AND CONSERVATION MEASURES
FOR SPECIAL-STATUS SPECIES OCCURRING IN THE ACTION AREA**

Species (Scientific Name / Common Name)	Listing Status Federal/ State	MSCS Species Goal	Applicable MSCS Species Specific Conservation Measures
<i>Pogonichthys macrolepidotus</i> Sacramento splittail	FSC/CSC		<ul style="list-style-type: none"> b. Avoid or minimize channel modifications in important natal, rearing, and migratory habitats that may result in habitat degradation and diminished habitat connectivity. c. Avoid, minimize, and compensate for all adverse impacts on instream, shallow-water, riparian, and shaded riverine aquatic habitats resulting from CALFED Actions, including bank protection of in-channel islands, construction of attached berms, and levee program actions. d. Compensate for adverse impacts on habitats by in-kind, onsite replacement of habitats and their functional values. Compensation shall result in a net increase in the extent and connectivity of these habitats for migrating, rearing, and spawning spring-run Chinook salmon. <ul style="list-style-type: none"> 3. Implementation of offsite, out-of-kind mitigation that reestablishes access to historical winter-run Chinook salmon spawning and rearing habitat may be considered appropriate compensation: <ul style="list-style-type: none"> a. Remove or modify artificial barriers and diversion structures. 4. Fish screens shall be installed in accordance with NMFS/DFG fish screening criteria on any new diversions, consolidated diversions, or on the intake of any existing diversion that is either enlarged, modified, relocated, or for which the season of use is changed as a result of a CALFED action within the range of spring-run Chinook salmon. CALFED may also install fish screens on existing diversions as a compensation measure. 5. Fully adhere to all terms and conditions in all applicable CESA and FESA biological opinions and permits for CVP and SWP operations. 6. Implement construction BMPs including stormwater pollution prevention plans, toxic materials control and spill response plans, vegetation protection plans, and restrictions on materials used in channel and on levee embankments: <ul style="list-style-type: none"> a. All materials that are used for construction of in-channel structures must meet applicable State and federal water quality criteria. Avoid or minimize the use of such materials that are deleterious to aquatic organisms. <ul style="list-style-type: none"> 1. Consistent with CALFED objectives, limit dredging, diking, and filling of occupied shallow-water habitats. 2. Avoid or minimize the use of hard structures (i.e., riprap) to stabilize banks. 3. Implement applicable conservation measures to avoid, minimize, and compensate for impacts on Sacramento splittail listed in MSCS Attachment D, "Summary of Potential Beneficial and Adverse Program Effects and Conservation Measures," Table D-20, "Estuarine Fish Group: Summary of Potential Beneficial and Adverse CALFED Effects and

**TABLE 2-2
CALFED MSCS SPECIES GOAL AND CONSERVATION MEASURES
FOR SPECIAL-STATUS SPECIES OCCURRING IN THE ACTION AREA**

Species (Scientific Name / Common Name)	Listing Status Federal/ State	MSCS Species Goal	Applicable MSCS Species Specific Conservation Measures
Conservation Measures.”			
Reptiles			
<i>Thamnophis gigas</i> Giant garter snake	FT/CT	r	<ol style="list-style-type: none"> 1. Conduct surveys to determine the occupancy and distribution of the species within suitable habitat that CALFED actions could affect.¹ 2. Restore potentially occupied habitat that would be temporarily degraded by CALFED actions onsite immediately following project completion.
Birds			
<i>Athene cunicularia</i> Western burrowing owl	--/CSC	m	<ol style="list-style-type: none"> 1. Restore or enhance 1-2 acres of suitable nesting habitat for each acre of occupied nesting habitat that is converted to unsuitable nesting habitat as a result of CALFED actions. 2. To the extent consistent with ERP objectives, design and manage grassland and agricultural land habitat restorations and enhancements to provide suitable foraging habitat conditions. 3. Avoid or minimize disturbances that could be associated with implementing CALFED actions near active nest sites during the nesting period (March-August). 4. To the extent consistent with ERP objectives, manage restored or enhanced habitats to maintain desirable rodent populations and minimize impacts associated with rodent control.
<i>Branta hutchinsii leucopareia</i> Cackling (=Aleutian Canada) goose	FD/--/--	m	<ol style="list-style-type: none"> 1. To the extent consistent with ERP objectives, direct proposed actions for improving agricultural habitats for wildlife to protecting and improving traditional wintering habitat.

¹ Note that the Service does not have a ‘protocol-level survey’ for the giant garter snake to determine presence/absence. Determination of species presence is based on habitat characteristics, the most current information about the extant range of the species, surrounding locality records, and the biology and ecology of the snake, and not on presence/absence surveys, which are not effective for this cryptic and evasive species.

**TABLE 2-2
CALFED MSCS SPECIES GOAL AND CONSERVATION MEASURES
FOR SPECIAL-STATUS SPECIES OCCURRING IN THE ACTION AREA**

Species (Scientific Name / Common Name)	Listing Status Federal/ State	MSCS Species Goal	Applicable MSCS Species Specific Conservation Measures
<i>Buteo swainsoni</i> Swainson's hawk	--/CT/--	r	<ol style="list-style-type: none"> 1. Before implementing actions that could result in take or the loss or degradation of occupied habitat, conduct surveys in suitable habitat within portions of the species' range that CALFED actions could affect to determine the presence and distribution of the species. 2. Avoid or minimize actions near locations that support high densities of nesting pairs that could adversely affect high value foraging and nesting habitat. 3. Avoid or minimize actions within 5 miles of active nest sites that could result in disturbance during the breeding period (April-September). 4. To the extent consistent with CALFED objectives, adhere to DFG Region II mitigation guidelines for avoiding or minimizing impacts of actions of the Swainson's hawk.
<i>Riparia riparia</i> Bank swallow	--/CT/--	r	<ol style="list-style-type: none"> 1. Before implementing actions that could result in take or the loss or degradation of occupied habitat, conduct surveys in suitable habitat within portions of the species' range that CALFED actions could affect to determine the presence and distribution of the species. 2. Avoid or minimize actions that could adversely affect known colonies or unoccupied river reaches with eroding banks composed of soils that would provide suitable nesting substrate. 3. Avoid actions near active colonies from April through August.

**TABLE 2-3
CALFED MSCS CONSERVATION MEASURES FOR NCCPA NATURAL COMMUNITIES OCCURRING IN THE ACTION AREA**

NCCPA Natural Community	Applicable MSCS Conservation Measures
Valley Riverine Aquatic Habitat	<ol style="list-style-type: none"> 1. Avoid or minimize disturbance to existing shaded riverine aquatic overhead cover. 2. Restore or enhance 1-3 times the linear footage of affected shaded riverine aquatic overhead cover near where impacts are incurred. 3. To the extent practicable, include project design features that allow for onsite reestablishment and long-term maintenance of shaded riverine aquatic overhead cover following project construction. 4. Avoid or minimize implementing actions during the periods evaluated species are present and could be affected by the actions.
Valley/Foothill Riparian Habitat	<ol style="list-style-type: none"> 1. Avoid or minimize disturbance to existing habitat. 2. Restore or enhance 2-5 acres of additional in-kind habitat for every acre of affected habitat near where impacts are incurred before implementing actions that could result in the loss or degradation of habitat. 3. To the extent practicable, include project design features that allow for onsite reestablishment and long-term maintenance of riparian vegetation following project construction. 4. Avoid or minimize construction activities during the breeding period of evaluated species that could be affected by the actions.
Anadromous Fish Group	<ol style="list-style-type: none"> 1. Implement measures on an emergency basis during extended droughts to protect water supplies dedicated to meet Delta inflow and outflow criteria deemed essential in maintaining anadromous fish populations. Such measures would be implemented infrequently and would be used only to readjust water supplies to levels expected without this set of CALFED actions. Measures may include additional supplies, or emergency provisions that would reduce other water supply demands. Another measure is initially to implement the actions to the extent feasible to determine potential effects on seasonal and critical-year water supplies and develop a long-term water management plan that includes this and other actions to minimize effects of reallocation in other seasons and critical years. 2. Avoid or minimize in-channel construction activities during periods when anadromous fish species are present in high abundance or when life stages are present that are most susceptible to adverse effects associated with implementing actions. 3. To the extent consistent with CALFED objectives, confine additional winter pumping for flooding agricultural lands to times and areas of channels with low densities of anadromous fish. 4. To the extent consistent with CALFED objectives, place consolidated intakes in areas with minimal numbers of juvenile anadromous fish. 5. To the extent consistent with CALFED objectives, include project design features that allow for onsite reestablishment and long-term maintenance of aquatic, wetland, and riparian habitat following project construction. 6. Reductions in unnatural inputs of organic carbon could be replaced with increased natural organic inputs such as from restored tidal wetlands and riparian habitats. 7. Water transfers should be conducted so as not to increase exports during times of the year when anadromous fish are more vulnerable to damage or loss at project facilities or when their habitat may be adversely affected. 8. Design and operate proposed new diversions from the Sacramento River to minimize adverse effects on migrating anadromous fish, to avoid blocking upstream migration of fish to the Sacramento River, and to improve habitat conditions for anadromous fish.
Estuarine Fish Group	<ol style="list-style-type: none"> 1. Implement measures on an emergency basis during extended droughts to protect water supplies dedicated to meet Delta

**TABLE 2-3
CALFED MSCS CONSERVATION MEASURES FOR NCCPA NATURAL COMMUNITIES OCCURRING IN THE ACTION AREA**

NCCPA Natural Community	Applicable MSCS Conservation Measures
	<p>inflow and outflow criteria deemed essential in maintaining anadromous fish populations. Such measures would be implemented infrequently and would be used only to readjust water supplies to levels expected without this set of CALFED actions. Measures may include additional supplies, or emergency provisions that would reduce other water supply demands. Another measure is initially to implement the actions to the extent feasible to determine potential effects on seasonal and critical-year water supplies and develop a long-term water management plan that includes this and other actions to minimize effects of reallocation in other seasons and critical years.</p> <ol style="list-style-type: none"> 2. To the extent consistent with CALFED objectives, construct and operate in-channel barriers and restrictions to provide sufficient leeway to adjust hydraulics in various channels to ensure fish are not being drawn in greater numbers or proportions toward the pumps or being affected by poor water quality. Implement monitoring and testing necessary to design, construct, and operate barriers and restrictions. Develop and implement procedures and operating criteria for barrier systems to protect fish. Implement monitoring and testing necessary to ensure against excessive movement of fish toward the south-Delta pumping plants. 3. Avoid or minimize in-channel construction activities during periods estuarine fish species would be most susceptible to adverse effects that could be associated with implementing proposed actions. 4. Avoid or minimize implementing proposed actions in occupied habitat areas that could have a substantial adverse effect on the distribution or abundance estuarine fish species. 5. To the extent practicable, confine additional pumping to times and area to channels with minimal concentrations of fish. 6. Install screens on new diversions to avoid entrainment of juvenile and adult estuarine fish. 7. Include project design features that allow for onsite reestablishment and long-term maintenance of aquatic, wetland, and riparian habitat following project construction. 8. Reductions in unnatural inputs of organic carbon could be replaced with increased natural organic inputs such as from restored tidal wetlands and riparian habitats. 9. Water transfers should be conducted in a manner that avoids increased exports during periods when estuarine fish are more vulnerable to damage or loss at project facilities. 10. Design and operate proposed new diversions from the Sacramento River to minimize adverse effects on migrating native estuarine fishes, to avoid blocking upstream migration of fish to the Sacramento River, and to improve habitat conditions for native estuarine fish.

CHAPTER 3

Environmental Baseline

The following chapter presents species accounts for species assessed in detail in this ASIP. The species addressed in this ASIP are those special-status species that may be affected or whose habitat may be affected by the Proposed Project/Action.

Species selected for detailed analysis include those federal- and/or state-listed species, candidate species, and/or species of special concern covered by the CALFED MSCS and potentially affected by the Proposed Project/Action. The following table shows these selected species which are addressed in detail in the ASIP.

Designated Critical Habitat and delineated Essential Fish Habitat in the Action Area are also discussed.

**TABLE 3-1
SPECIES, CRITICAL HABITAT, AND ESSENTIAL FISH HABITAT
ADDRESSED IN DETAIL IN THIS ASIP**

Species
<ul style="list-style-type: none"> • North American green sturgeon (Southern DPS) (<i>Acipenser medirostris</i>) • Central Valley steelhead (<i>Oncorhynchus mykiss</i>) • Central Valley fall/late fall-run Chinook (<i>Oncorhynchus tshawytscha</i>) • Central Valley spring-run Chinook (<i>Oncorhynchus tshawytscha</i>) • Sacramento River winter-run Chinook (<i>Oncorhynchus tshawytscha</i>) • Sacramento splittail (<i>Pogonichthys macrolepidotus</i>) • Giant garter snake (<i>Thamnophis gigas</i>) • Western burrowing owl (<i>Athene cunicularia</i>) • Cackling (=Aleutian Canada) Goose (<i>Branta hutchinsii leucopareia</i>) • Swainson's hawk (<i>Buteo swainsoni</i>) • Bank swallow (<i>Riparia riparia</i>)
Critical Habitat
<ul style="list-style-type: none"> • Central Valley steelhead Critical Habitat • Central Valley spring-run Chinook salmon Critical Habitat • Sacramento River winter-run Chinook salmon Critical Habitat
Essential Fish Habitat
<ul style="list-style-type: none"> • Pacific salmon Essential Fish Habitat

3.1 Baseline Conditions for Species

The stretch of the Sacramento River that includes the Action Area is part of a migratory corridor for adult Sacramento River winter-run Chinook salmon, Central Valley spring-run Chinook salmon, and Central Valley steelhead, and provides migration and rearing habitat for juveniles of these species. A large proportion of all Federally listed Central Valley salmonids are expected to utilize aquatic habitat within the Sacramento River in the Action Area. The Sacramento River also functions as a migratory and holding corridor for adult and rearing and migratory habitat for juvenile Southern DPS of North American green sturgeon. The entire population of migrating adults and emigrating juvenile winter-, and Central Valley spring-run Chinook salmon, and a majority of Central Valley steelhead, must pass by/through the Action Area. The following section provides life history information for these special-status species with potentially affected by the Proposed Project/Action.

3.1.1 North American Green Sturgeon

On April 7, 2006, NMFS listed the Southern Distinct Population Segment (DPS) of the North American green sturgeon as threatened, although Critical Habitat for the green sturgeon has not yet been determined. Sturgeon are an anadromous fish species, spending the majority of their life in marine waters and then moving into freshwater throughout the fall and winter to spawn in the spring. Upon hatching the young green sturgeon develop in the fresh water and are known to return to the ocean within one to four years (COSEWIC, 2004). Historically, green sturgeon was found in the lower reaches of the San Joaquin River and Delta. Today, they occur in the upper Sacramento River and tributaries to the Sacramento River including the Feather, Yuba and American Rivers. Green sturgeon is frequently caught along the coast, but is present in limited numbers in the estuaries (COSEWIC, 2004).

The green sturgeon has diverse habitat needs ranging from freshwater streams, rivers, estuarine habitat as well as marine waters depending upon their life stage. The specific habitat requirements for green sturgeon are poorly understood but are thought to resemble those of white sturgeon. Green sturgeon spawning is thought to occur in deep pools in areas of large cobbles, but can range from clean sand to bedrock in turbulent river mainstems. The larger eggs and higher growth rates of developing green sturgeon in comparison to white sturgeon suggest that a higher oxygen demand may be required for proper embryonic development. Therefore, green sturgeon may subsequently require colder, cleaner water for spawning relative to white sturgeon (COSEWIC, 2004).

The spawning population of the Southern DPS of North American green sturgeon is currently restricted to the Sacramento River below Keswick Dam. This population is composed of a single breeding population which must pass by/through the Action Area. Adults migrate upstream by/through the Action Area primarily between March and June (Adams *et al.* 2002), and small groups of juveniles have been captured at various locations on the Sacramento River as well in the Delta (downstream of Sacramento) during all months of the year (IEP Database, Borthwick *et al.* 1999). Therefore, within the Action Area, green sturgeon are likely to occur within the riverine aquatic habitat of the Sacramento River year-round (**Figure 2-2, Figure 2-3, and Figure 2-4**).

3.1.2 Central Valley Steelhead

The Sacramento and San Joaquin Rivers offer the only migration route to the drainages of the Sierra Nevada and southern Cascade mountain ranges for steelhead. Information on migration and spawning tendencies of steelhead is difficult to determine due to the low abundance of spawners and the high flows and turbid waters occurring during winter spawning periods. NMFS reports limited data on the recent abundance of this ESU, but its present total run size based dam counts, hatchery returns, and past spawning surveys is probably less than 10,000 fish (NMFS, 1996). The most widespread run type of steelhead is in the winter (ocean-maturing) steelhead. Winter steelhead occur in essentially all coastal rivers in California, while summer steelhead are far less common. In California, both winter and summer steelhead generally begin spawning in December. Spawning occurs December through April in the Sacramento River mainstem and tributaries. Eggs are buried by the females in the loose gravel, usually at the lower end of a pool. Newly hatched larvae (alevins) initially stay in the gravel nesting area until their yolk sacs are absorbed (about two weeks) and then move into adjacent shallow and quiet pools. Juvenile steelhead remain in freshwater streams from one to three years before entering the ocean. Downstream migration predominantly occurs during fall and spring. Generally, steelhead will return to their natal streams in one to three years.

Adult steelhead typically migrate upstream within the Sacramento River during the winter (November - January) to spawning areas upstream of the proposed diversion locations and juvenile smolts migrate downstream during the spring (March – May). Steelhead inhabit the upper Sacramento River and occur seasonally in the vicinity of the proposed diversion locations. The proportion of steelhead in this DPS that migrate through the Action Area is unknown; however, because of the relatively large amount of suitable habitat in the Sacramento River relative to the San Joaquin River, the proportion of steelhead is probably high. At the Proposed diversion locations, there is limited quality juvenile rearing habitat (aquatic riverine habitat) in the Sacramento River – the vegetation along the shore and on the levee bank consists of ruderal vegetation, and on the levee, the vegetation is maintained annually by burning (**Figure 2-2**, **Figure 2-3**, and **Figure 2-4**). Riparian vegetation both upstream and downstream of the Proposed diversions, and at the existing Grimes and Drexler Diversions, provide suitable shaded riverine aquatic likely to be suitable rearing habitat. However, when the majority of juvenile steelhead emigrate as yearlings, they are assumed to be primarily utilizing the center of the channel rather than the shoreline.

Adult steelhead may be present in the Action Area from June through March, with the peak occurring between August and October (Bailey 1954, Hallock *et al.* 1957). Juvenile steelhead emigrate through the Sacramento River from late fall to spring. Given the timing of migrations and emigrations of adults and juveniles, Central Valley steelhead may be expected to occur in the Sacramento River near and within the Action Area from June through March.

3.1.3 Central Valley Spring-Run Chinook Salmon

Chinook salmon runs (fall-run, late fall-run, winter-run, and spring-run) are named for the time of season that upstream spawning migration occurs, and are defined by the combined timing of adult migration, the amount of time juveniles reside in a stream, and the time of year the smolts migrate out to sea. Timing of adult upstream migration varies within individual runs depending upon the region (Yoshiyama, 1998). Central Valley spring-run Chinook enter the Sacramento River system from March to July, and spawning occurs from late August through early October (Yoshiyama, 1998). Due to the longer period of time between upstream migration and spawning, spring-run Chinook must hold out in the cold temperatures of mountain headwaters to avoid excessive summertime temperatures of the valley and foothills. Spring-run ascent to mountain elevations can only be accomplished if there are no obstructions within the drainage system preventing passage.

Life histories (migration, holding, spawning, rearing, and juvenile emigration) of Chinook salmon vary within the separate runs, but essential habitat requirements including substrate, temperature, dissolved oxygen, stream flow, and water quality are consistent throughout the runs. Chinook salmon require a water temperature from 43° to 56° F to successfully spawn (Boles, 1988). Spawning can occur in habitats ranging from small tributaries to large river beds, and generally requires coarse gravel riffles. Chinook salmon eggs incubate in the gravel for approximately 35 to 50 days, depending on the temperature. The newly emerged fry remain in the gravel until most of the yolk sac is absorbed.

Successful rearing of juvenile Chinook requires cool streams/rivers with significant vegetative cover providing shade for protection from predation. Emigration strategies within the Sacramento-San Joaquin system can vary depending on the time of emergence. Spring-run emigration timing is dependant upon the tributaries of origin, and can occur through the period of November through June. Based upon Butte Creek research conducted by CDFG, over 95% of spring-run emigrate as fry/young-of-the-year. Only a small portion of the population will over-summer emigrating the subsequent fall as yearlings (McReynolds et al., 2006).

Adult Central Valley spring-run Chinook salmon are expected on the Sacramento River between March and July (Myers *et al.* 1998, Good *et al.* 2005). Peak presence is believed to be during February and March (CDFG 1998). In the Sacramento River, juveniles may begin migrating downstream almost immediately following emergence from the gravel with most emigration occurring from December through March (Moyle *et al.* 1989, Vogel and Marine 1991). Snider and Titus (2000) observed that up to 69 percent of spring-run Chinook salmon emigrate during the first migration phase between November and early January. The remainder of the Central Valley spring-run Chinook salmon emigrate during subsequent phases that extend into early June. The exact composition of the age structure is not known, although populations from Mill and Deer Creek primarily emigrate as yearlings (Colleen Harvey-Arrison, CDFG, pers. comm., 2004), and populations from Butte Creek primarily emigrate as fry (Ward *et al.* 2002). Younger juveniles are found closer to the shoreline than older individuals (Healey 1991).

Given the timing of migrations and emigrations of adults and juveniles, Central Valley spring-run Chinook may be expected to occur in the Sacramento River near and within the Action Area from November through June.

3.1.4 Central Valley Fall/Late Fall-Run Chinook Salmon

Although fall/late fall-run Chinook salmon inhabit a number of watersheds within the Central Valley for spawning and juvenile rearing, the largest populations occur within the mainstem Sacramento River, Feather River, Yuba River, American River, Mokelumne River, Merced River, Tuolumne River, and Stanislaus River. Fall/late fall-run Chinook salmon, in addition to spawning in these river systems, are also produced in fish hatcheries located on the Sacramento River, Feather River, American River, Mokelumne River, and Merced River. Hatchery operations are intended to mitigate for the loss of access to upstream spawning and juvenile rearing habitat resulting from construction of dams and reservoirs within the Central Valley in addition to producing fall/late fall-run Chinook salmon as part of the ocean salmon enhancement program to support commercial and recreational ocean salmon fisheries. Fall/late fall-run Chinook salmon also support an inland recreational fishery.

Adult fall/late fall-run Chinook salmon migrate from the coastal marine waters upstream through San Francisco Bay, Suisun Bay, and the Delta during late summer and early to late fall (approximately late July – early December). Spawning occurs between October and December with the greatest spawning activity occurring typically in November and early December. A portion of the fry population migrate downstream soon after emergence, where they rear within the lower river channels, Delta, and estuary, including Suisun Bay and the lower reaches of channels within the marsh, during the spring months. The remaining portion of juvenile salmon continue to rear in the upstream stream systems through the spring months, until they are physiologically adapted to migration into saltwater (smolting), which typically takes place between April and early June. A small proportion of the Chinook salmon juveniles may, in some systems, rear through the summer and fall months migrating downstream during the fall, winter, or early spring as yearlings. Adult Chinook salmon spawn at ages ranging from approximately two to five years, with the majority of adult fall-run Chinook salmon returning at age three.

Given the timing of migrations of adults and the potential for juveniles to linger within the Sacramento River system, Central Valley fall/late fall-run Chinook may be expected to occur in the Sacramento River near and within the Action Area all the months of the year.

3.1.5 Sacramento River Winter-Run Chinook Salmon

Winter-run Chinook salmon generally begin migrating upstream from December through February and hold-over in the Sacramento River system for a couple of months before peak spawning occurs between May and July (Groot, p. 319, 1998). Temperatures must be suitable for the winter-run to hold over. Winter-run Chinook emigration to the Delta has been known to occur from November through April, after only four to seven months of river life (Groot, p. 319, 1998). Juveniles may exhibit a sustained residence in the middle or lower Sacramento River or Upper Delta prior to seaward migration. Juvenile Sacramento River winter-run Chinook salmon

migration patterns in the Sacramento River can best be described by temporal migration characteristics found by the USFWS (2001) in beach seine captures along the lower Sacramento River between Sacramento and Princeton. Beach seining samples the shoreline rather than the center of the channel, as is often the case in rotary screw traps and trawls, and is considered the most accurate sampling effort in predicting the nearshore presence of juvenile salmonids. In the Sacramento River, between Princeton and Sacramento, juveniles are expected between September and mid April, with highest densities between December and March (USFWS 2001). Rotary screw trap work at Knights Landing on the Sacramento River by Snider and Titus (2000) captured juveniles between August and April, with heaviest densities observed first during November and December, and second during January through March. The largest captures occurred during periods of sustained high flow, generally greater than 20,000 cfs.

Adult winter-run typically migrate to spawning areas upstream of the proposed diversion locations, and occur seasonally in the vicinity of the proposed diversion locations. Adult Sacramento River winter-run Chinook salmon are expected to be present in the Sacramento River near and within the Action Area between November and June (Myers *et al.* 1998, Good *et al.* 2005) as they migrate to spawning grounds. Juveniles are expected to occur within the Sacramento River near and within the Action Area from September through April. Suitable winter-run Chinook rearing habitat occurs in the vicinity of the existing diversions, although at the locations of the Proposed new diversions, rearing habitat is absent.

3.1.6 Sacramento Splittail

The Sacramento splittail was recently (2003) delisted as a threatened species by the USFWS, but remains a State and Federal Species of Concern. The Sacramento splittail is endemic to the sloughs, lakes, and rivers of the Central Valley. In the Sacramento Valley, they were found in early surveys as far up the Sacramento River as Redding (below the Battle Creek Fish Hatchery in Shasta County), in the Feather River as high as Oroville, and in the American River to Folsom (Rutter 1908). Today they are found most frequently in the Sacramento River below the mouth of the Feather River and become increasingly rare in an upstream direction, particularly during summer and fall. A few individuals have been found annually in the Sacramento River at Red Bluff Diversion Dam, at Hamilton City, at the entrance to the Glenn Colusa irrigation diversion, and at the mouth of Big Chico Creek (Moyle *et al.*, 2004).

Splittail live 7-9 years, tolerate a wide range of environmental conditions, and have high fecundity. Typically, adults migrate upstream in January and February and spawn on seasonally inundated floodplains in March and April. In May the juveniles migrate back downstream to shallow, brackish water rearing grounds, where they feed on detritus and invertebrates for 1-2 years before migrating back upstream to spawn. Seven long-term sampling programs in the estuary indicate that the splittail population is maintained by strong year classes resulting from successful spawning in wet years, although some spawning occurs in all years. The Sacramento splittail may be expected to occur in the Sacramento River near and within the Action Area from January through May.

3.1.7 Giant Garter Snake

Giant garter snake preys primarily on aquatic species such as fish and amphibians; both native and introduced species are taken. Generally active from April through September, the giant garter snake breeds from March into May, and again briefly in September. Young are brooded internally by females, who give birth to 10 to 46 (average is 23) live young from late July into September. Young disperse into dense cover and reabsorb their yolk sacs, then begin feeding on their own. They reach sexual maturity in three to five years. From early October to April, the giant garter snake takes refuge in winter retreats and is generally not active (USFWS, 1999).

The giant garter snake is endemic to wetlands of California's Central Valley. This snake inhabits irrigation and drainage canals, rice lands, marshes, sloughs, ponds, small lakes, low-gradient streams, and adjacent uplands. The snake requires enough water during their active season to maintain high densities of prey; emergent wetland vegetation for cover and foraging; and adjacent uplands and openings in streamside vegetation for basking sites. Higher uplands are used for cover and refuge from floodwaters during their non-active season. The giant garter snake is typically absent from wetlands with sand, gravel, or rock substrates, and from riparian woodlands.

The giant garter snake population was probably always disjunct, with a southern population occurring from the vicinity Buena Vista Lake in Kern County to Merced County, and a northern population occurring from San Joaquin County to Butte County. To the east and west, the populations were probably confined by the foothills of the Sierra Nevada Mountains and the Coast Ranges. There are 13 separate populations presently recognized by the USFWS, coinciding with historic flood basins and tributary streams in the Central Valley (USFWS, 1999). These populations are discontinuously distributed from the Fresno area in the south to Butte Creek in the north. Dispersal corridors do not exist between the populations.

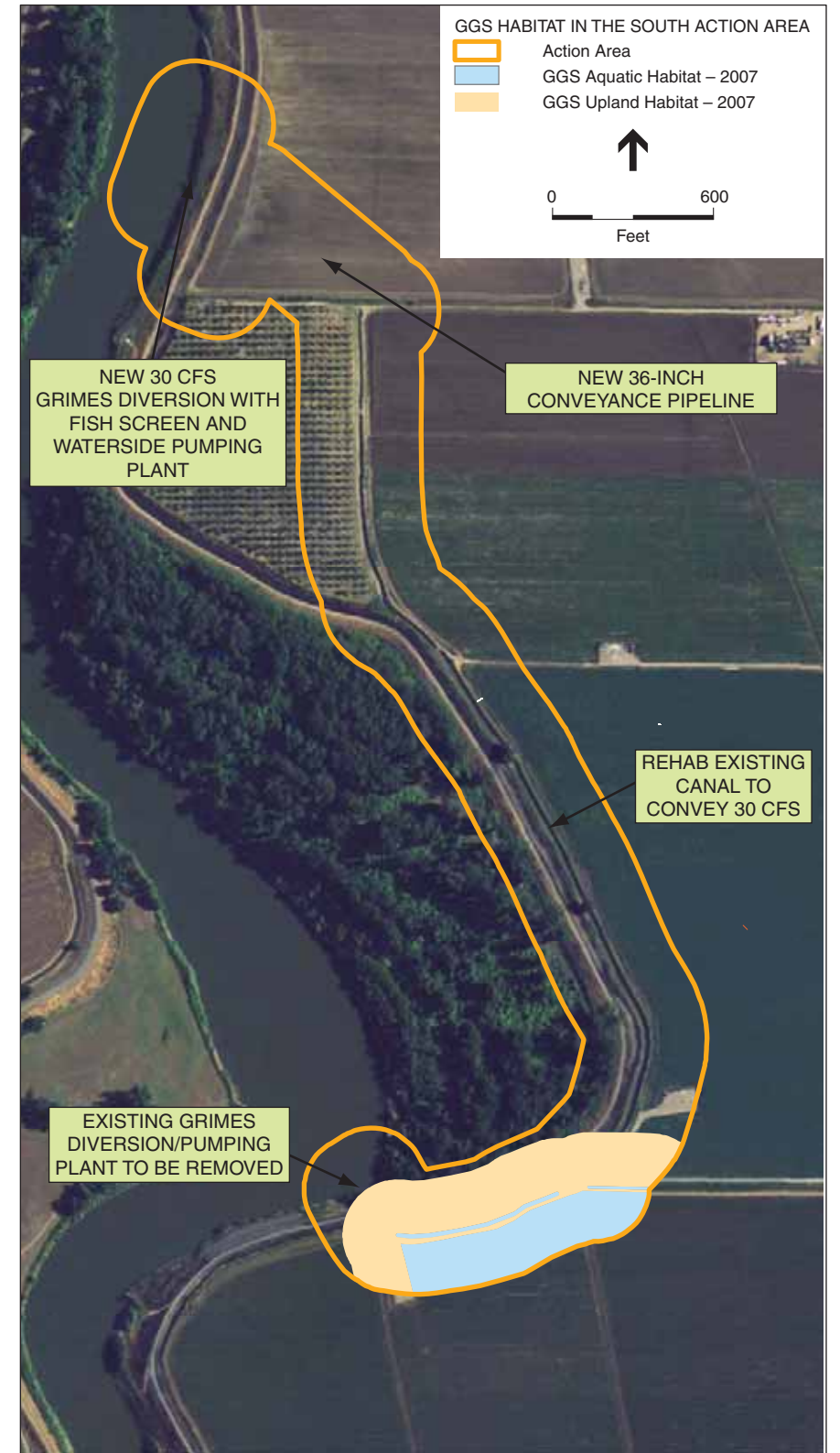
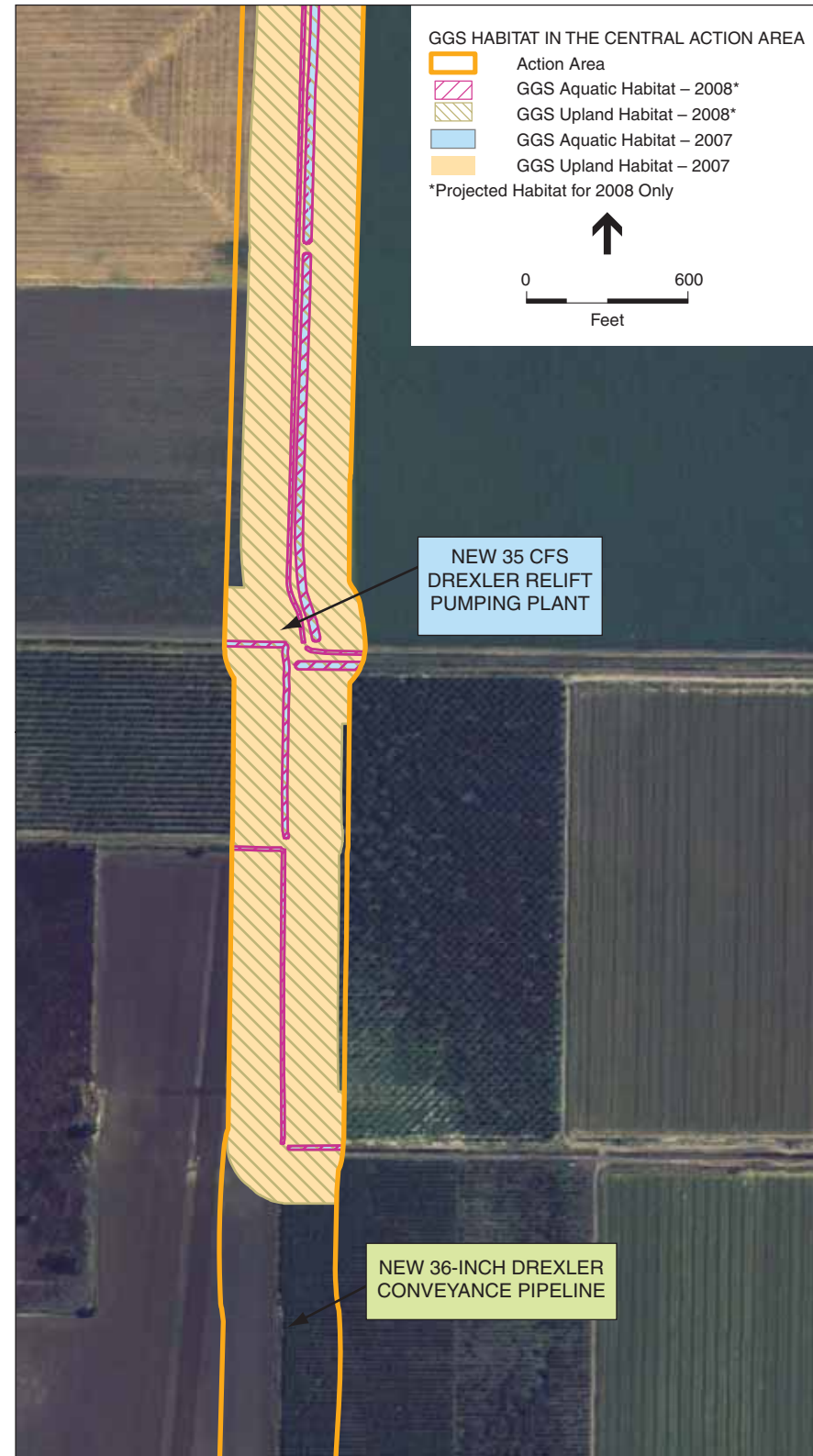
Giant garter snakes have been recorded in one location near the Action Area. The record dates back to 1983 and is approximately six miles southwest of the Action Area (CNDDDB, 2006). No giant garter snakes were observed during field reconnaissance for this project; however, given the cryptic and evasive nature of this species, determination of presence more often relies on the habitat characteristics, the most current information about the extant range of the species, surrounding locality records, and the biology and ecology of the giant garter snake.

Agricultural land use within the region generally provides suitable giant garter snake habitat, with abundant rice fields and associated irrigation ditches, rodent burrows for upland refugia, and open upland areas for basking. Within the Action Area, there are several types of drainage ditches that border various types of crops (including rice). The availability of emergent or aquatic vegetation for cover and basking sites varies with each ditch, season, and the operations of MFWC within a given year. A description of the potential giant garter snake habitat within the Action Area is provided below and is depicted in **Figure 3-1**. Within the Action Area, all habitats within 200' of suitable giant garter snake aquatic habitat are considered either aquatic or upland habitat for the snake. However, upland areas that are covered by a walled structure such as a building or more than 200' from suitable aquatic habitat are generally not considered suitable habitat for giant garter snake.

Aquatic Habitat

Rice Fields

Rice is a common crop grown within the Proposed Project/Action Area, and there are rice fields within the MFWC Service Area. In the 2007 growing season, there was one organic rice field within the Action Area, on the Park Farming Property in the vicinity of the Grimes canal improvements. For the 2008 growing season, rice fields are planned on the Gusti Properties, located along the Main Canal improvements within the Action Area (**Figure 3-1**). Because rice fields are inundated through the spring and summer, during the giant garter snake's active period, and because rice provides suitable vegetative cover, rice fields within the Action Area provide suitable habitat for the giant garter snake.



Irrigation Drains, Ditches, and Canals

There are several types of conveyances within the Action Area, ranging from wide, concrete-lined canals for irrigation delivery to relatively shallow, unstructured seep ditches used to collect minor drainage from fields. As previously mentioned, the giant garter snake's specific habitat requirements include the presence of aquatic habitat during its active period, the availability of aquatic vegetative cover, basking sites, and prey during the active period, and the availability of upland refugia (generally within 200 feet of suitable aquatic habitat) during the inactive period. Each type of ditch may provide some, all, or none of the required elements that define giant garter snake habitat, depending on MFWC maintenance and operations, as well as the individual farmer's agricultural practices, including which crops are grown in the fields. Following field visits to the site, analysis of collected data, and informal consultation with USFWS biologists, it was determined that the only ditches that are suitable aquatic habitat for giant garter snake are select drains belonging to Reclamation District 70, and portions of the Main Canal that are within 200 feet of suitable aquatic habitat. These drains are described in further detail in this chapter. In addition, the other types of conveyances are also described to document why they were excluded as suitable giant garter snake habitat under current conditions. **Figure 2-2, Figure 2-3, and Figure 2-4** show all types of ditches within the Action Area, and **Figure 3-1** shows the drains that are considered suitable giant garter snake aquatic habitat. A summary of suitable aquatic habitat for giant garter snake is included in **Table 3-2**.

Reclamation District 70 Drains

Some of the Reclamation District 70 drains (Reclamation Drains) are suitable aquatic habitat for giant garter snake, as they provide all the criteria necessary to support giant garter snake during its active and inactive periods. The Reclamation Drains are larger drainage ditches that follow along and adjacent to the Main Canal and are used by MFWC for water delivery or drainage. The locations of the Reclamation drains within the Action Area are shown in **Figure 2-2, Figure 2-3, and Figure 2-4**. These are unlined ditches up to 30 feet wide and five to six feet deep, and are typically vegetated with common tule (*Scirpus acutus*) and cattail (*Typha latifolia*). The Reclamation District maintains the drains for vegetation removal by burning and/or baling, on average approximately every two or three years, depending on how much the drain is used. Some drains may go without maintenance for longer periods if they do not receive significant drainage flows. Many of the Reclamation Drains hold water throughout the spring and summer, and presumably support aquatic invertebrates, amphibians, and small fish species. Reclamation Drains that were suitable in the 2007 growing season are considered suitable for 2008. Some Reclamation Drains, although they did not hold water in 2007, are located adjacent to fields that will be planted with rice for the 2008 growing season, and therefore are considered suitable aquatic habitat for giant garter snake in 2008. The select Reclamation Drains that are considered suitable aquatic habitat for giant garter snake within the Action Area are shown in **Figure 3-1**, and represented in **Photo 7, Appendix B**.

Main Canal

The aquatic habitat of the Main Canal is not suitable for giant garter snake, except for where it is 200 feet or less from otherwise suitable giant garter snake aquatic habitat, be it a Reclamation Drain, natural suitable wetlands, or rice field. The Main Canal is a concrete-lined ditch for the majority of its alignment. It is used to convey and deliver water from the Meridian

Diversion/Pumping Plant south to the central portion of the MFWC Service Area during the spring and summer. The Main Canal in the Action Area begins at the Meridian Diversion to its intersection with Summy Road as shown in **Figure 2-2**, **Figure 2-3**, and **Figure 2-4**.

Approximately 12 feet wide and 6 feet deep, the Main Canal typically does not support vegetation along its banks. Ruderal vegetation may grow along the unlined freeboard of the canal or along unlined portions of the canal, but this vegetation is regularly removed several times during the spring and summer. Control methods include application of herbicide three times per year and mowing three times per year. Although an aquatic grass grows within portions of the Main Canal during the summer, it is sparsely distributed and does not provide adequate structure or cover for giant garter snake. During the fall and winter, the Main Canal is no longer used for conveyance and remains dry until the next spring. A portion of the Main Canal is shown in **Photo 8, Appendix B**.

Another concrete-lined ditch in the northern portion of the Action Area, called the “Railroad Ditch,” has the same characteristics as the Main Canal and is not considered suitable aquatic habitat for giant garter snake because it does not provide the necessary cover and it is not within 200 feet of suitable aquatic habitat (**Figure 2-4**).

Water Delivery Ditches

Ditches used for water delivery are generally not considered suitable aquatic habitat for giant garter snake due to the lack of emergent aquatic vegetation for cover and basking, and/or lack of consistent water within the ditches during the snake’s active period. However, some delivery ditches within 200 feet or less from suitable giant garter snake aquatic habitat may be used by the snake. In addition to the Main Canal, these smaller (3-4 feet wide), unlined, earthen ditches are used to deliver irrigation water throughout the MFWC Service Area. Within the Action Area, these delivery ditches are located along the conveyance improvements in the Proposed Project/Action and are depicted in **Figure 2-2**, **Figure 2-3**, and **Figure 2-4**. A view of a typical delivery ditch is shown **Photo 9, Appendix B**. Similar to the Main Canal, the delivery ditches receive regular maintenance to remove all vegetation that grows within the ditches and along its banks. The vegetation removal occurs several times during the spring and summer – usually at least once and up to six times per year, depending on how often the maintenance is needed. Control methods include herbicide treatment, burning, and/or baling. These delivery ditches convey water at specified times during the spring and summer months and are controlled by MFWC operations. A few ditches hold water throughout the growing season, but the majority of the delivery ditches only hold water for one week during each month during the growing season while MFWC delivers water to its clients. Therefore, although there may be water in these ditches during the snake’s active period, it is not of sufficient duration to support giant garter snake aquatic habitat.

Seep Ditches

Seep ditches within the Action Area generally do not provide suitable aquatic habitat for giant garter snake, except where they are sufficiently wet, vegetated, unmaintained and/or in proximity to other aquatic habitat, including rice fields. Seep ditches, if not in a condition to be aquatic habitat for giant garter snake, are upland habitat for the snake if they are within 200’ of suitable giant garter snake aquatic habitat. These earthen, unlined ditches are on the edges of crop fields and serve to drain excess moisture from the fields. Seep ditches are dug by farmers within their

fields; therefore, the maintenance and even existence of these ditches is up to the farmers' discretion. These ditches are on average three to four feet wide and are located throughout the Action Area (**Figure 2-2, Figure 2-3, and Figure 2-4**). The seep ditches that appeared to be unmaintained during the 2007 growing season supported ruderal species such as Johnsongrass, prickly lettuce, and Italian thistle up to three feet tall (**Photo 10, Appendix B**). Because these ditches are not used for water delivery or large-flow drainage, they do not consistently hold water during the spring and summer unless they are adjacent to a rice field, for which the entire field is flooded. The ditches only receive rainwater in the winter, during the giant garter snake's inactive period. The only places where the ditches might be inundated during the snake's active period are where these ditches are located adjacent to rice fields, which are flooded during the spring and summer. During the 2007 growing season, the only rice fields identified within the Action Area, shown in **Figure 3-1**, are in the vicinity of the Grimes conveyance improvements. A map of crop types projected for 2008 for the general project region is also included in **Figure A-1** of the ASIP (**Appendix A**). The projected locations of rice fields in the Action Area for the 2008 growing season are shown in this figure as well. Currently no seep ditches are located within any rice fields in 2008.

Upland Habitat

Within the Action Area, upland refugia for the giant garter snake exist primarily as burrows made by small burrowing mammals such as ground squirrels and gophers. Upland burrows up to 200 feet from aquatic habitat are considered to be suitable refugia for giant garter snake. Open areas within 200 feet from aquatic habitat may also provide suitable basking habitat for giant garter snake during its active season. Small mammal burrows and basking habitat vary in location and quantity, but are generally available along the upper banks of ditches and unpaved areas, along and including roads or cultivated fields (the widths vary from five to 20 feet) (**Photo 11, Appendix B**). Earthen berms along agricultural fields may also support small mammal burrows.

Summary of Giant Garter Snake Habitat

Table 3-2 below summarizes the potential habitats available in the Action Area for the giant garter snake. The calculations were based on mapped locations of the crop types for 2007 and the projected crop types for 2008; and the locations of the drains, ditches, and canals within the Action Area. It should be noted that a few projections for crop types in 2008 – especially along Phase 2 of the Proposed Action – may change, as the type of crop planted is up to the individual farmer's discretion. Suitable aquatic habitats were determined to include all waterways with vegetative cover with adequate water during the snake's active season. Ditches that had an adequate water supply during the active season but did not have vegetative cover were included as aquatic habitat only if they were within 200 feet of suitable aquatic habitat. Upland habitats were determined to include all lands not covered by a walled structure, such as a building, within 200 feet of suitable aquatic habitat. All upland habitats with rodent burrows are suitable refugia for the giant garter snake during their inactive season, and all other upland habitats without refugia may be used by the giant garter snake for basking. Cropland is also included as upland habitat, although its utility to the giant garter snake may be limited and highly variable, depending on the type of crop.

**TABLE 3-2
SUMMARY OF SUITABLE GGS HABITAT IN THE ACTION AREA**

Habitat Type	2007		2008	
	Lineal feet	Acres	Lineal feet	Acres
AQUATIC:				
Rice Fields	--	3.9	--	15.7
Reclamation Drains	6,953.6	4.0	8,229.1	4.5
Main Canal	4,484.2	1.2	6,964.1	1.9
Delivery Ditches	992.6	0.3	140.3	0.03
UPLAND				
	--	61.0	--	62.3

3.1.8 Western Burrowing Owl

The western burrowing owl inhabits open grasslands and shrub lands with perches and burrows. These owls eat mainly insects, with small mammals, reptiles, and birds making up a portion of the diet as well. For cover and breeding, old rodent burrows, as well as debris piles are used. The western burrowing owl generally breeds from March through August, peaking in April and May.

In the Action Area, potential nest/burrow sites occur in unpaved and relatively undisturbed upland areas, such as along earthen berms and unpaved roads and turnouts. The relatively-exposed banks and levees of the Sacramento River and drainage canals may also provide suitable habitat.

3.1.9 Cackling (=Aleutian Canada) Goose

The cackling goose is a small, island-nesting subspecies of the Canada goose. This subspecies nests on the Aleutian Islands and winters in the Central Valley where it forages in meadows, agricultural fields, pastures, and moist grasslands near open water (lakes and ponds) and wetlands. The cackling goose was federal-listed endangered in 1967 due to a severe decline in populations. Hunting and loss of migration and wintering habitat contributed to this species' decline, although the introduction of Arctic and red foxes to the breeding islands was the main reason for population decline. However, due to reintroductions of wild geese onto fox-free islands and other conservation efforts, populations of cackling goose have recovered from approximately 6,300 individuals in 1989 to 37,000 individuals in 1999. The cackling goose was reduced to federal-listed threatened status in 1989, and finally delisted in 2001 (FR 66:54, 15642-15656, March 2001). Monitoring of goose populations will continue for 5 years after delisting, as required by the Endangered Species Act to ensure full recovery of the species. The cackling goose is still protected under the Migratory Bird Treaty Act, and is a federal species of concern.

Within the Action Area, suitable foraging habitat exists in the surrounding agricultural fields along the Sacramento River and the MFWC Service Area. The only occurrence in the CNDDDB (2006) is from 1978, documenting this species at Davis Ranch, 5 miles north of Grimes and within 2 miles of the MFWC service boundary.

3.1.10 Swainson's Hawk

The Swainson's hawk is a migratory raptor listed as threatened by the State of California, and federally as a species of special concern. It breeds in western North America and winters for the most part in South America. It nests in trees, usually in riparian areas, but forages over pasturelands and open agricultural fields. In the Central Valley it is associated with riparian corridors adjacent to field crops and grasslands and subsists largely on small mammals, especially California vole, California ground squirrel, and large insects. Suitable foraging habitat within an energetically efficient flight distance from active Swainson's hawk nests has been found to be of great importance. Because the prey base for Swainson's hawk is highly variable from year to year, depending on cycles of agriculture, rainfall, and other natural cycles, large acreages of potential foraging habitat must be allotted per breeding pair.

The decline of the species in the Central Valley has been associated with extensive reduction of Swainson's hawk habitat. Suitable foraging habitat is present within the Action Area in agricultural fields, where populations of prey species are supported. Suitable nesting habitat occurs within the riparian woodland habitats adjacent with the Proposed Project/Action site. Large valley oak and cottonwood trees occur adjacent to the river on the bank opposite from the proposed intake structures and fish screens. The most recent CNDDDB (2006) occurrence for Swainson's hawk within the MFWC Service Area boundary was observed in 1989 within riparian forest along the Sacramento River, approximately 0.5-mile north of Grimes. Within two miles of the MFWC Service Area, an active nest was observed in a strip of riparian forest on the north bank of the Sacramento River, east of Colusa.

3.1.11 Bank Swallow

The bank swallow is the smallest North American swallow, with a body length of about 4.75 inches. The bank swallow nests in colonies and creates nests by burrowing into vertical banks consisting of fine-texture soils. Bank swallows breed in California from April to August and spend the winter months in South America. Currently, bank swallows are locally common only in restricted portions of California where sandy, vertical bluffs or riverbanks are available for the birds to dig their burrows and nest in colonies. Most of California's remaining populations nest along the upper Sacramento River where it still meanders in a somewhat natural manner. In this alluvial plain, the river system provides suitable soil types and erosion needed for prime nesting habitat. Seventy-five percent of the State's population is concentrated on the banks of Central Valley streams, including several colonies on the Sacramento River.

Since 1900, the range of bank swallows in California has been reduced by approximately 50 percent largely attributed to habitat loss. The rip-rapping of natural stream banks is the single most serious, human-caused threat to the long-term survival of the bank swallow in California. Existing colonies

and areas of potential habitat may be lost over the next several years if current planning is implemented. Rip-rap installed by the COE under the Sacramento River Bank Protection Project has already affected almost 150 miles of Sacramento River bank since 1960. Additional rip-rap proposed under this project may result in extensive loss of essential, eroding bank habitat.

On the Sacramento River, bank swallow populations continue to decline. Based on an average occupancy rate of about 45 percent of all burrows dug into river banks, an estimated population of 13,170 pairs of bank swallows nested in Sacramento River habitats in 1986. In 1998 the population reached its lowest level of 4,990 pairs and then rebounded dramatically in 1999 to 8,210 pairs regaining some habitat from which it was extirpated (in 1998) on the lower end of its Sacramento River range. The significance of the apparent turnaround may not be known for a few years if it continues. The 1999 result may be a beginning of an expanding population boom for the species or just a momentary upswing. Further monitoring will be necessary to determine the true population trend, if any. Currently, the status of the bank swallow is still considered declining (CDFG, 2000a).

The State Recovery Plan for bank swallow includes identifying habitat preserves and a return to a natural, meandering riverine ecosystem as the two primary strategies for recovering the bank swallow. A recovery planning team has cited the return to naturally functioning riparian ecosystems as the best way to preserve, recover, and conserve the many species, including the bank swallow, that are dependent on this unique ecosystem.

In the general Action Area there is potential for nesting along the banks of the Sacramento River. The CNDDDB documents two occurrences of bank swallow within the MFWC Service Area. The most recent observation is from 1987; approximately 0.5-mile north of Grimes a colony of bank swallows was observed nesting in the river bank. There are three more observations, dated 1986-1987, of nesting colonies within two miles outside of the MFWC Service Area. The bank swallow prefers steep, open cliff-like banks for nesting. Where the proposed new intake will be located, however, the shore slopes gradually up to the levee and is largely vegetated with annual grasses.

3.2 Critical Habitat

The Action Area occurs within designated Critical Habitat for Central Valley steelhead, Central Valley spring-run Chinook salmon, and Sacramento River winter-run Chinook salmon. Critical Habitat for threatened Central Valley steelhead and Central Valley spring-run Chinook salmon was issued by NMFS on September 2, 2005. Critical Habitat for endangered Sacramento River winter-run Chinook salmon was designated on June 16, 1993.

The project vicinity is located within the Colusa Basin Hydrologic Unit (5520) of Critical Habitat for Central Valley steelhead and Central Valley spring-run Chinook. This unit includes the Sacramento River upstream to and including: Tisdale Bypass, Butte Creek, Butte Slough, Nelson Slough, Sacramento Slough, Sutter Bypass, Colusa Bypass, Little Chico Creek, and Little Dry Creek.

For the Sacramento winter-run Chinook, Critical Habitat is designated to include the Sacramento River from Keswick Dam, Shasta County (River Mile 302) to Chipps Island (River Mile 0) at the westward margin of the Sacramento-San Joaquin Delta, all waters from Chipps Island westward

to Carquinez Bridge, including Honker Bay, Suisun Bay, and Carquinez Strait, all waters of San Pablo Bay westward of the Carquinez Bridge, and all waters of San Francisco Bay (north of the San Francisco/Oakland Bay Bridge) from San Pablo Bay to the Golden Gate Bridge.

These species share similar habitat requirements. The Primary Constituent Elements (PCE's) of salmonid habitat within the Action Area include: freshwater spawning and rearing habitat; freshwater migration corridors; and estuarine areas containing adequate substrate, water quality, water quantity, water temperature, water velocity, cover/shelter, food, riparian vegetation, space, and safe passage conditions. The Sacramento River provides freshwater habitat in the Action Area and serves as an upstream and downstream salmonid migratory route, as well as juvenile salmonid rearing habitat.

The diversion and storage of natural flows by dams and diversion structures on Central Valley waterways have depleted streamflows and altered the natural cycles by which juvenile and adult salmonids have evolved. Changes in streamflows and diversions of water affect freshwater rearing habitat and freshwater migration corridor PCEs in the action area. Various land-use activities in the action area such as urbanization and agricultural encroachment have resulted in habitat simplification. Runoff from residential and industrial areas also contributes to water quality degradation (Regional Board 1998). Urban stormwater runoff contains pesticides, oil, grease, heavy metals, polynuclear aromatic hydrocarbons, other organics and nutrients (Regional Board 1998) that contaminate drainage waters and destroy aquatic life necessary for salmonid survival (NMFS 1996). In addition, juvenile salmonids are exposed to increased water temperatures as a result of thermal inputs from municipal, industrial, and agricultural discharges in the action area. Accelerated predation as a result of habitat changes in the action area, such as the alteration of natural flow regimes and the installation of bank revetment structures such as dams, bridges, water diversions, and piers are likely a factor in the decline of Sacramento River winter-run Chinook salmon, CV spring-run Chinook salmon, and CV steelhead.

Within the action area, the freshwater rearing and migration PCEs have been transformed from a meandering waterway lined with a dense riparian corridor, to a highly leveed system under varying degrees of control over riverine erosional processes and flooding. In the reach from Colusa downstream to Verona (RMs 143 to 80) – which includes the Action Area – levees are generally constructed near the edge of the river (USFWS 2000). Severe long-term riparian vegetation losses have occurred in this part of the Sacramento River, and there are large open gaps without the presence of important habitat features due to the high amount of riprap (USFWS 2000). Overall, more than half of the Sacramento Rivers banks in the lower 194 miles have been ripped (USFWS 2000).

1. Freshwater Rearing Habitat

Freshwater rearing sites are those with water quantity and floodplain connectivity to form and maintain physical habitat conditions and support juvenile growth and mobility; water quality and forage supporting juvenile development; and natural cover such as shade, submerged and overhanging large wood, log jams, beaver dams, aquatic vegetation, large rocks and boulders, side channels, and undercut banks. Both spawning areas and migratory corridors comprise

rearing habitat for juveniles, which feed and grow before and during their outmigration. Non-natal, intermittent tributaries also may be used for juvenile rearing. Rearing habitat condition is strongly affected by habitat complexity, food supply, and presence of predators of juvenile salmonids. Some complex, productive habitats with floodplains remain in the system (*e.g.*, the lower Cosumnes River, Sacramento River reaches with set-back levees [*i.e.*, primarily located upstream of the City of Colusa]). However, the channeled, leveed, and riprapped river reaches and sloughs that are common in the Sacramento-San Joaquin system typically have low habitat complexity, low abundance of food organisms, and offer little protection from either fish or avian predators. Freshwater rearing habitat also has a high conservation value as the juvenile life stage of salmonids is dependant on the function of this habitat for successful survival and recruitment. Thus, although much of the rearing habitat is in poor condition, it is important to the species.

2. Freshwater Migration Corridors

Ideal freshwater migration corridors are free of obstruction with water quantity and quality conditions and contain natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, side channels, and undercut banks supporting juvenile and adult mobility, survival and food supply. Migratory corridors are downstream of the spawning area and include the lower Sacramento River and the Delta. These corridors allow the upstream passage of adults, and the downstream emigration of outmigrant juveniles. Migratory habitat condition is strongly affected by the presence of barriers, which can include dams, unscreened or poorly- screened diversions, and degraded water quality. For successful survival and recruitment of salmonids, freshwater migration corridors must function sufficiently to provide adequate passage. For adults, upstream passage through the Delta and the much of the Sacramento River is not a problem, but problems exist on many tributary streams, and at the RBDD. For juveniles, unscreened or inadequately screen water diversions throughout their migration corridors, and a scarcity of complex in-river cover have degraded this PCE. However, since the primary migration corridors are used by numerous populations, and are essential for connecting early rearing habitat with the ocean even the degraded reaches are considered to have a high conservation value to the species. Thus, although much of the migration corridor is in poor condition, it is important to the species.

In the Action Area and vicinity, the adjacent riparian habitat has been modified by trails (both paved and unpaved), levees, and general recreation activities. These areas may be of poor quality but still provide cover for rearing juveniles. However, at the locations of the proposed new diversions (within the Action Area) suitable salmonid rearing habitat is low, lacking riparian-shaded riverine aquatic habitat. More suitable rearing habitat exists immediately upstream and downstream from the Proposed diversions, and at the existing diversion sites which will be removed. Based on unconsolidated sediments dominating the channel substrate, it is not likely that spawning habitat exists within Action Area.

3.3 Essential Fish Habitat

Essential Fish Habitat (EFH) is defined as those waters and substrates necessary to fish for spawning, breeding, feeding, or growth to maturity. For the purposes of interpreting the definition

of EFH, “waters” includes aquatic areas and their associated physical, chemical, and biological properties that are used by fish, and may include areas historically used by fish where appropriate; “substrate” includes sediment, hard bottom, structures underlying the waters, and associated biological communities; “necessary” means habitat required to support a sustainable fishery and a healthy ecosystem; and “spawning, breeding, feeding, or growth to maturity” covers all habitat types used by a species throughout its life cycle. The Proposed Project/Action is located within the region identified as EFH for Pacific salmon, including Chinook salmon, in Amendment 14 of the Pacific Salmon FMP.

The Sacramento River provides freshwater habitat in the Action Area and serves as an upstream and downstream migratory route for Pacific salmon and green sturgeon, as well as juvenile salmonid rearing habitat. Although the adjacent riparian habitat has been modified by trails (both paved and unpaved), levees, and general recreation activities, it does in some areas provide cover for rearing juveniles. However, in the vicinity of the proposed new diversion locations (within the Action Area), suitable salmonid and sturgeon rearing habitat does not occur due to low quality shaded riverine aquatic habitat. Based on unconsolidated sediments dominating channel substrate, it is not likely that spawning habitat exists within the immediate vicinity of the Action Area.

CHAPTER 4

Effects of Proposed Project/Action on Special Status Species

This section describes the methods used to determine the potential effects of the Proposed Project/Action on special-status species potentially occurring in the Action Area. Species included in this analysis are federal- and state-listed, candidates for federal or state listing, and other species of special concern that are covered under the CALFED MSCS. These special-status species include:

- North American green sturgeon (Southern DPS) (*Acipenser medirostris*)
- Central Valley steelhead (*Oncorhynchus mykiss*)
- Central Valley fall/late fall-run Chinook (*Oncorhynchus tshawytscha*)
- Central Valley spring-run Chinook (*Oncorhynchus tshawytscha*)
- Sacramento River winter-run Chinook (*Oncorhynchus tshawytscha*)
- Sacramento splittail (*Pogonichthys macrolepidotus*)
- Giant garter snake (*Thamnophis gigas*)
- Western burrowing owl (*Athene cunicularia*)
- Cackling (=Aleutian Canada) Goose (*Branta canadensis leucopareia*)
- Swainson's hawk (*Buteo swainsoni*)
- Bank swallow (*Riparia riparia*)

Evaluating potential effects on species within the Action Area requires an understanding of the species' life histories and life stage specific environmental requirements. Ecological and status information on these species is provided in Chapter 3, Environmental Baseline – Special-Status Species Accounts and Status in the Action Area, of this ASIP.

The analysis of effects of a particular action on a biological resource can be composed of one or more types of effects. Direct and indirect effects, interrelated and interdependent effects, and cumulative effects are defined below.

4.1 Direct and Indirect Effects

Under FESA (16 USC 1531-1544), direct effects are those that are caused by the Proposed Project/Action and occur at the time of the action. According to the USFWS and NOAA Fisheries, indirect effects:

“...are caused by or result from the proposed action, are later in time, and are reasonably certain to occur, e.g., predators may follow ORV tracks into piping plover nesting habitat and destroy nests; the people moving into the housing unit may bring cats that prey on the mice left in the adjacent habitat. Indirect effects may occur outside of the area directly affected by the action.”

4.2 Interrelated and Interdependent Effects

According to FESA, interrelated and interdependent actions are defined as follows:

Effects of the action under consultation are analyzed together with the effects of other activities that are interrelated to, or interdependent with, that action. An interrelated activity is an activity that is part of the proposed action and depends on the proposed action for its justification. An interdependent activity is an activity that has no independent utility apart from the action under consultation.

According to the USFWS and NOAA Fisheries, interrelated actions are those that are part of the Proposed Project/Action and depend on the Proposed Project/Action for their justification - actions that would not occur “but for” the larger action of the action under consultation (Proposed Project/Action). Interdependent actions are those that have no significant utility apart from the action that is under consideration. There are no interrelated or interdependent actions associated with MFWC’s Proposed Project/Action.

4.3 Effects on Species

4.3.1 North American Green Sturgeon, Central Valley Steelhead, Central Valley Fall/Late Fall-Run and Spring-Run Chinook Salmon, Sacramento River Winter-Run Chinook Salmon, and Sacramento Splittail

The Proposed Project/Action would involve work within the Sacramento River; therefore, the important special-status species to consider in this habitat are the threatened North American green sturgeon (Southern DPS), threatened Central Valley steelhead, endangered Sacramento River winter-run Chinook salmon, and special-concern Central Valley fall/late-fall Chinook salmon and Sacramento splittail. Although further USFWS and NOAA consultation on Phase 1 and Phase 2 will occur separately, this discussion applies to both phases.

Construction and operation of a surface water diversion in the Sacramento River has the potential to adversely impact various salmonids, sturgeon, and other fish species and their habitats through several mechanisms, including entrainment into the water diversion, impingement on the intake screen, increased vulnerability to predation mortality, and increased levels of turbidity and suspended solids, and underwater sound pressure waves. Direct mortality of fish species may also occur during cofferdam installation and dewatering. The following table summarizes potential effects to special-status fish species occurring in the Action Area (diversion footprints plus 200 feet).

Potential Stressors:	Type of Exposure	Location of Exposure	Species (Life Stage) Exposed	Timing of Exposure	Duration of Exposure	Frequency of Exposure
Entrainment	Direct	Diversion Intake	GS (A, J); CVST (A); CVSR (A, J); CVFR (J); SWR (A, J); SS (A, J)	During normal operation	April to October	Constant
Impingement	Direct	Intake Screen	GS (A, J); CVST (A); CVSR (A); CVSR (A, J); CVFR (J); SWR (A, J); SS (A, J)	During normal operation	April to October	Constant
Increased Predation	Indirect	Local Vicinity of Diversion	All species (Both A and J stages)	Always	April to October	Constant
Increased turbidity and suspended solids	Indirect	Local Vicinity of Diversion	GS (A, J); CVST (A); CVSR (A); CVFR (J); SWR (A)	During construction	June to October	One-time construction event
Sound pressure waves	Indirect	Vicinity of Diversion	GS (A, J); CVST (A); CVSR (A); CVFR (J); SWR (A)	During installation of cofferdam	June to October	One-time construction event
*Stranding during dewatering	Indirect	Diversion (area within cofferdam)	GS (A, J); CVST (A); CVSR (A); CVFR (J); SWR (A)	During installation of cofferdam	June to October	One-time construction event
*Cofferdam	Direct	Local Vicinity of Diversion	GS (A, J); CVST (A); CVSR (A); CVFR (J); SWR (A)	During installation of cofferdam	June to October	One-time construction event

*Phase 2 only

A=Adults; J=Juveniles; GS=Green Sturgeon (Southern DPS); CVST= Central Valley Steelhead; CVSR=Central Valley Spring-run Chinook; CVFR=Central Valley Fall/Late Fall-run Chinook; SWR=Sacramento Winter-run Chinook, SS=Sacramento Splittail

As shown in Table 4-1, the effects of the Proposed Project/Action on special-status fish depend on whether the fish are exposed, which life stages are exposed, how long, how often, and when the fish are exposed. It can be inferred that with increasing distance from the stressor/source of stressor the effects to an individual are diminished. For many of the stressors, fish must be within the immediate vicinity of the Action Area to be affected. For example, a fish swimming a few hundred feet upstream of a diversion is not likely be pulled by suction into the diversion; however, if that fish approached within a few feet of the diversion intake, there is a much greater probability of entrainment. The following discussion analyzes the fish response to the potential stressors, and what kind of effects to the species would result.

Entrainment and Impingement

All of the special-status fish species considered are at risk of being entrained or impinged by a diversion in the Sacramento River. The risk of entrainment occurs when the pumps are drawing water; for the MFWC this is from April to October every year. Similarly, impingement or death

by collision or entrapment against the intake screen is a hazard to the fish when the pumps are active. However, the design criteria outlined by the Proposed Project/Action will comply with CDFG and NOAA Fisheries fish screen criteria, and will reduce potential effects from fish entrainment and impingement substantially. Installation of the new diversions with fish screens would be a significant improvement over the current diversions which are not screened.

Increased Predation

Placement of structures within the Sacramento River, including a positive barrier fish screen, would modify local velocity and current patterns, create localized turbulence and eddies, and provide cover habitat for a variety of predatory fish species, such as striped and smallmouth bass. Structural components of the positive barrier fish screen may result in the potential for increased localized predation mortality for all special-status species considered, as well as other fish species within the river. Juvenile fish are particularly vulnerable. However, placement of the Proposed Project/Action's new diversion structures is within areas with adequate flow velocities, thereby minimizing backwater eddy effects and potential impacts to salmonids and sturgeon from predatory species. Therefore, increased predation at these diversions is likely a stressor of low magnitude.

Sound Pressure Waves

Sound pressure waves or "noise" within the water would result from installation of support piles for the diversion facilities or installation of sheet piles and beams during construction of the cofferdam. Fish may be injured or killed by the impact sounds generated by percussive pile driving. Their hearing may also be affected or their behavior altered such that it constitutes harassment or harm. The specific effects of pile driving on fish depend on a wide range of factors including the type of pile, type of hammer, fish species, environmental setting, and many other factors (Popper et al., 2006). The Proposed Project/Action may require the use of vibratory or percussion hammer methods. Both methods produce underwater sound pressure waves that can be perceived by fish; however, while vibrating hammers do not produce sound pressure levels that would result in injury or mortality to fish, they may still be impact the fish. The percussion hammer, if needed for cofferdam installation, would be used on an intermittent and short duration basis. Use of the percussion hammer would be minimized to the maximum extent possible. Fish species within the Action Area and vicinity are at risk of exposure to this stressor. The fish would likely respond to this stressor by swimming away from the noise. The pile-driving activity would only occur during the June 1 to October 1 period (to November 1 with NOAA Fisheries approval), when large numbers of special-status species are less likely to occur in the Action Area.

Cofferdam Construction

The construction of the proposed Meridian Diversion fish screen facility would require placement and removal of a sheet-pile cofferdam to isolate the work site from the rest of the river. Constructing a cofferdam would have a short-term, localized impact to water quality by causing an increase in turbidity and suspended solids. Increased sedimentation may cause reduced survival of eggs or alevins, reduce primary and secondary river productivity, interfere with feedings, cause behavioral avoidance, and cause a breakdown of social organization to native species downstream of the discharge area. In addition, the dewatering of the cofferdam would strand fish and other organisms trapped within the cofferdam. The physical placement of the cofferdam into the water may also cause direct mortality to fish.

Cofferdams generally lessen the impact of construction on the surrounding environment by isolating the construction area; however, the installation of the cofferdam does cause short-term localized impacts. In order to minimize impacts to fish species, the cofferdam installation would be limited to the in-water work period, from June 1 to October 1 (to November 1 with NOAA Fisheries approval). During this time, installation of the cofferdam would have the least impact on fish species. The abandonment of the existing Grimes Diversion (Phase 1) and Drexler Diversion (Phase 2), which would require minimal in-river work to cap and seal the existing intake pipe manifold, would also occur during the in-water work period. Any fish trapped in the cofferdam during dewatering will be salvaged, and the implementation of measures detailed in the Project Description will minimize impacts to water quality. Once it is installed, the cofferdam is not likely to be a significant stressor to fish species.

Given the overall benefit to fish as a result of the Proposed Project/Action, as well as the use of a cofferdam, the fish salvage requirement for dewatered work sites, the localized and minimal in-river disturbances, and constructing within the June 1 to October 1 in-water work period (may be extended to November 1 with NOAA approval), the Proposed Project/Action is expected to result in minimal impacts to the fisheries resources of the Sacramento River. The following measures will further reduce potential effects to listed and special-concern fish species in Phase 1 and Phase 2.

- **Measure BIO-1: Pile Driving Activities.** For Phases 1 and 2, the contractor shall use vibrational pile driving to the greatest extent feasible. If percussive pile driving is necessary, its use shall be minimized to the maximum extent possible and comply with the following *Interim Criteria for Injury of Fish to Pile Driving Operations* (Popper et al., 2006):
 - The Sound Exposure Level (SEL) shall not exceed 187 dB (re: 1 $\mu\text{Pa}^2 \cdot \text{sec}$) in any single strike, measured at a distance of 32.8 ft from the source;
 - The peak sound pressure level should not exceed 208 dB (re: 1 $\mu\text{Pa}_{\text{peak}}$) in any single strike, measured at a distance of 32.8 ft from the source.
- **Measure BIO-2: Dewatering.** For Phase 2 only, pump(s) used for dewatering the construction site will be screened according to NMFS fish screening criteria for anadromous salmonids (NMFS, 1997b). A qualified biologist will be on-site during such pumping activities to ensure that any fish that may be present within the construction area are relocated to suitable habitat near the project area.

The Proposed Project/Action may affect but is not likely to adversely affect special-status fish species for Phase 1 because (1) all in-water work will occur when fish are least likely to be located in the project area; (2) the duration of the in-water work will be relatively short (several weeks); and (3) a vibratory hammer will be used (as stated in Measure BIO-1). For these reasons, the effects to fish species will be reduced to a less than significant level in Phase 1. For Phase 2, there is potential for “incidental take” of special-status fish associated with installation of the cofferdam, and the Proposed Project/Action may affect and is likely to adversely affect special-status fish species.

4.3.2 Giant Garter Snake

Consultation for Phase 1 and Phase 2 will be conducted separately for each phase. The following discussion applies to both phases; however, the effects and conservation measures are different

for each phase. This document provides supporting information for Phase 1 consultation; therefore, the analysis for Phase 1 is more detailed than for Phase 2, which is planned for a future date. General effects are described for Phase 2, but consultation on this phase will occur at a later date and will require more in-depth analysis at that time.

The effects to giant garter snake habitat are those areas of habitat that would be permanently and/or temporarily affected by the activity within a Work Area. The Work Area is defined to include the construction footprint of all the diversion and pumping plant facilities, the conveyance facility improvements, and the Drexler Relift station. In addition to the footprints of all facilities, the Work Area includes construction easements and potential staging areas where construction activity may occur. Because construction is proposed for 2008, and habitat conditions for giant garter snake are largely dependent upon agricultural practices within the Action Area, the projected cropping pattern for 2008 was used to determine available habitat to giant garter snake in 2008. However, because cropping patterns may change season to season, the estimated future availability of habitat for and the estimated effects to the giant garter snake are also tentative for Phase 2.

Phase 1 Effects

Phase 1, which includes construction of the New Grimes Diversion/Pumping Plant, New Grimes Pipeline and Canal Modifications, and the Drexler Pipeline, as well as the removal of the existing Grimes Diversion, will temporarily affect a small amount of aquatic habitat for giant garter snake. **Figure 4-1** shows the giant garter snake habitats potentially affected by the Proposed Project/Action for Phase 1. In this phase, there is no suitable aquatic habitat in the vicinity of the Grimes Diversion or Grimes conveyance improvements. However, there is suitable aquatic habitat in the Reclamation Drains within 200' of the Work Area in the vicinity of the Drexler Pipeline. Most of the drains will be avoided; however, a section of a Reclamation Drain – approximately 435 square feet in area – at its intersection with Summy Road will be temporarily affected by the installation of an outfall into this drain (**Figure 4-1**). This work, associated with the construction of the Drexler Pipeline, will likely result in minor back-fill to this drain during the snake's active season. Therefore, Phase 1 may affect and is likely to adversely affect the giant garter snake. **Table 4-2** summarizes the habitat impacts resulting from Phase 1.

TABLE 4-2
SUMMARY OF GGS IMPACTS FOR PHASE 1

Habitat Type	Acres
Aquatic Temporary	0.01
Upland Temporary	1.67

Because Phase 1 is likely to adversely affect the giant garter snake, the conservation measures from the USFWS Programmatic BO (included in this chapter) have been incorporated to the Project Description (Chapter 2) and will be implemented to minimize and avoid permanent effects to the giant garter snake. Conservation measures include installation of snake-exclusion fencing to prevent snakes from entering the Work Area, and restoration of disturbed habitat. Any back-fill into the drain resulting from the outfall installation will be removed, and the bank of the drain will be

restored to pre-construction condition and planted with a native seed mix or covered with erosion-control matting to prevent further soil erosion into the drain. In addition, 1.67 acres of upland habitat adjacent to these drains and within the Work Area for the Drexler Pipeline will be restored to pre-project conditions after completion of construction.

All effects resulting from Phase 1 are considered temporary because the disturbance to the giant garter snake and its habitat will last only one season. Under the Programmatic BO, Phase 1 effects are considered Level 1 Effects. These are effects that are (a) not permanent, (b) less than 20 acres of disturbance, and (c) restored to pre-project conditions within the same season or, at most, the same calendar year. The mitigation for Phase 1 implementation includes (a) restoration of temporary impacts to giant garter snake habitat, and (b) one year of monitoring with a photo documentation report due one year from the restoration implementation showing pre- and post-project area photos. The project will implement these measures in addition to several more “reasonable and prudent measures” included in the Programmatic BO.

Phase 2 Effects

Phase 2 includes the construction of the New Meridian Diversion/Pumping Plant, Main Canal Modifications, Drexler Relift, removal of the existing Meridian and Drexler Diversions, and the expansion of the Drexler Pipeline as well. The defined Work Area will avoid most of the Reclamation Drains and rice fields that are suitable aquatic habitat for the giant garter snake; there is no other fill of giant garter snake aquatic habitat associated with Phase 2 of the Proposed Project/Action. Widening the Main Canal would increase the amount of potential aquatic habitat, but it would also mean a subsequent permanent loss of potential upland habitat for the giant garter snake. In addition, a short section of a seep ditch would be filled in order to construct the Drexler Relift. Although this ditch was deemed unsuitable aquatic habitat for giant garter snake due to a lack of inundation, it is considered suitable upland habitat.

The main effect to giant garter snake as a result of Phase 2 is the construction during the snake’s inactive period. Because operation of the Main Canal is essential for MFWC water delivery in the spring and summer, the proposed Phase 2 improvements to the Main Canal must occur during the fall and winter. However, this time coincides with the giant garter snake’s inactive period, when there is greater danger of harming a snake that has taken refuge in the upland habitat within the Work Area. Because of these effects, implementation of Phase 2 of the Proposed Project/Action may affect and is likely to adversely affect giant garter snake. **Table 4-3** below summarizes generalized effects to giant garter snake anticipated with the implementation of Phase 2.

TABLE 4-3
SUMMARY OF GGS IMPACTS FOR PHASE 2

-
- Temporary effects to GGS aquatic habitat resulting from the Main Canal improvements
 - Temporary and permanent effects to GGS upland habitat along the Main Canal improvements
 - Permanent effects to GGS upland habitat in association with the Drexler Relift
 - Possible incidental “take” of GGS during their inactive period

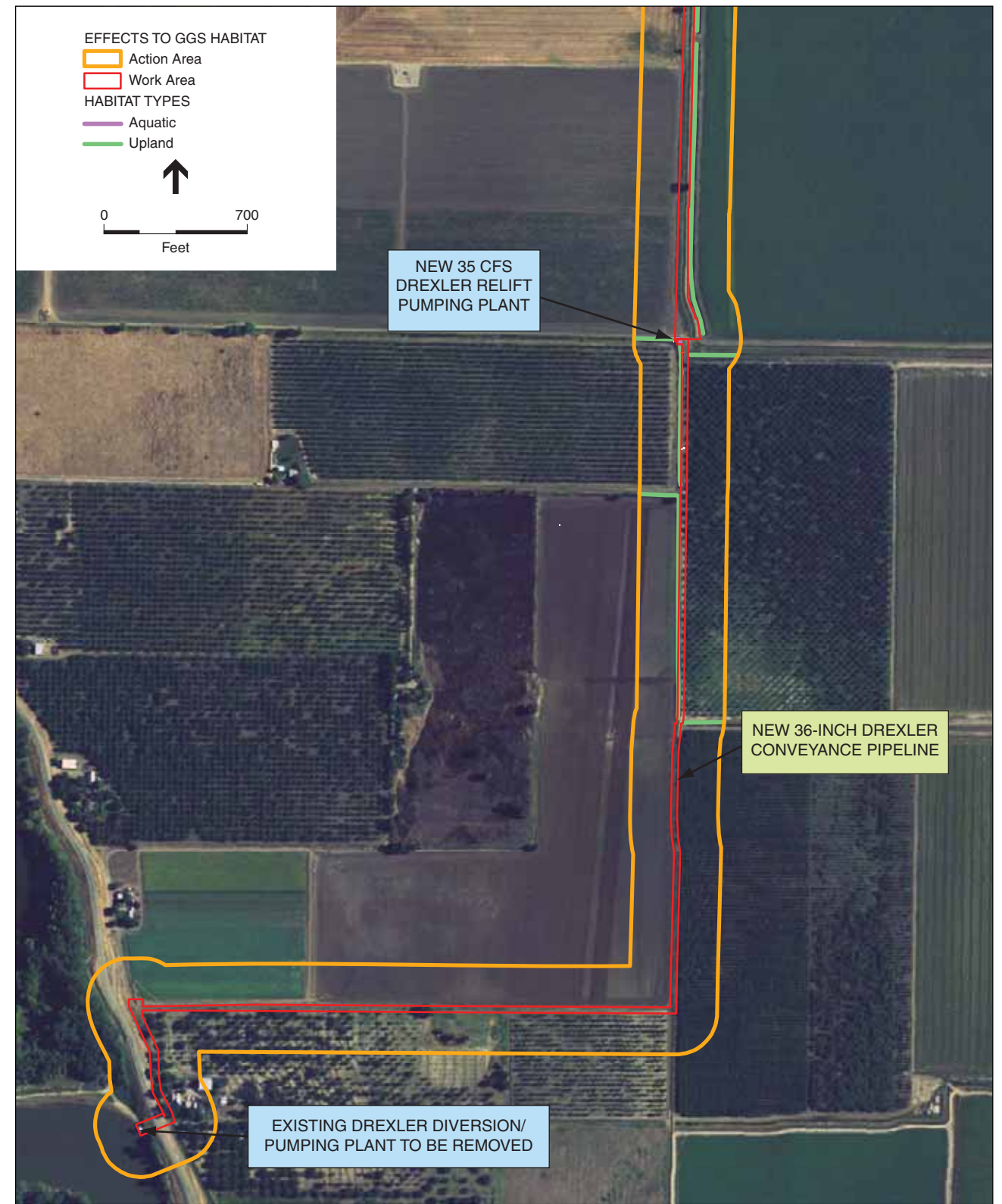
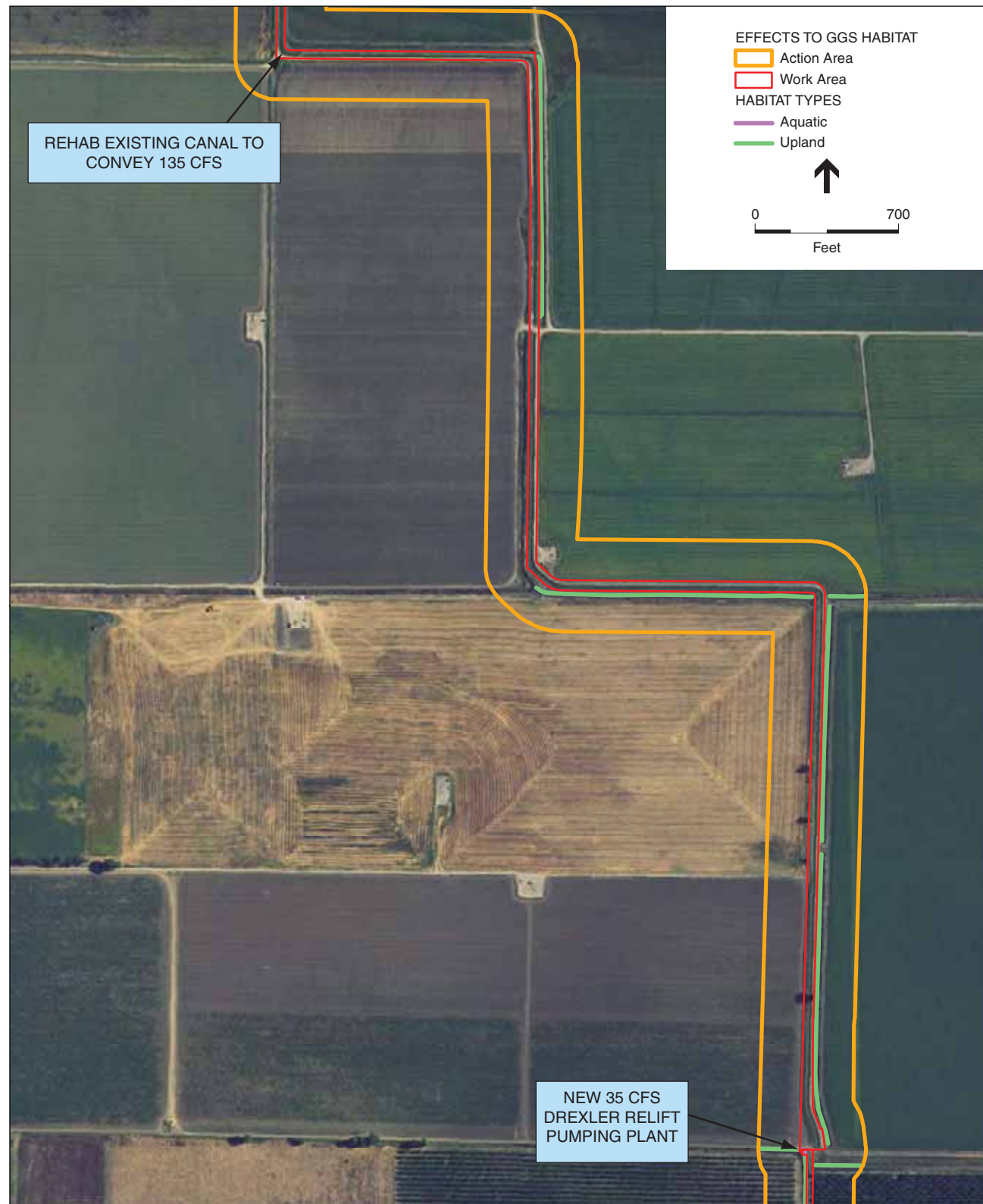
Because Phase 2 may affect and is likely to adversely affect the giant garter snake, the conservation measures from the USFWS Programmatic BO (included in this chapter) have been incorporated to the Project Description (Chapter 2) and will be implemented to minimize and avoid permanent effects to the giant garter snake as much as possible. Conservation measures include installation of snake-exclusion fencing to prevent snakes from entering the Work Area, and restoration of disturbed habitat to pre-project conditions. Because there will likely be permanent loss of giant garter snake upland habitat with the widening of the Main Canal, effects resulting from Phase 2 would be considered at Level 3 in the BO, and compensation for Phase 2 work would likely be required at a rate of 3 acres replaced for every 1 acre of effected habitat.

In summary, both phases may and are likely to adversely affect giant garter snake, and both phases will implement the conservation measures from the Programmatic BO to minimize and avoid effects to giant garter snake as much as possible. Phase 1 will temporarily affect 0.01-acre of aquatic habitat and 1.67 acres of upland habitat. There will be no permanent effects as a result of Phase 1, but there is potential for incidental take associated with working within aquatic habitat. Phase 2 may and is likely to result in temporary disturbance to aquatic habitat and both temporary and permanent disturbance to aquatic and upland habitats. In addition, there is a greater risk for “incidental take” in Phase 2, due to construction during the giant garter snake’s inactive period. Phase 2 analysis is generalized and is subject to change as conditions change in the Project/Action Area. **Table 4-4** below summarizes the Programmatic mitigation levels for effects to giant garter snake habitat.

TABLE 4-4
SUMMARY OF GGS IMPACTS FOR PHASE 2

	Duration of Effect	Acres of Effect	Level of Mitigation	Compensation
Phase 1	1 season	<20 and temporary	Level 1	Restoration
Phase 2*	permanent loss	<3 acres total GGS habitat AND <1 acre aquatic habitat	Level 3	3:1 Replacement

* Phase 2 effects will be re-evaluated prior to consultation on Phase 2.



The following conservation measures include avoidance and minimization, compensation, and mitigation measures for giant garter snake and will reduce potential effects to giant garter snake in both phases:

For Phase 1 Effects:

- **Measure BIO-3: Traffic Routing, and Movement.** During construction operations, the number of access routes, number and size of staging areas, and the total area of the proposed project activity will be limited to the minimum necessary. Routes and boundaries will be clearly demarcated. Movement of heavy equipment to and from the project site will be restricted to established roadways to minimize habitat disturbance. Project-related vehicles shall observe a 20-mile-per-hour speed limit within construction areas, except on County roads and on State and Federal highways. This is particularly important during periods when the snake may be sunning or moving on roadways. All heavy equipment, vehicles, and supplies will be stored at the designated staging area at the end of each work period.
- **Measure BIO-4: Staging Areas.** During construction operations, stockpiling of construction materials, portable equipment, vehicles, and supplies will be restricted to the designated construction staging areas and exclusive of the Environmentally Sensitive Areas (ESAs). The applicant will ensure contamination of habitat does not occur during such operations. All workers will be informed of the importance of preventing spills and appropriate measures to take should a spill occur.
- **Measure BIO-5: Pre-construction Surveys.** At most 24-hours prior to the commencement of construction activities, the ESA shall be surveyed for giant garter snakes by a USFWS-approved biologist. The biologist will provide the USFWS with a written report that adequately documents the monitoring efforts within 24-hours of commencement of construction activities. The project area shall be re-inspected by the monitoring biologist whenever a lapse in construction activity of two weeks or greater has occurred.
- **Measure BIO-6: Timing of Construction.** Construction activity within giant garter snake habitat (*e.g.* aquatic, upland, and rice habitat) shall be conducted between May 1 and October 1. This is the active period for the snake and direct mortality is lessened, because snakes are expected to actively move and avoid danger. If it appears that construction activity may go beyond October 1, the project proponents shall contact the USFWS as soon as possible, but not later than September 15 of the year in question, to determine if additional measures are necessary to minimize take. Construction activities within 200 feet from the banks of snake aquatic habitat will be avoided during the snake's inactive season. **If this is not feasible, the Project Proponent must consult with USFWS to determine measures to avoid impacts to giant garter snake.**
- **Measure BIO-7: Monitoring During Construction.** A USFWS-approved biologist shall inspect construction-related activities at the ESA to ensure that no unauthorized take of federally listed species or destruction of their habitat occurs. The biologist shall be

available for monitoring throughout all phases of construction that may result in adverse effects to the giant garter snake. This includes clearing and grubbing activities and installation of exclusion fence in giant garter snake upland habitat. Furthermore, the biologist shall have the authority through communication with the resident engineer to stop construction activities in the immediate area if a giant garter snake is encountered during construction until appropriate corrective measures have been completed or until the snake is determined to be unharmed. Snakes encountered during construction activities shall be allowed to move away from the area on their own volition. The biologist shall notify the USFWS immediately if any listed species are found on-site, and will submit a report, including date(s), location(s), habitat description, and any corrective measures taken to protect the species found. The biologist shall be required to report any take of listed species to the USFWS immediately by telephone at 916/ 414-6600 and by electronic mail or written letter addressed to the Chief, Endangered Species Division, within three (3) working days of the incident. The Service does not authorize any handling or moving of a giant garter snake by other than a USFWS-approved biologist.

- **Measure BIO-8: Worker Awareness Training.** A Worker Environmental Awareness Training Program for construction personnel shall be conducted by the USFWS-approved biologist for all construction workers, including contractors, prior to the commencement of construction activities. The program shall provide workers with information on their responsibilities with regard to the snake, an overview of the life-history of this species, information on take prohibitions, protections afforded this animal under the Act, and an explanation of the relevant terms and conditions of this biological opinion. Written documentation of the training must be submitted to the Sacramento Fish and Wildlife Office within 30 days of the completion of training. As needed, training shall be conducted in Spanish for Spanish language speakers.
- **Measure BIO-9: Install Snake Exclusion Fencing.** Prior to the commencement of construction activities, high visibility fencing will be erected around the habitats of federally listed species to identify and protect these designated ESAs from encroachment of personnel and equipment. These areas will be avoided by all construction personnel. The fencing shall be inspected by the Contractor before the start of each work day and maintained by the Contractor until completion of the project. The fencing may be removed only when the construction of the project is completed. Fencing will be established in upland immediately adjacent to aquatic snake habitat and extending up to 200 feet from construction activities. Silt fencing, if properly installed, may serve as suitable snake exclusion fencing.
- **Measure BIO-10: Provide Adequate Signage.** Signs will be posted by the Contractor every 50 feet along the edge of the ESAs, with the following information: “This area is habitat of federally-threatened and/or endangered species, and must not be disturbed. These species are protected by the Endangered Species Act of 1973, as amended. Violators are subject to prosecution, fines, and imprisonment.” The signs should be clearly readable from a distance of 20 feet, and must be maintained by the Contractor for the duration of construction.

- **Measure BIO-11: Implement BMPs.** Best Management Practices (BMPs), including a Storm Water Pollution Prevention Plan (SWPPP) and Water Pollution Control Program (WPCP), will be implemented to minimize effects to the snake during construction. Best management practices will be implemented to prevent sedimentation from entering ESAs and to reduce erosion, dust, noise, and other deleterious aspects of construction related activities. These BMPs may include, but are not limited to, silt fencing, temporary berms, restrictions on cleaning equipment in or near ESAs, installation of vegetative strips, and temporary sediment disposal. Runoff from dust control and hazardous materials will be retained on the construction site and prevented from flowing into the ESAs.
- **Measure BIO-12: Erosion Control Materials.** Tightly woven fiber netting (mesh size less than 0.25 inch) or similar material shall be used for erosion control and other purposes at the ESA to ensure that the giant garter snake is not trapped or becomes entangled. This limitation shall be communicated to the contractor using special provisions included in the bid solicitation package.
- **Measure BIO-13: Properly Dispose of Garbage.** To eliminate an attraction to predators of the snake, all food-related trash items, such as wrappers, cans, bottles, and food scraps, must be disposed of in closed containers and removed at the end of each workday from the entire project site.
- **Measure BIO-14: Use Approved Aggregate, Fill, or Borrow Materials.** The Contractor shall provide documentation that aggregate, fill, or borrow material provided for the proposed project was obtained in compliance with the State Mining and Reclamation Act (SMARA). Evidence of compliance with the Act shall be demonstrated by providing the resident engineer with one of the following: 1) a letter from the USFWS stating that the use of the borrow pit will not result in the incidental take of species; 2) an incidental take permit for contractor-related activities issued by the USFWS pursuant to section 10(a)(1)(B) of the Act; 3) a biological opinion or letter concurring with a “not likely to adversely affect” determination issued by the USFWS to the Federal agency having jurisdiction over contractor-related services; 4) a letter from the USFWS concurring with the “no effect” determination for contractor-related activities; or 5) contractor submittal of information to the resident engineer indicating compliance with the SMARA and provision of County land use permits and California Environmental Quality Act (CEQA) clearance.
- **Measure BIO-15: Restore Temporarily Affected Habitat.** After construction activities are complete, any temporary fill or construction debris shall be removed and disturbed areas restored to their pre-project conditions. An area subject to “temporary” disturbance includes any area that is disturbed during the project, but that, after project completion, will not be subject to further disturbance and has the potential to be re-vegetated. All ESA snake habitats subject to temporary ground disturbances, including storage and staging areas and temporary roads, will be restored to pre-project conditions. If appropriate, these areas shall also be re-contoured to pre-project conditions. A written report shall be submitted to the USFWS within ten (10) working days of the completion of construction at the project site and restoration of the site to pre-project conditions.

- **Measure BIO-16: Post-construction Monitoring.** An inspection of the site, with a photo documentation report showing pre- and post-project area photos, will be conducted and photos and a brief report will be submitted to USFWS one year from implementation of restoration to pre-project conditions.
- **Measure BIO-17: Minimize Impacts.** The Contractor shall minimize the potential for harm, harassment, and direct mortality of the snake resulting from project-related activities by implementation of the project. The Contractor shall ensure that the temporary loss of giant garter snake habitat is confined to the proposed project site.

For Phase 2 Effects:

Include all above measures for Phase 1, and the following additional or modified measures:

- **Measure BIO-18: De-watering Giant Garter Snake Habitat.** Aquatic habitat for the snake will be dewatered 15 days prior to the initiation of construction activities. If complete dewatering is not possible, potential snake prey (*i.e.*, fish and tadpoles) will be removed so that snakes and other wildlife are not attracted to the construction area.
- **Measure BIO-19: Monitoring During Construction.** A USFWS-approved biologist shall inspect construction-related activities at the proposed project site to ensure that no unauthorized take of federally listed species or destruction of their habitat occurs. The biologist shall be available for monitoring throughout all phases of construction that may result in adverse affects to the giant garter snake. This includes clearing and grubbing and other construction activities in the areas of wetland vegetation/aquatic habitat, adjacent upland habitat, and during exclusion fence installation. Furthermore, the biologist shall have the authority through communication with the resident engineer to stop construction activities in the immediate area if a giant garter snake is encountered during construction until appropriate corrective measures have been completed or until the snake is determined to be unharmed. Snakes encountered during construction activities shall be allowed to move away from the area on their own volition. The biologist shall notify the USFWS immediately if any listed species are found on-site, and will submit a report, including date(s), location(s), habitat description, and any corrective measures taken to protect the species found. The biologist shall be require to report any take of listed species to the USFWS immediately by telephone at 916/ 414-6600 and by electronic mail or written letter addressed to the Chief, Endangered Species Division, within three (3) working days of the incident. The Service does not authorize any handling or moving of a giant garter snake by other than USFWS-permitted biologist.

Measure BIO-20: Compensation. Prior to the commencement of construction activities, the project proponent shall compensate for the temporary and permanent loss habitat of the snake according to the Programmatic Guidelines.

4.3.3 Swainson's Hawk

In both phases, no known Swainson's hawk nesting habitat is proposed to be modified or eliminated by the Proposed Project/Action. Suitable nesting habitat is found adjacent to the Sacramento River within the valley riparian habitat. Habitat in this area includes riparian woodlands with large diameter (i.e., greater than 30 inches diameter at breast height) valley oak (*Quercus lobata*), cottonwood (*Populus fremontii*) and black willow (*Salix goodingii*). These overstory trees provide moderate to high (i.e., greater than 50%) canopy closure in this area. This riparian habitat will not be impacted by project activities. A few domestic trees and one isolated valley oak will be removed as a result of the Project Action. Minimal disturbances to potential foraging habitat (i.e., annual grassland and agricultural areas) will be temporary and are not expected to impact this species based on the overall regional abundance of these habitat types. This species is listed as threatened by the State of California. With numerous records of Swainson's hawk nests occurring within one mile of the project site along the Sacramento River (CNDDDB, 2006) there is a moderate to high potential this area may be used by this species for nesting. To compensate potential disturbance and to avoid active nest sites, the following conservation measures are proposed:

- **Measure BIO-21: Tree Removal Period.** Some trees will be removed on the Chesney property for the Drexler pipeline, and some walnut trees removed on the Coffman property for the Meridian Pumping Plant. All of these trees are outside the Sacramento River riparian areas. If possible, trees required for removal shall be removed outside of the nesting period (nesting period = March 1st through August 31st).
- **Measure BIO-22: Swainson's Hawk Nest Survey.** If construction is proposed to take place during the nesting season, then a qualified biologist shall survey the project site and all habitats within 0.5 mile of the site for Swainson's hawk nests. Should an active nest site occur within 0.5 mile of the project site, the CDFG shall be consulted to develop measures that will protect the nest site from project-generated disturbance. Measures may include implementing a limited operating period surrounding the nest site until young have fledged.
- **Measure BIO-23: Riparian Habitat Exclusion.** There shall be no encroachment by construction equipment or personnel into existing riparian habitat areas located along the Sacramento River. Storage or parking of equipment shall be restricted within 100 feet of riparian habitat.

4.3.4 Cackling (=Aleutian Canada) Goose

The following discussion applies to both phases. The cackling goose winters in the Central Valley, and may use the cropland in the proposed project/action vicinity for foraging or cover. No potential foraging habitat is proposed to be modified or eliminated by the Proposed Project/Action, however noise and construction activities associated with the proposed

project/action may potentially disturb geese that may use the surrounding croplands. This disturbance may cause the geese to avoid foraging in the croplands in the vicinity and forage elsewhere. Due to the abundance of agriculture in the area it is unlikely that the geese would be subject to starvation or predation due to temporary disturbance from the proposed project/action. To compensate for potential disturbances to foraging habitat, the following conservation measures are proposed:

- **Measures BIO-24: Pre-Construction Avian Surveys.** Implement all conservation measures listed for the Swainson's hawk. Pre-construction avian surveys shall also target the above species.

4.3.5 Bank Swallow

The following discussion applies to both phases. Although the bank swallow is known to nest along the Sacramento River, the immediate Action Area does not provide suitable nesting habitat for bank swallow. The gradual grassy slope of the riverbank that would be affected by the proposed screened intake is not suitable for nesting. The bank swallow may occur both upstream and downstream from the Action Area, however, and may potentially be disturbed by construction activities related to the Proposed Project/Action. Disturbance to nesting bank swallows may cause abandonment or failure of the nest, reduced productivity, and possibly a decline of the local population.

To avoid potential disturbances to nearby breeding bank swallows, the following conservation measures are proposed:

- **Measures BIO-25: Pre-Construction Avian Surveys.** Implement all conservation measures listed for the Swainson's hawk. Pre-construction avian surveys shall also target the above species. Should active nests be found within 0.25 mile of the project site, CDFG shall be consulted to develop appropriate mitigation and avoidance measures.

4.3.6 Western Burrowing Owl

The following discussion applies to both phases. The western burrowing owl is a year-round resident in the Central Valley, and may nest along the levee bank where the proposed screened intake is located, and along the edges of cropland along the pipeline alignment. The burrowing owl may use the surrounding cropland for foraging as well. No cropland is proposed to be modified or eliminated by the Proposed Project/Action, however noise and construction activities associated with the proposed project/action may potentially disturb nesting burrowing owls in the vicinity. If burrowing owl nests occur within the construction footprint along the levee, or along the pipeline alignment near cropland, implementation of the proposed project/action may result in the destruction of nesting birds or an active nest, which may reduce the success of this species and potentially affect the stability of the local population. To avoid potential disturbances to nesting and foraging habitat, the following conservation measures are proposed:

- **Measures BIO-26: Pre-Construction Avian Surveys.** Implement all conservation measures listed for the Swainson's hawk. Pre-construction avian surveys shall also target the above species. Should active nests be found within 50 meters of the project site, CDFG shall be consulted to develop appropriate mitigation and avoidance measures.

4.4 Effects on Critical Habitat

Construction activities associated with both phases of the Proposed Project/Action would result in temporary disturbances – including increased turbidity and sedimentation, cofferdam installation, and dewatering – to designated Critical Habitat for Central Valley steelhead, Central Valley spring-run Chinook salmon, and Sacramento River winter-run Chinook salmon. These potential effects are mitigated through measures incorporated in the project (see Chapter 2). Furthermore, the proposed fish screens would permanently alter designated Critical Habitat within the Action Area. However, the overall benefit of the Proposed Project on fish species outweighs the minor modifications to designated Critical Habitat.

4.5 Effects on Essential Fish Habitat

Construction activities associated with both phases of the Proposed Project/Action would result in temporary disturbances, including increased turbidity and sedimentation, cofferdam installation, and dewatering, to delineated EFH for Chinook salmon. These potential effects are mitigated through measures incorporated in the project (see Chapter 2). Furthermore, the proposed fish screens would permanently alter delineated EFH within the Action Area. However, the overall benefit of the Proposed Project on fish species outweigh the minor modifications to delineated EFH.

CHAPTER 5

Environmental Baseline – NCCPA Communities

NCCPA Communities includes both habitats and ecologically-based fish groups which are defined in the MSCS. Two NCCPA habitats and two fish groups occur within the Action Area, have potential to be affected by the Action, and are therefore included within this ASIP. These communities are listed below, and their MSCS definitions are included in the following sections. The discussion is relevant to both Phase 1 and Phase 2.

- Valley Riverine Aquatic
- Valley/Foothill Riparian
- Anadromous Fish Group
- Estuarine Fish SpeciesGroup

5.1 NCCPA Habitats

There are 18 NCCPA habitats evaluated in the MSCS. These habitats were evaluated based on certain criteria: the level of acceptance of habitat nomenclature within the scientific community; consistency with existing CALFED habitat nomenclature from the ERP; consistency with existing electronically-mapped habitat data; and the potential for habitat types to be affected by CALFED actions.

5.1.1 Valley Riverine Aquatic

Valley riverine aquatic habitat includes the water column of flowing streams and rivers in low-gradient channel reaches below 300 feet in elevation. These waters are not tidally-influenced and include features such as pools, riffles, runs, and unvegetated channel beds and banks, as well as sloughs, backwaters, and flood bypasses.

In the Action Area, valley riverine aquatic habitat exists in the Sacramento River. The Sacramento River riverine habitat is characterized by fresh-water aquatic and shaded riparian. Flows are relatively slow within the Action Area, exhibiting deep channel characteristics with levied banks. Channel substrate generally consists of fine sandy-loam with sparse areas imported rip-rap along the banks used to reinforce the adjacent levees. At both proposed new diversion locations the channelized river bank habitat is exposed and dominated by annual grassland, exhibiting a deep, cold and slow moving flow.

5.1.2 Valley/Foothill Riparian

Valley/foothill riparian habitat includes all successional stages of woody vegetation, commonly dominated by willow, Fremont cottonwood, valley oak, or sycamore. This habitat occurs within the current and historical floodplains of low-gradient reaches of streams and rivers generally below 300 feet in elevation.

The valley riparian and riparian forest habitats are located adjacent to the Sacramento River system as it winds south along the western boundary of the Meridian Farms Service Area, and is usually located within the flood plain and levee system. Valley riparian habitats provide food, water, migration and dispersal corridors, and escape, nesting, and thermal cover for an abundance of wildlife. At least 50 amphibians and reptiles and 147 bird species occur in lowland riparian systems. Additionally, 55 species of mammals are known to use California's Central Valley riparian communities.

This habitat type is not within the immediate vicinity of proposed activities near or in the Sacramento River. Riparian forest habitat occurs along the opposite bank of both proposed diversion locations as shown in **Figure 2-2** and **Figure 2-4**, and a few non-contiguous patches of mixed willow riparian habitat occurs approximately 440 feet north of the proposed New Grimes Diversion.

5.2 NCCPA Fish Groups

There are two NCCPA Fish Groups which are evaluated in the MSCS: anadromous and estuarine fish species. These fishes are associated with several of the NCCPA habitats but are assessed separately because factors that support fish populations are not sufficiently addressed in the NCCPA habitats which are based on vegetation, land use, and geography. Instead, each fish group addresses the effects CALFED actions may have on factors important to fish ecology such as water flow, depth, temperature, quality, and seasonal fluctuations in stage and flow.

The fish species included in the NCCPA fish groups are those that will be most affected by CALFED actions, depend on the health of the Bay-Delta ecosystem, and are subject to existing USFWS, NOAA Fisheries, and DFG recovery goals. The following section describes the NCCPA Fish Groups potentially affected by the Project.

5.2.1 Anadromous Fish Species

Anadromous fish are those that are born in fresh water, migrate to the ocean where they mature into adults, and return to their native fresh waters to spawn. Anadromous fish species that are included in this fish group are Sacramento River winter-run Chinook salmon, Central Valley spring-run Chinook salmon, Central Valley fall/late fall-run Chinook salmon, Central Valley steelhead, Central California Coast steelhead ESUs, and green sturgeon. These species are associated with the following NCCPA habitat types: tidal perennial aquatic, valley riverine aquatic, montane riverine aquatic, lacustrine, saline emergent, and tidal freshwater emergent.

5.2.2 Estuarine Fish Species

Estuarine fish are those that spend most or all of their lives in euryhaline conditions, or at various salinities. Estuarine fish that are included in this fish group are the tidewater goby, delta smelt, longfin smelt, Sacramento splittail, and Sacramento perch. These species are associated with the following NCCPA habitat types: tidal perennial aquatic, valley riverine aquatic, lacustrine, saline emergent, and tidal freshwater emergent.

CHAPTER 6

Effects of the Proposed Project/Action on NCCPA Communities

This chapter analyzes the direct, indirect, and cumulative effects on NCCPA communities that exist within the Action Area and that may result from implementation of both phases of the Proposed Project/Action, as well as actions related to and dependent on those actions. The Proposed Project/Action is considered to have an effect on NCCPA communities if it could result in “take” of a species, or if it would decrease the quality or extent of habitat potentially occupied by a species.

This analysis also includes a discussion of the conservation measures to avoid, minimize, and compensate for such effects, as appropriate. For descriptions of the NCCPA communities addressed in this ASIP, refer to Chapter 5.

6.1 Proposed Project/Action Effects and Conservation Measures

The following text contains an analysis of potential direct, indirect, and cumulative effects on NCCPA communities and the appropriate compensation measures:

6.1.1 Valley Riverine Aquatic

The one sensitive natural community that may be impacted by the Proposed Project/Action is the valley riverine aquatic habitat in the Sacramento River. As shown in **Figure 2-2**, **Figure 2-3**, and **Figure 2-4**, the Work Area includes valley riverine aquatic habitat in the vicinity of the proposed and existing diversions. Work within the Sacramento River at the existing diversions and the proposed Grimes Diversion will be fairly minimal; however, construction of the new Meridian Diversion will require the use of a cofferdam.

Approximately 35 acres of valley riverine aquatic habitat in the Action Area will be affected by Proposed Project/Action. However, with avoidance, minimization, and erosion control measures outlined in Chapter 2 (Project Description), impacts to the Sacramento River are considered minimal.

6.1.2 Valley Riparian

Because of the proximity of the valley riparian and cottonwood riparian habitat in the vicinity of the existing Grimes Diversion and the existing Drexler Diversion, these habitats may also be

impacted by water quality effects resulting from in-water work. Both communities provide habitat for a range of terrestrial wildlife species, including several species of songbirds, small mammals, mesocarnivores, reptiles and amphibians. Incorporation of **Measure BIO-3** and **Measure BIO-23** will ensure no disturbance and encroachment into these sensitive riparian habitat areas, thereby reducing potential effects.

6.1.3 Anadromous and Estuarine Fish Groups

Within the Action Area, effects to valley riverine aquatic habitat in the Sacramento River may subsequently affect special-status fish species from both fish groups. The Sacramento River in the vicinity of the proposed intake locations serves as a migratory corridor for the upstream migration of adult salmon and steelhead, and the downstream migration of juvenile salmon and steelhead. Other fish species in the Sacramento River near the proposed intake locations include North American green sturgeon, Sacramento splittail, striped bass, threadfin shad, American shad, catfish, Sacramento pikeminnow, tule perch, sculpin, bullhead, and a variety of other resident fish species. The Sacramento River near Sacramento also provides habitat for a variety of invertebrates, including planktonic species such as copepods, and epibenthic species such as crawfish and amphipods. With avoidance, minimization, and erosion control measures outlined in Chapter 2 (Project Description), and implementation of **Measure BIO-1** and **Measure BIO-2**, impacts to the Fish Groups in the Sacramento River will be minimized.

CHAPTER 7

Interrelated, Interdependent, and Cumulative Effects

This chapter assesses the interrelated, interdependent and cumulative effects of the Proposed Project/Action.

7.1 Interrelated and Interdependent Effects

The Proposed Project/Action is considered to be an action that is independent and has a function apart from other projects. Installation of the proposed diversion facilities would not increase water diversions or lead to any future water use not already feasible under existing baseline conditions. Thus the Proposed Project/Action is not part of a single, larger project, and therefore no interdependent or interrelated effects will occur.

7.2 Cumulative Effects

Two new diversion facilities will be installed and three existing facilities will be removed as part of this MFWC Project. The capacity of water diverted from the Sacramento River would not increase or decrease. These continuing baseline diversions as well as the implementation of BMP's and conservation measures will ensure no cumulative effects to water quality (water resources). The placement and design of the new permanent water diversion facilities in the Sacramento River is not likely to result in any obstruction of fishery migration and will likely decrease the mortality of emigrating juvenile fish species (in particular steelhead and Chinook salmon), thus not contributing to a cumulative effect on fishery resources.

Placement of the cofferdam and associated dewatering activities may potentially contribute to the loss of native fish trapped within the structure. However, the timing of proposed dewatering activities is likely to avoid special-status native fish species known to inhabit the Sacramento River based on known migratory requirements and the unlikely occurrence of these species in the vicinity of the Proposed Project/Action outside of migratory periods.

Existing surrounding land-use (i.e., agricultural) will continue to provide foraging opportunities for Swainson's hawk and other raptor species. With the implementation of Conservation measures for Swainson's hawk, suitable habitat will be preserved for future nesting opportunities, and thus will not contribute to a cumulative effect to Swainson's hawk and other species associated with riparian habitat.

CHAPTER 8

Monitoring Needs

A list of monitoring needs is included below. Monitoring is necessary in order to monitor the effects and the implementation and effectiveness of the conservation measures. These are identified as measures that the implementing entity will undertake.

1. Conduct pre-construction surveys for GGS. Biological monitors present during pre-construction shall monitor for GGS and ensure that:
 - a. construction measures to minimize effects to GGS habitat outside the construction area are followed,
 - b. construction activities do not encroach into riparian areas outside of Proposed Project/Action footprint.
2. Conduct monitoring for GGS during construction activities within its habitat.
3. Conduct a post-construction monitoring visit to document restoration of affected GGS habitat within 1 year of restoration.
4. Conduct pre-construction avian surveys for Swainson's hawk, burrowing owl, cackling goose, bank swallow, and other avian species covered under the Migratory Bird Treaty Act. Should active nests be found within 0.25 mile of the project site, CDFG shall be consulted to develop appropriate mitigation and avoidance measures. Additional monitoring may be required.
5. If construction is proposed to take place during the nesting season, then a qualified biologist shall conduct a survey the Proposed Project/Action site and all habitats within 0.5 mile of the site for Swainson's hawk nests. Should an active nest site occur within 0.5 mile of the Proposed Project/Action site, the CDFG shall be consulted to develop measures that will protect the nest site from project-generated disturbance. Measures may include implementing a limited operating period surrounding the nest site until young have fledged and additional monitoring of the nest site.
6. NFMS engineers/inspectors shall be allowed to make a final inspection of the fish screens prior to the flooding of the intake bay. NFMS engineers/inspectors may also be present when operational criteria of the screens are being tested.

CHAPTER 9

Changed Circumstances

There are no anticipated changed circumstances that would affect implementation of the Proposed Project/Action.

CHAPTER 10

Effects Determination Conclusion

The purpose of this ASIP is to review the Meridian Farms Water Company's Proposed Fish Screen Project in sufficient detail to determine to what extent the Proposed Project/Action may affect any threatened, endangered, proposed, or sensitive species within the Action Area. This chapter summarizes the environmental setting, analysis, and effects determination presented in Chapters 3 and 4.

10.1 Summary of Effects

A determination of effects based on the Proposed Project/Action on the following five species is summarized below:

- North American green sturgeon (Southern DPS) (*Acipenser medirostris*)
- Central Valley steelhead (*Oncorhynchus mykiss*)
- Central Valley spring-run Chinook salmon (*Oncorhynchus tshawytscha*)
- Sacramento River winter-run Chinook salmon (*Oncorhynchus tshawytscha*)
- Giant garter snake (*Thamnophis gigas*)

In addition, a determination of effects based on the Proposed Project/Action on designated Critical Habitat for the following three species is summarized below:

- Central Valley steelhead (*Oncorhynchus mykiss*)
- Central Valley spring-run Chinook salmon (*Oncorhynchus tshawytscha*)
- Sacramento River winter-run Chinook salmon (*Oncorhynchus tshawytscha*)

Furthermore, a determination of effects based on the Proposed Project/Action on delineated EFH for species is summarized below:

- Pacific salmon, specifically Chinook salmon (*Oncorhynchus tshawytscha*)

Lastly, a determination of effects based on the Proposed Project/Action on the following four NCCPA Communities is summarized below:

- Valley Riverine Aquatic Habitat
- Valley/Foothill Riparian Habitat
- Anadromous Fish Species
- Estuarine Fish Species

These species and communities have been selected from a broad list of species compiled from USFWS lists and database searches from the CNDDDB and CNPS. The five species are federal-listed. The NCCPA communities were selected from 20 communities defined in the MSCS. These species and communities have the potential to be affected by the Proposed Project/Action and are therefore included in this ASIP.

10.1.1 North American Green Sturgeon (Southern DPS)

The Project Action occurs within and adjacent to the Sacramento River which provides habitat for several special-status anadromous fish species. Based on the Proposed/Project Actions described in Chapter 2, these fish species are most likely to be affected by a decrease in water quality due to construction-related activities, underwater sound pressure effects generated by pile driving activities associated with cofferdam installation, and direct mortality as a result of cofferdam installation and dewatering. Included within the Proposed Project/Action are measures to minimize such impacts; these include following the Central Valley RWQCB regulations to minimize construction-related effects, installing silt screens to filter out sediment before water re-enters the river, installing a cofferdam to contain most construction activities in the water, minimizing sound pressure effects, screening of dewatering pumps, and relocation of individuals trapped within the dewatered cofferdam. With the implementation of these measures and with the incorporation of seasonal in-channel construction restrictions, it is unlikely that construction of the Proposed Project/Action would significantly affect green sturgeon populations. Moreover, the proposed project will result in avoidance of future entrainment of green sturgeon at the diversion sites. This is a beneficial effect is expected to outweigh the temporary construction-related effects.

The Proposed Project/Action may affect but is not likely to adversely affect special-status fish species for Phase 1 because (1) all in-water work will occur when fish are least likely to be located in the project area; (2) the duration of the in-water work will be relatively short (several weeks); and (3) a vibratory hammer will be used (as stated in Measure BIO-1). For these reasons, the effects to fish species will be reduced to a less than significant level in Phase 1. For Phase 2, there is potential for “incidental take” of special-status fish associated with installation of the cofferdam, and the Proposed Project/Action may affect and is likely to adversely affect special-status fish species.

10.1.2 Central Valley Steelhead

The Project Action occurs within and adjacent to the Sacramento River which provides habitat for several special-status anadromous fish species. Based on the Proposed/Project Actions described in Chapter 2, these fish species are most likely to be affected by a decrease in water quality due to construction-related activities, underwater sound pressure effects generated by pile driving activities associated with cofferdam installation, and direct mortality as a result of cofferdam installation and dewatering. Included within the Proposed Project/Action are measures to minimize such impacts; these include following the Central Valley RWQCB regulations to minimize construction-related effects, installing silt screens to filter out sediment before water re-enters the river, and installing a

cofferdam to contain most construction activities in the water, minimizing sound pressure effects, screening of dewatering pumps, and relocation of individuals trapped within the dewatered cofferdam. With the implementation of these measures and with the incorporation of seasonal in-channel construction restrictions, it is unlikely that construction of the Proposed Project/Action would significantly affect Central Valley steelhead populations. Moreover, the proposed project will result in avoidance of future entrainment of Central Valley steelhead at the diversion sites. This is a beneficial effect is expected to outweigh the temporary construction-related effects.

The Proposed Project/Action may affect but is not likely to adversely affect special-status fish species for Phase 1 because (1) all in-water work will occur when fish are least likely to be located in the project area; (2) the duration of the in-water work will be relatively short (several weeks); and (3) a vibratory hammer will be used (as stated in Measure BIO-1). For these reasons, the effects to fish species will be reduced to a less than significant level in Phase 1. For Phase 2, there is potential for “incidental take” of special-status fish associated with installation of the cofferdam, and the Proposed Project/Action may affect and is likely to adversely affect special-status fish species.

10.1.3 Central Valley Spring-Run Chinook Salmon

The Project Action occurs within and adjacent to the Sacramento River which provides habitat for several special-status anadromous fish species. Based on the Proposed/Project Actions described in Chapter 2, these fish species are most likely to be affected by a decrease in water quality due to construction-related activities, underwater sound pressure effects generated by pile driving activities associated with cofferdam installation, and direct mortality as a result of cofferdam installation and dewatering. Included within the Proposed Project/Action are measures to minimize such impacts; these include following the Central Valley RWQCB regulations to minimize construction-related effects, installing silt screens to filter out sediment before water re-enters the river, and installing a cofferdam to contain most construction activities in the water, minimizing sound pressure effects, screening of dewatering pumps, and relocation of individuals trapped within the dewatered cofferdam. With the implementation of these measures and with the incorporation of seasonal in-channel construction restrictions, it is unlikely that construction of the Proposed Project/Action would significantly affect Central Valley spring-run Chinook salmon populations. Moreover, the proposed project will result in avoidance of future entrainment of Central Valley spring-run Chinook salmon at the diversion sites. This is a beneficial effect is expected to outweigh the temporary construction-related effects.

The Proposed Project/Action may affect but is not likely to adversely affect special-status fish species for Phase 1 because (1) all in-water work will occur when fish are least likely to be located in the project area; (2) the duration of the in-water work will be relatively short (several weeks); and (3) a vibratory hammer will be used (as stated in Measure BIO-1). For these reasons, the effects to fish species will be reduced to a less than significant level in Phase 1. For Phase 2, there is potential for “incidental take” of special-status fish associated with installation of the cofferdam, and the Proposed Project/Action may affect and is likely to adversely affect special-status fish species.

10.1.4 Sacramento River Winter-Run Chinook Salmon

The Project Action occurs within and adjacent to the Sacramento River which provides habitat for several special-status anadromous fish species. Based on the Proposed/Project Actions described in Chapter 2, these fish species are most likely to be affected by a decrease in water quality due to construction-related activities, underwater sound pressure effects generated by pile driving activities associated with cofferdam installation, and direct mortality as a result of cofferdam installation and dewatering. Included within the Proposed Project/Action are measures to minimize such impacts; these include following the Central Valley RWQCB regulations to minimize construction-related effects, installing silt screens to filter out sediment before water re-enters the river, and installing a cofferdam to contain most construction activities in the water, minimizing sound pressure effects, screening of dewatering pumps, and relocation of individuals trapped within the dewatered cofferdam. With the implementation of these measures and with the incorporation of seasonal in-channel construction restrictions, it is unlikely that construction of the Proposed Project/Action would significantly affect Sacramento River winter-run Chinook salmon populations. Moreover, the proposed project will result in avoidance of future entrainment of Sacramento River winter-run Chinook salmon at the diversion sites. This is a beneficial effect is expected to outweigh the temporary construction-related effects.

The Proposed Project/Action may affect but is not likely to adversely affect special-status fish species for Phase 1 because (1) all in-water work will occur when fish are least likely to be located in the project area; (2) the duration of the in-water work will be relatively short (several weeks); and (3) a vibratory hammer will be used (as stated in Measure BIO-1). For these reasons, the effects to fish species will be reduced to a less than significant level in Phase 1. For Phase 2, there is potential for “incidental take” of special-status fish associated with installation of the cofferdam, and the Proposed Project/Action may affect and is likely to adversely affect special-status fish species.

10.1.5 Giant Garter Snake

The giant garter snake has a low to moderate potential to occur in the Action Area and is an important species in the Central Valley region. The aquatic giant garter snake inhabits slow-moving waters, such as backwaters and sloughs, and requires some aquatic vegetation for basking and cover. Phase 1 habitats for giant garter snake include aquatic habitat in portions of some Reclamation Drains, the Main Canal, and delivery ditches, and upland habitat in adjacent undeveloped land within 200 feet of the aquatic habitat. Effects to Phase 1 habitats are temporary in duration, and will be restored to pre-project conditions. In addition, implementation conservation measures from the Programmatic BO will avoid or minimize potential effects to giant garter snake for Phase 1.

The details of Phase 2 effects are currently unknown; however, the anticipated effects to giant garter snake include: temporary effects to aquatic habitat resulting from the Main Canal improvements; temporary and permanent effects to upland habitat along the Main Canal improvements; permanent effects to upland habitat in association with the Drexler Relift; and

possible incidental “take” during the snake’s inactive period. Consultation on Phase 2 will be initiated at a later date as funds become available. At that time, a more-detailed analysis of Phase 2 effects on giant garter snake will be conducted. To avoid and minimize the anticipated effects to giant garter snake in Phase 2, conservation measures from the Programmatic BO will be implemented. Compensation for permanent loss of habitat in Phase 2 is anticipated at a 3:1 replacement ratio.

It is anticipated that both phases of the Proposed Project/Action ‘may affect and is likely to adversely affect’ the giant garter snake.

10.2 Critical Habitat

Construction activities associated with the Proposed Project/Action would result in temporary disturbances, including increased turbidity and sedimentation, cofferdam installation, and dewatering, to designated Critical Habitat for Central Valley steelhead, Central Valley spring-run Chinook salmon, and Sacramento River winter-run Chinook salmon. These potential effects are mitigated through measures incorporated in the project (see Chapter 2). Furthermore, the proposed fish screens would permanently alter designated Critical Habitat within the Action Area. However, the overall benefit of the proposed project on fish species outweighs the minor modifications to designated Critical Habitat.

Therefore, both Phase 1 and Phase 2 of the Proposed Project/Action may affect, but are not likely to adversely affect Critical Habitat identified in this ASIP.

10.3 Essential Fish Habitat

Construction activities associated with the proposed project/action would result in temporary disturbances, including increased turbidity and sedimentation, cofferdam installation, and dewatering, to delineated EFH for Chinook salmon. These potential effects are mitigated through measures incorporated in the project (see Chapter 2). Furthermore, the proposed fish screens would permanently alter delineated EFH within the Action Area. However, the overall benefit of the Proposed Project/Action on fish species outweigh the minor modifications to delineated EFH.

Therefore, both Phase 1 and Phase 2 of the Proposed Project/Action may affect, but are not likely to adversely affect Essential Fish Habitat identified in this ASIP.

10.4 NCCPA Communities

This section summarizes the environmental setting, analysis, and effects determination presented in Chapters 5. The NCCPA communities that may be affected by the Proposed Project/Action include Valley Riverine Aquatic and Valley/Foothill Riparian habitats, and the Anadromous and Estuarine Fish Groups, which are associated with these habitats in the Action Area. Effects to the fishes are largely related to water quality, which was addressed in the Proposed Project/Action description. Water quality control measures are included in the Proposed Project/Action, and reduce the effects to the fishes to less-than-significant levels.

Effects to the two habitats are addressed in conservation measures in Chapter 5, which include avoidance of riparian areas, and the implementation of Swainson's hawk conservation and water quality measures. With the implementation of these measures, effects to Valley Riverine Aquatic and Valley/Foothill Riparian habitats are not likely. Adverse effects to Anadromous and Estuarine Fish Groups are expected to be minor and are outweighed by the overall beneficial effects of the Proposed Project.

Therefore, both Phase 1 and Phase 2 of the Proposed Project/Action may affect, but are not likely to adversely affect NCCPA Communities identified in this ASIP.

CHAPTER 11

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Appendix A (ASIP)

Species List





United States Department of the Interior
FISH AND WILDLIFE SERVICE

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



July 12, 2007

Document Number: 070712043233

Sara Lee
Environmental Science Associates
8950 Cal Center Drive
Building 3, Suite 300
Sacramento, CA 95820

Subject: Species List for Meridian Farms Fish Screen Project

Dear: Ms. Lee,

We are sending this official species list in response to your July 12, 2007 request for information about endangered and threatened species. The list covers the California counties and/or U.S. Geological Survey 7½ minute quad or quads you requested.

Our database was developed primarily to assist Federal agencies that are consulting with us. Therefore, our lists include all of the sensitive species that have been found in a certain area *and also ones that may be affected by projects in the area.* For example, a fish may be on the list for a quad if it lives somewhere downstream from that quad. Birds are included even if they only migrate through an area. In other words, we include all of the species we want people to consider when they do something that affects the environment.

Please read Important Information About Your Species List (below). It explains how we made the list and describes your responsibilities under the Endangered Species Act.

Our database is constantly updated as species are proposed, listed and delisted. If you address proposed and candidate species in your planning, this should not be a problem. However, we recommend that you get an updated list every 90 days. That would be October 10, 2007.

Please contact us if your project may affect endangered or threatened species or if you have any questions about the attached list or your responsibilities under the Endangered Species Act. A list of Endangered Species Program contacts can be found at www.fws.gov/sacramento/es/branches.htm.

Endangered Species Division



**Federal Endangered and Threatened Species that Occur in
or may be Affected by Projects in the Counties and/or
U.S.G.S. 7 1/2 Minute Quads you requested**

Document Number: 070712043233
Database Last Updated: June 9, 2007

Quad Lists

Listed Species

Invertebrates

- Branchinecta conservatio*
 - Conservancy fairy shrimp (E)*
- Branchinecta lynchi*
 - vernal pool fairy shrimp (T)*
- Desmocerus californicus dimorphus*
 - valley elderberry longhorn beetle (T)*
- Lepidurus packardi*
 - Critical habitat, vernal pool tadpole shrimp (X)*
 - vernal pool tadpole shrimp (E)*

Fish

- Acipenser medirostris*
 - green sturgeon (T) (NMFS)*
- Hypomesus transpacificus*
 - delta smelt (T)*
- Oncorhynchus mykiss*
 - Central Valley steelhead (T) (NMFS)*
 - Critical habitat, Central Valley steelhead (X) (NMFS)*
- Oncorhynchus tshawytscha*
 - Central Valley spring-run chinook salmon (T) (NMFS)*
 - Critical Habitat, Central Valley spring-run chinook (X) (NMFS)*
 - Critical habitat, winter-run chinook salmon (X) (NMFS)*
 - winter-run chinook salmon, Sacramento River (E) (NMFS)*

Amphibians

- Ambystoma californiense*
 - California tiger salamander, central population (T)*
- Rana aurora draytonii*
 - California red-legged frog (T)*

Reptiles

- Thamnophis gigas*
 - giant garter snake (T)*

Candidate Species

Fish

- Oncorhynchus tshawytscha*
 - Central Valley fall/late fall-run chinook salmon (C) (NMFS)*
 - Critical habitat, Central Valley fall/late fall-run chinook (C) (NMFS)*

Birds

- Coccyzus americanus occidentalis*
 - Western yellow-billed cuckoo (C)*

Quads Containing Listed, Proposed or Candidate Species:

SUTTER BUTTES (545A)

MERIDIAN (545B)

GRIMES (545C)

TISDALE WEIR (545D)

County Lists

No county species lists requested.

Key:

(E) *Endangered* - Listed as being in danger of extinction.

(T) *Threatened* - Listed as likely to become endangered within the foreseeable future.

(P) *Proposed* - Officially proposed in the Federal Register for listing as endangered or threatened.

(NMFS) Species under the Jurisdiction of the National Oceanic & Atmospheric Administration Fisheries Service. Consult with them directly about these species.

Critical Habitat - Area essential to the conservation of a species.

(PX) *Proposed Critical Habitat* - The species is already listed. Critical habitat is being proposed for it.

(C) *Candidate* - Candidate to become a proposed species.

(V) Vacated by a court order. Not currently in effect. Being reviewed by the Service.

(X) *Critical Habitat* designated for this species

Important Information About Your Species List

How We Make Species Lists

We store information about endangered and threatened species lists by U.S. Geological Survey 7½ minute quads. The United States is divided into these quads, which are about the size of San Francisco.

The animals on your species list are ones that occur within, **or may be affected by** projects within, the quads covered by the list.

- Fish and other aquatic species appear on your list if they are in the same watershed as your quad or if water use in your quad might affect them.
- Amphibians will be on the list for a quad or county if pesticides applied in that area may be carried to their habitat by air currents.
- Birds are shown regardless of whether they are resident or migratory. Relevant birds on the county list should be considered regardless of whether they appear on a quad list.

Plants

Any plants on your list are ones that have actually been observed in the area covered by the list. Plants may exist in an area without ever having been detected there. You can find out what's in the surrounding quads through the California Native Plant Society's online [Inventory of Rare and Endangered Plants](#).

Surveying

Some of the species on your list may not be affected by your project. A trained biologist or botanist, familiar with the habitat requirements of the species on your list, should determine whether they or habitats suitable for them may be affected by your project. We recommend that your surveys include any proposed and candidate species on your list.

For plant surveys, we recommend using the [Guidelines for Conducting and Reporting Botanical Inventories](#). The results of your surveys should be published in any environmental documents prepared for your project.

Your Responsibilities Under the Endangered Species Act

All animals identified as listed above are fully protected under the Endangered Species Act of 1973, as amended. Section 9 of the Act and its implementing regulations prohibit the take of a federally listed wildlife species. Take is defined by the Act as "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect" any such animal.

Take may include significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding, or shelter (50 CFR §17.3).

Take incidental to an otherwise lawful activity may be authorized by one of two procedures:

- If a Federal agency is involved with the permitting, funding, or carrying out of a project that may result in take, then that agency must engage in a formal [consultation](#) with the Service.

During formal consultation, the Federal agency, the applicant and the Service work together to avoid or minimize the impact on listed species and their habitat. Such consultation would result in a biological opinion by the Service addressing the anticipated effect of the project on listed and proposed species. The opinion may authorize a limited level of incidental take.

- If no Federal agency is involved with the project, and federally listed species may be taken as part of the project, then you, the applicant, should apply for an incidental take permit. The Service may issue such a permit if you submit a satisfactory conservation plan for the species that would be affected by your project.

Should your survey determine that federally listed or proposed species occur in the area and are likely to be affected by the project, we recommend that you work with this office and the California Department of Fish and Game to develop a plan that minimizes the project's direct and indirect impacts to listed species and compensates for project-related loss of habitat. You should include the plan in any environmental documents you file.

Critical Habitat

When a species is listed as endangered or threatened, areas of habitat considered essential to its conservation may be designated as [critical habitat](#). These areas may require special management considerations or protection. They provide needed space for growth and normal behavior; food, water, air, light, other nutritional or physiological requirements; cover or shelter; and sites for breeding, reproduction, rearing of offspring, germination or seed dispersal.

Although critical habitat may be designated on private or State lands, activities on these lands are not restricted unless there is Federal involvement in the activities or direct harm to listed wildlife.

If any species has proposed or designated critical habitat within a quad, there will be a separate line for this on the species list. Boundary descriptions of the critical habitat may be found in the Federal Register. The information is also reprinted in the Code of Federal Regulations (50 CFR 17.95). See our [critical habitat page](#) for maps.

Candidate Species

We recommend that you address impacts to candidate species. We put plants and animals on our candidate list when we have enough scientific information to eventually propose them for listing as threatened or endangered. By considering these species early in your planning process you may be able to avoid the problems that could develop if one of these candidates was listed before the end of your project.

Species of Concern

The Sacramento Fish & Wildlife Office no longer maintains a list of species of concern. However, various other agencies and organizations maintain lists of at-risk species. These lists provide essential information for land management planning and conservation efforts. [More info](#)

Wetlands

If your project will impact wetlands, riparian habitat, or other jurisdictional waters as defined by section 404 of the Clean Water Act and/or section 10 of the Rivers and Harbors Act, you will need to obtain a permit from the U.S. Army Corps of Engineers. Impacts to wetland habitats require site specific mitigation and monitoring. For questions regarding wetlands, please contact Mark Littlefield of this office at (916) 414-6580.

Updates

Our database is constantly updated as species are proposed, listed and delisted. If you address proposed and candidate species in your planning, this should not be a problem. However, we recommend that you get an updated list every 90 days. That would be October 10, 2007.

California Department of Fish and Game

Natural Diversity Database

Selected Elements by Scientific Name - Portrait

USGS 7.5-minute Quads: Grimes, Kirkville, Dunnigan, Arbuckle, Colusa, Wildwood School, Tisdale Weir, Sutter Buttes, Meridian

Scientific Name/Common Name	Element Code	Federal Status	State Status	GRank	SRank	CDFG or CNPS
1 <i>Agelaius tricolor</i> tricolored blackbird	ABPBXB0020			G2G3	S2	SC
2 <i>Ambystoma californiense</i> California tiger salamander	AAAAA01180	Threatened		G2G3	S2S3	SC
3 <i>Antrozous pallidus</i> pallid bat	AMACC10010			G5	S3	SC
4 <i>Ardea alba</i> great egret	ABNGA04040			G5	S4	
5 <i>Ardea herodias</i> great blue heron	ABNGA04010			G5	S4	
6 <i>Astragalus tener var. ferrisiae</i> Ferris' milk-vetch	PDFAB0F8R3			G1T1	S1.1	1B.1
7 <i>Athene cunicularia</i> burrowing owl	ABNSB10010			G4	S2	SC
8 <i>Atriplex depressa</i> brittlescale	PDCHE042L0			G2Q	S2.2	1B.2
9 <i>Atriplex joaquiniana</i> San Joaquin spearscale	PDCHE041F3			G2	S2.1	1B.2
10 <i>Branchinecta lynchi</i> vernal pool fairy shrimp	ICBRA03030	Threatened		G3	S2S3	
11 <i>Branta hutchinsii leucopareia</i> cackling (=Aleutian Canada) goose	ABNJB05035	Delisted		G5T4	S2	
12 <i>Buteo swainsoni</i> Swainson's hawk	ABNKC19070		Threatened	G5	S2	
13 <i>California macrophyllum</i> round-leaved filaree	PDGER01070			G3	S3.1	1B.1
14 <i>Carduelis lawrencei</i> Lawrence's goldfinch	ABPBY06100			G3G4	S3	
15 <i>Charadrius montanus</i> mountain plover	ABNNB03100			G2	S2?	SC
16 <i>Cicindela hirticollis abrupta</i> Sacramento Valley tiger beetle	IICOL02106			G5TH	SH	
17 <i>Coastal and Valley Freshwater Marsh</i>	CTT52410CA			G3	S2.1	
18 <i>Coccyzus americanus occidentalis</i> western yellow-billed cuckoo	ABNRB02022	Candidate	Endangered	G5T2	S1	
19 <i>Cordylanthus palmatus</i> palmate-bracted bird's-beak	PDSCR0J0J0	Endangered	Endangered	G1	S1.1	1B.1
20 <i>Desmocerus californicus dimorphus</i> valley elderberry longhorn beetle	IICOL48011	Threatened		G3T2	S2	
21 <i>Dipodomys californicus eximius</i> Marysville California kangaroo rat	AMAFD03071			G4T1	S1	SC
22 <i>Great Valley Cottonwood Riparian Forest</i>	CTT61410CA			G2	S2.1	
23 <i>Great Valley Mixed Riparian Forest</i>	CTT61420CA			G2	S2.2	
24 <i>Great Valley Willow Scrub</i>	CTT63410CA			G3	S3.2	

California Department of Fish and Game

Natural Diversity Database

Selected Elements by Scientific Name - Portrait

USGS 7.5-minute Quads: Grimes, Kirkville, Dunnigan, Arbuckle, Colusa, Wildwood School, Tisdale Weir, Sutter Buttes, Meridian

Scientific Name/Common Name	Element Code	Federal Status	State Status	GRank	SRank	CDFG or CNPS
25 <i>Grus canadensis tabida</i> greater sandhill crane	ABNMK01014		Threatened	G5T4	S2	
26 <i>Hibiscus lasiocarpus</i> rose-mallow	PDMAL0H0Q0			G4	S2.2	2.2
27 <i>Lasiurus blossevillii</i> western red bat	AMACC05060			G5	S?	
28 <i>Lasiurus cinereus</i> hoary bat	AMACC05030			G5	S4?	SC
29 <i>Lasthenia glabrata ssp. coulteri</i> Coulter's goldfields	PDAST5L0A1			G4T3	S2.1	1B.1
30 <i>Layia septentrionalis</i> Colusa layia	PDAST5N0F0			G2	S2.2	1B.2
31 <i>Lepidurus packardii</i> vernal pool tadpole shrimp	ICBRA10010	Endangered		G3	S2S3	
32 <i>Myotis ciliolabrum</i> western small-footed myotis	AMACC01140			G5	S2S3	
33 <i>Navarretia leucocephala ssp. bakeri</i> Baker's navarretia	PDPLM0C0E1			G4T2	S2.1	1B.1
34 <i>Northern Hardpan Vernal Pool</i>	CTT44110CA			G3	S3.1	
35 <i>Perognathus inornatus inornatus</i> San Joaquin pocket mouse	AMAFD01061			G4T2T3	S2S3	
36 <i>Plegadis chihi</i> white-faced ibis	ABNGE02020			G5	S1	SC
37 <i>Riparia riparia</i> bank swallow	ABPAU08010		Threatened	G5	S2S3	
38 <i>Silene verecunda ssp. verecunda</i> San Francisco champion	PDCAR0U213			G5T2	S2.2	1B.2
39 <i>Spea hammondii</i> western spadefoot	AAABF02020			G3	S3	SC
40 <i>Thamnophis gigas</i> giant garter snake	ARADB36150	Threatened	Threatened	G2G3	S2S3	
41 <i>Trichocoronis wrightii var. wrightii</i> Wright's trichocoronis	PDAST9F031			G4T3	S1.1	2.1



Inventory of Rare and Endangered Plants

v7-07c 7-09-07

Status: search results - Thu, Jul. 12, 2007 15:42 c

{QUADS_123} = ~ m/545C|530A|530B|546D|546A|531A|545D|545/

Tip: Want to search by county? Try the [county index](#). [\[all tips and help.\]](#) [\[search history\]](#)

Your Quad Selection: Grimes (545C) 3912118, Kirkville (530A) 3812187, Dunnigan (530B) 3812188, Arbuckle (546D) 3912211, Colusa (546A) 3912221, Wildwood School (531A) 3812281, Tisdale Weir (545D) 3912117, Sutter Buttes (545A) 3912127, Meridian (545B) 3912128

Hits 1 to 11 of 11

Requests that specify topo quads will return only Lists 1-3.

To save selected records for later study, click the ADD button.

Selections will appear in a new window.

open	save	hits	scientific	common	family	CNPS
	<input type="checkbox"/>	1	Astragalus tener var. ferrisiae	Ferris' milk-vetch	Fabaceae	List 1B.1
	<input type="checkbox"/>	1	Atriplex depressa	brittlescale	Chenopodiaceae	List 1B.2
	<input type="checkbox"/>	1	Atriplex joaquiniana	San Joaquin spearscale	Chenopodiaceae	List 1B.2
	<input type="checkbox"/>	1	California macrophylla	round-leaved filaree	Geraniaceae	List 1B.1
	<input type="checkbox"/>	1	Cordylanthus palmatus	palmate-bracted bird's-beak	Scrophulariaceae	List 1B.1
	<input type="checkbox"/>	1	Hibiscus lasiocarpus	rose-mallow	Malvaceae	List 2.2
	<input type="checkbox"/>	1	Lasthenia glabrata ssp. coulteri	Coulter's goldfields	Asteraceae	List 1B.1
	<input type="checkbox"/>	1	Layia septentrionalis	Colusa layia	Asteraceae	List 1B.2
	<input type="checkbox"/>	1	Navarretia leucocephala ssp. bakeri	Baker's navarretia	Polemoniaceae	List 1B.1
	<input type="checkbox"/>	1	Silene verecunda ssp. verecunda	San Francisco champion	Caryophyllaceae	List 1B.2
	<input type="checkbox"/>	1	Trichocoronis wrightii var. wrightii	Wright's trichocoronis	Asteraceae	List 2.1

To save selected records for later study, click the ADD button.

Selections will appear in a new window.

No more hits.





SOURCE: USDA, 2005; MWH, 2007; MFWC, 2007; and ESA, 2008

Meridian Farms Water Company – Fish Screen Project . 203104

Figure A-1
 Proposed Crop Types for 2008 in the
 Vicinity of the Action Area

Appendix B (ASIP)

Site Photos





PHOTO 1 – Riparian habitat near the existing Drexler Diversion.



PHOTO 2 – Location of the Proposed New Grimes Diversion.



PHOTO 3 – Location of the Proposed Meridian Diversion.



PHOTO 4 – View of ruderal grassland along the Sacramento River near the Meridian Diversion.



PHOTO 5 – Existing Grimes Diversion.



PHOTO 6 – Existing Meridian Diversion.



PHOTO 7 – Reclamation District 70 Drain.



PHOTO 8 – Main Canal.



PHOTO 9 – Water Delivery Ditch.



PHOTO 10 – Seep Ditch at the location of the Proposed Drexler Relift.



PHOTO 11 – Small mammal burrow.