APPENDIX B

Alternatives Development Process

TABLE OF CONTENTS

TABLES

FIGURES

ATTACHMENTS

Appendix B

Salton Sea Species Conservation Habitat Alternatives Development Process

B.1 Introduction

The goals and objectives/purpose for a project could be met in a variety of ways. However, these alternative ways of implementation would likely differ in how well they achieved the project objectives/purpose, their feasibility, and their impacts. The approach and requirements for alternatives analysis are slightly different under Federal and state law.

Both the National Environmental Policy Act (NEPA) and the California Environmental Quality Act (CEQA) require that an Environmental Impact Statement (EIS) or Environmental Impact Report (EIR), respectively, analyze the impacts of alternative ways of implementing a project. NEPA's requirements for an alternatives analysis are found in the Council on Environmental Quality's NEPA Regulations (40 Code of Federal Regulations [CFR] 1502.14), and CEQA's are found in CEQA Guidelines section 15126.6. Under NEPA, the range of alternatives required to be evaluated by an EIS is governed by the rule of reason, which requires an EIS to set forth only those alternatives necessary to permit a reasoned choice. An EIS must rigorously explore and objectively evaluate a reasonable range of alternatives as defined by the specific facts and circumstances of the proposed action. Alternatives must be feasible and consistent with the statement of purpose and need. Feasible alternatives are those that can be carried out based on technical, economic, and environmental factors, as well as common sense (40 CFR 1502.14; Forty Most Asked Questions Concerning CEQ's NEPA Regulations No. 2a). If alternatives have been eliminated from detailed study, the EIS must briefly discuss the reasons for their elimination. In addition, under NEPA, the alternatives analysis should present the environmental impacts of the proposed project and the alternatives "in comparative form, thus sharply defining the issues and providing a clear basis for choice among options by the decision maker and the public" (40 CFR section 1502.14). The "No Federal Action" alternative (no permit issued) must be included among the alternatives analyzed. The Federal lead agency also should identify its preferred alternative.

In addition to the NEPA alternatives analysis, the United States (U.S.) Army Corps of Engineers (Corps) is required to analyze alternatives pursuant to the Clean Water Act section 404(b)(1) Guidelines (40 CFR Part 230). Under those guidelines, the Corps is required to identify and determine the "least environmentally damaging practicable alternative." A Draft Section 404(b)(1) Alternatives Analysis for the proposed project will be prepared pursuant to the Guidelines and included in the Final EIS/EIR. The Draft Section 404(b)(1) Alternatives Analysis is intended to assist the Corps in complying with the guidelines in connection with its decision whether to issue a Clean Water Act section 404 permit for the proposed project or an alternative to the proposed project. Pursuant to the Section 404(b)(1) Guidelines and Corps regulations (33 CFR 320-332), the Corps can issue a permit only for a project that is the least environmentally damaging practicable alternative (focusing primarily on impacts on aquatic resources) and is not contrary to the public interest.

CEQA requires that EIRs examine a reasonable range of alternatives that would feasibly achieve most of the basic project objectives, but would avoid or substantially lessen one or more of a project's significant environmental impacts. Project alternatives must be feasible based on specific economic, social, legal, and technical considerations. The EIR must explain the rationale for selecting the alternatives to be discussed, identify those that were eliminated as infeasible, and briefly explain why they were eliminated. The range of alternatives required in an EIR is governed by a "rule of reason," which requires the EIR to set forth only those alternatives necessary to permit a reasoned choice. The EIR need examine in detail only the alternatives that the lead agency determines could feasibly attain most of the project objectives (CEQA Guidelines section 15126.6[f]). An EIR need not consider an alternative whose effects cannot be reasonably ascertained and whose implementation is remote and speculative (CEQA Guidelines section 15126.6[f][3]).

CEQA Guidelines section 15126.6[e][1] indicates that the no project alternative (referred to as the "No Action Alternative" in this document) is not the baseline for determining whether the proposed project's environmental impacts may be significant unless it is identical to the existing environmental setting. CEQA Guidelines section 15126.6[e][2] further indicates that the no action analysis should discuss the existing conditions at the time the Notice of Preparation is published, as well as what would be reasonably expected to occur in the foreseeable future if the action were not approved, based on current plans and consistent with available infrastructure and community services.

The initial concept for the Salton Sea Species Conservation Habitat (SCH) Project was to restore approximately 2,400 acres of saline habitat, based on available funds. The habitat would be configured in a series of interconnected shallow ponds located within the Sea's current footprint, consistent with the characteristics of the Early Start Habitat identified in the Programmatic Environmental Impact Report for the Salton Sea Ecosystem Restoration Program (California Department of Water Resources [DWR] and California Department of Fish and Game [DFG] 2007). This appendix describes the process used for developing this initial concept and refining the list of alternatives to be evaluated in the SCH Project EIS/EIR. This process has occurred in a systematic, incremental manner, involving the development of Project goals and objectives/purpose; identification of potential site locations, configurations, and Project components; and the application of exclusionary and evaluative criteria to the potential sites and Project components with the intent of eliminating those that either did not meet the goals and objectives/purpose or were not viable due to cost, technical, or environmental considerations. Additional refinements to the Project alternatives included in the EIS/EIR occurred after this initial analysis, based on information included in the geotechnical analysis, special studies and workshops, land use compatibility issues, budgetary considerations, and input from Stakeholders.

B.1.1 SCH Project Goals and Objectives/Purpose

Feasible alternatives must, at a minimum, meet the Project goals and objectives/purpose, which were developed after consideration of the existing and projected conditions of the Salton Sea ecosystem.

The Salton Sea currently supports a wide variety of bird species and a limited aquatic community. Over many decades, the components of the aquatic-dependent community have shifted in response to receding water levels and increasing salinity. The Salton Sea currently is a hypersaline ecosystem (about 51 parts per thousand [ppt]) (C. Holdren, Reclamation, unpublished data). Without restoration, declining inflows in future years will result in the Sea's ecosystem collapse due to increasing salinity (expected to exceed 60 ppt by 2018, which is too saline to support fish) and other water quality stresses, such as temperature extremes, eutrophication, and related anoxia due to algal productivity.

The most serious and immediate threat to the Salton Sea ecosystem is the loss of fishery resources that support piscivorous birds. The birds that feed on invertebrates have more options and resources, because the invertebrate fauna has a wider range of salinity tolerances. Piscivorous birds, on the other hand, are at risk of decline. To address this immediate need, the California Legislature appropriated funds for the purpose of implementing "conservation measures necessary to protect the fish and wildlife species dependent on the Salton Sea, including adaptive management measurements" (California Fish and Game

Code section 2932(b)). Therefore, under CEQA the SCH Project's goals are two-fold: (1) develop a range of aquatic habitats that will support fish and wildlife species dependent on the Salton Sea; and (2) develop and refine information needed to successfully manage the SCH Project habitat through an adaptive management process. Specific objectives under each goal are described in detail in Section 1 of this EIS/EIR.

GOAL 1. DEVELOP A RANGE OF AQUATIC HABITATS THAT WILL SUPPORT FISH AND WILDLIFE SPECIES DEPENDENT ON THE SALTON SEA.

The SCH Project's purpose is to provide in-kind replacement for near-term habitat losses. The Project's target species are those piscivorous bird species use the Salton Sea and that are dependent on shallow saline habitat for essential habitat requirements and the viability of a significant portion of their population.

OBJECTIVES FOR GOAL 1:

1. Provide appropriate foraging habitat for piscivorous bird species.
2. Develop habitats required to support piscivorous bird species.
3. Support a sustainable, productive aquatic community.
4. Provide suitable water quality for fish.
5. Minimize adverse effects on desert pupfish.
6. Minimize risk of selenium.
7. Minimize risk of disease/toxicity impacts.

GOAL 2. DEVELOP AND REFINE INFORMATION NEEDED TO SUCCESSFULLY MANAGE THE SCH PROJECT HABITAT THROUGH AN ADAPTIVE MANAGEMENT PROCESS.

The SCH Project's second goal would be to serve as a proof of concept for the restoration of shallow-water habitat that supports fish and wildlife currently dependent upon the Salton Sea. The Project would incorporate an adaptive management framework to guide evaluation and improved management of the newly created habitat as well as to inform future restoration. An adaptive management framework provides a flexible decision-making process for ongoing knowledge acquisition, monitoring, and evaluation, leading to continuous improvement in management planning and Project implementation to achieve specified objectives. The information obtained would be used to measure Project effectiveness, to refine operations and management of the ponds, to reduce uncertainties about key issues, and to inform subsequent stages of habitat restoration at the Salton Sea.

OBJECTIVES FOR GOAL 2:

1. Identify uncertainties in achieving the objectives of providing habitat and prey for piscivorous birds (e.g., maintaining suitable water temperature and dissolved oxygen) and minimizing impacts on species (e.g., selenium ecorisk).
2. Design science-based means to test alternatives and reduce uncertainty.
3. Develop and implement a monitoring plan.
4. Develop a decision-making framework.
5. Provide proof of concept for future restoration.

The purpose of the Project under NEPA is to develop a range of aquatic habitats that will support and wildlife species dependent on the Salton Sea in Imperial County, California.

B.2 Potential Project Locations, Configurations, and Components

B.2.1 Potential Pond Locations and Configurations

Three generalized locations for the SCH ponds initially were identified by DWR and DFG based on the potential availability of contiguous acreage and the potential availability of a nearby, suitable water supply. The most suitable general areas based on this initial screening were located near the mouths of the New, Alamo, and Whitewater rivers, as shown on Figure B-1. More specific views of areas considered as potential ponds sites are shown on Figures B-2 through B-4.

At the Sea's northern end near the Whitewater River, only about 900 acres are available, while larger areas are available at the Sea's southern end near the Alamo and New rivers. Therefore, several acreage combinations were developed using one or more of the rivers, resulting in habitats that were contiguous or dispersed, as follows.

6. Contiguous SCH Ponds at Whitewater River (900 acres)
7. Contiguous SCH Ponds at New River (2,400 acres)
8. Contiguous SCH Ponds at Alamo River (2,400 acres)
9. Dispersed SCH Ponds at New and Alamo Rivers (4,800 acres)
10. Dispersed SCH Ponds at Whitewater and New Rivers (3,300 acres)
11. Dispersed SCH Ponds at Whitewater and Alamo Rivers (3,300 acres)
12. Dispersed SCH Ponds at Whitewater, New, and Alamo rivers (5,700 acres)

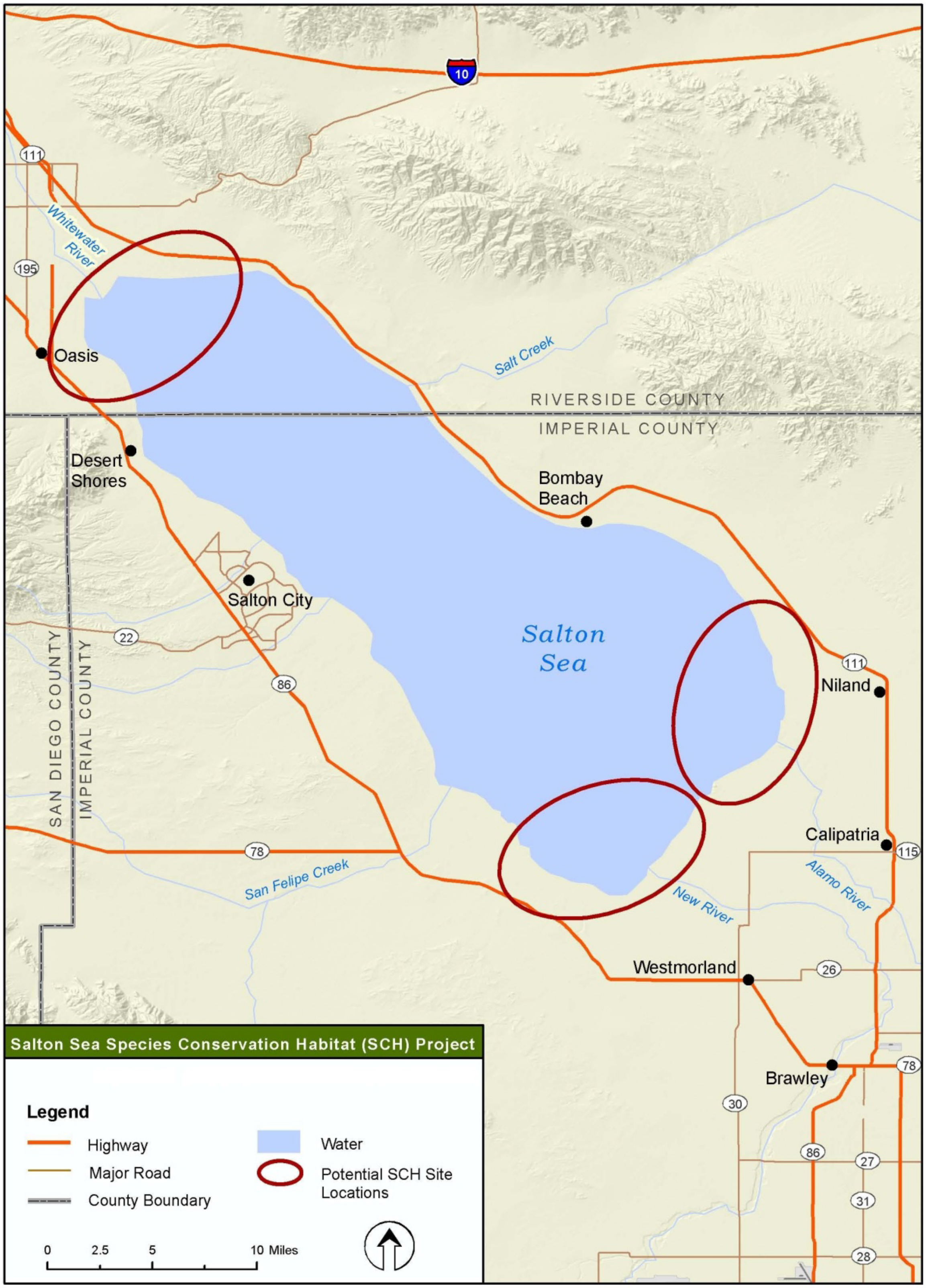

Figure B-1 Regional Setting and Generalized Locations of Potential SCH Alternative Sites

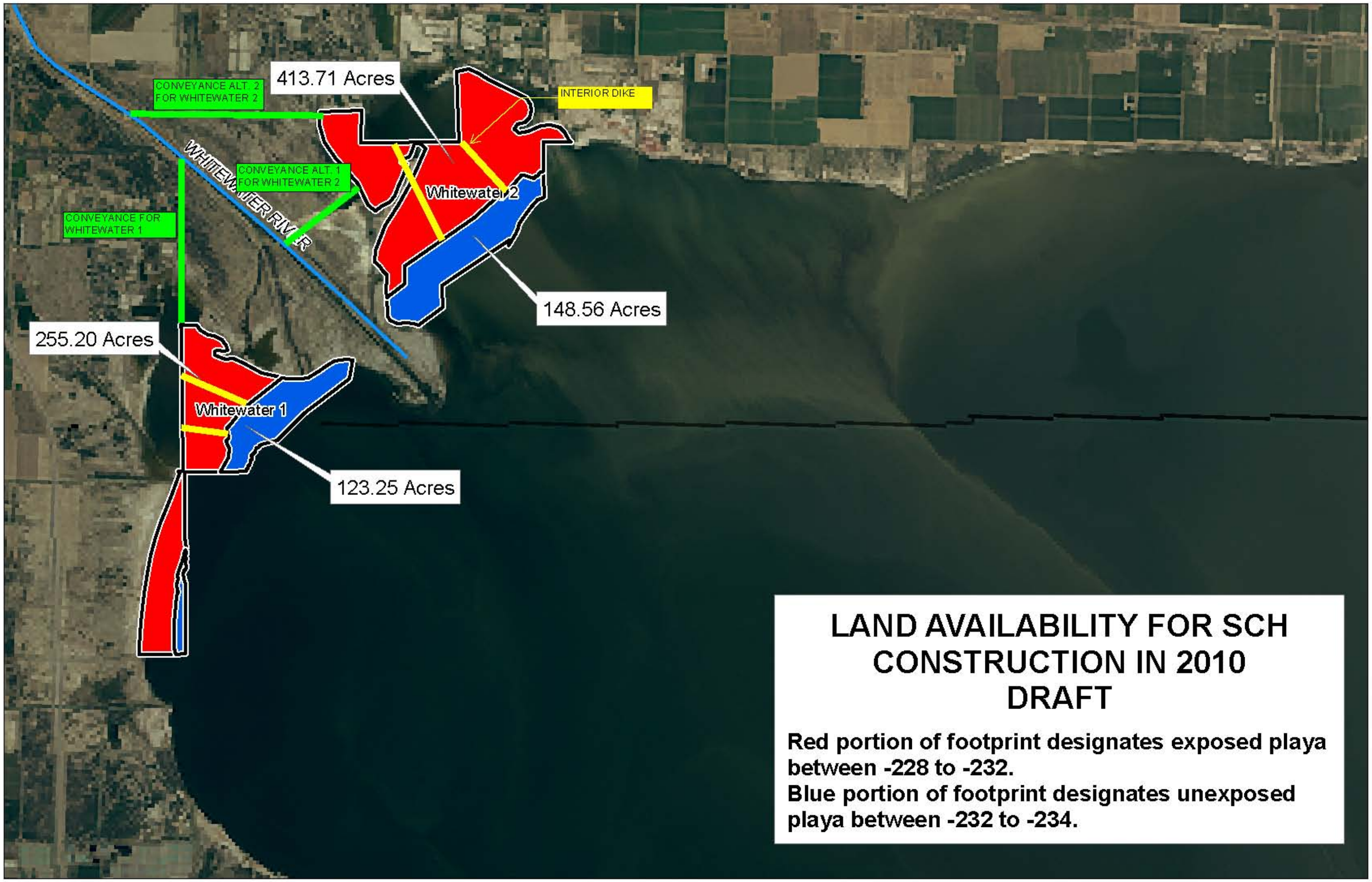

Figure B-2 Conceptual SCH Pond Sites near the Whitewater River Based on DFG and DWR Evaluations

Note: Dikes and conveyances shown on this figure are hypothetical and subject to change

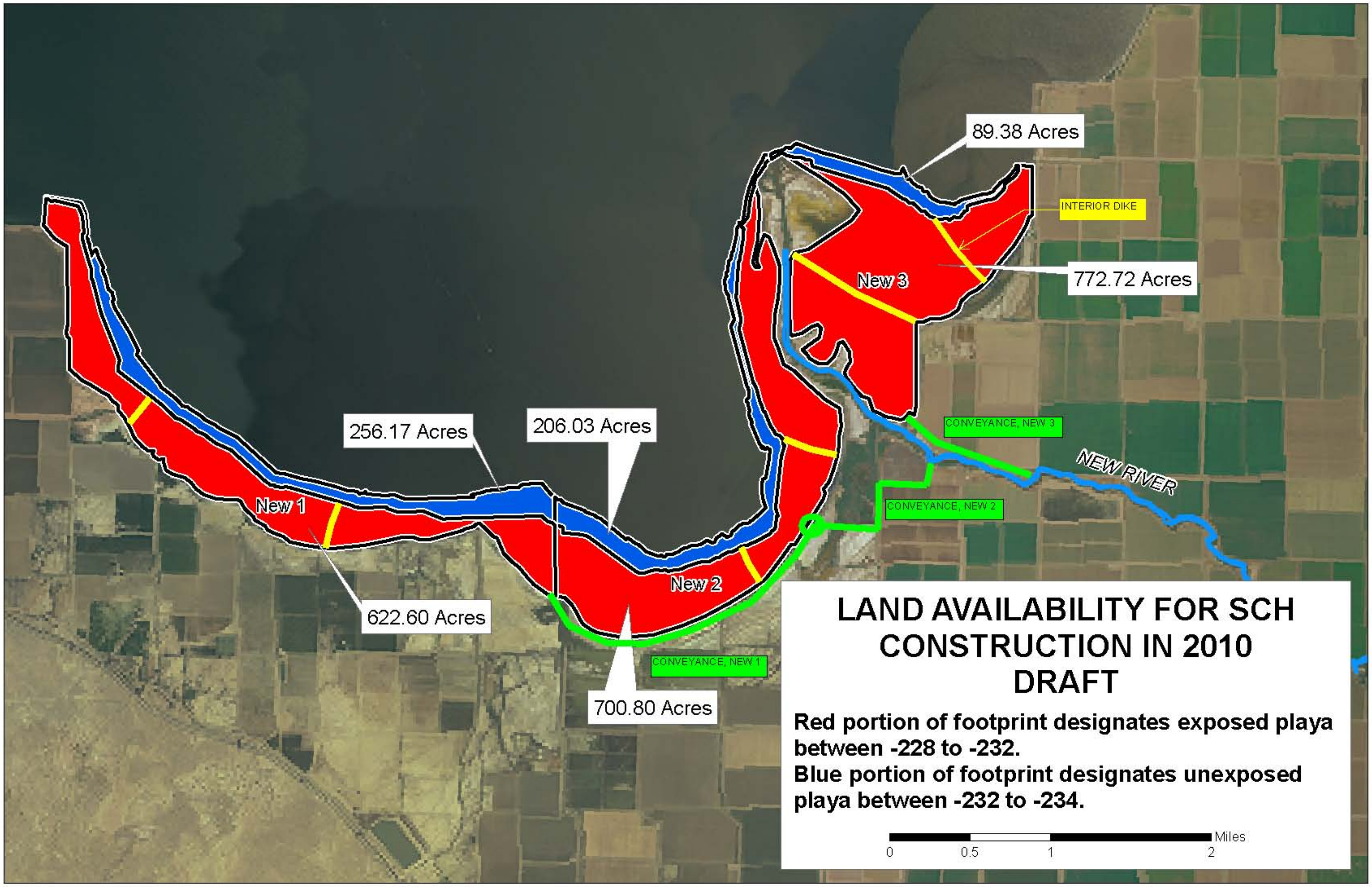

Figure B-3 Conceptual SCH Pond Sites near the New River Based on DFG and DWR Evaluations

Note: Dikes and conveyances shown on this figure are hypothetical and subject to change

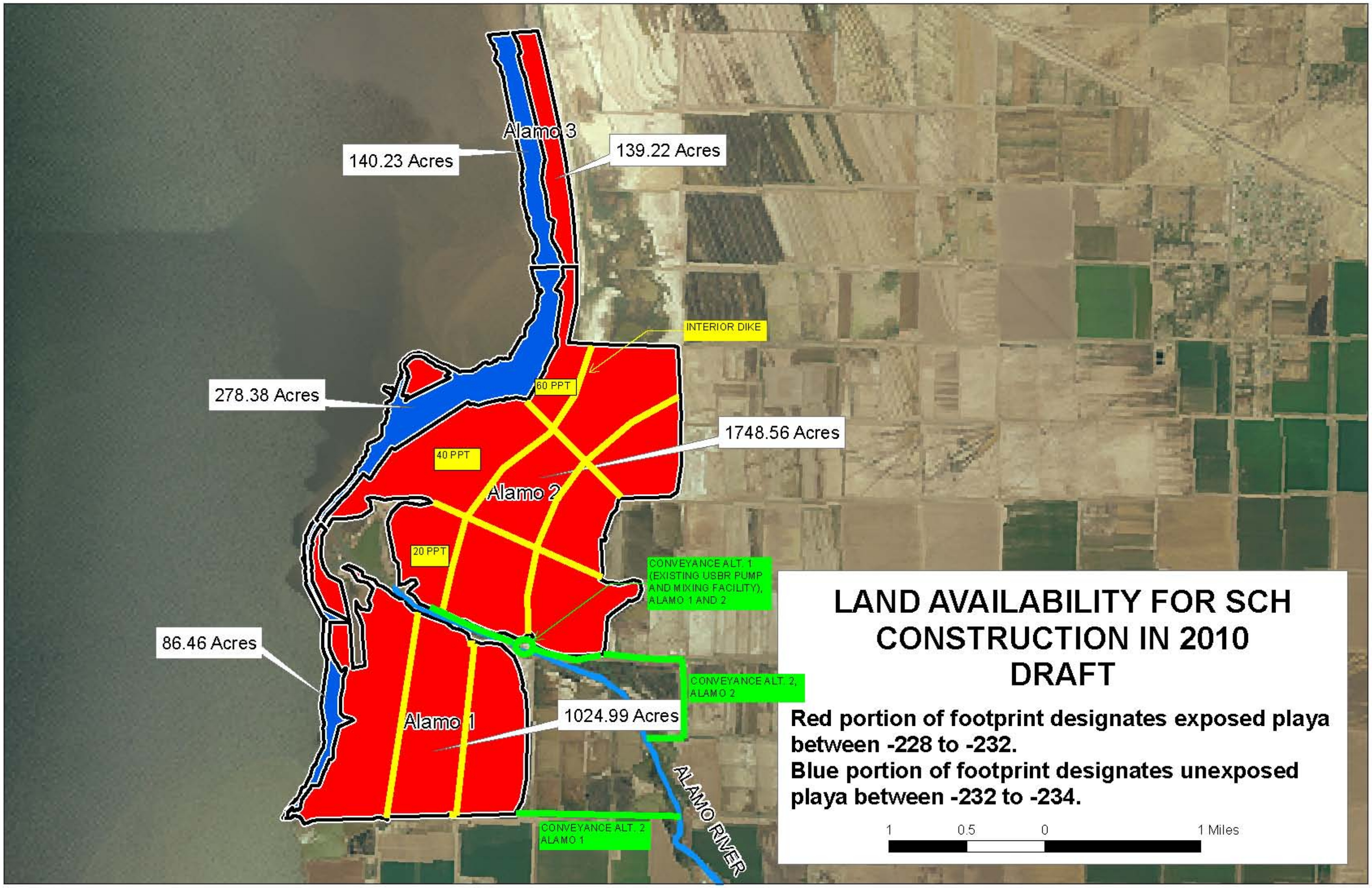

Figure B-4 Conceptual SCH Pond Sites near the Alamo River Based on DFG and DWR Evaluations

Note: Dikes and conveyances shown on this figure are hypothetical and subject to change

A description of each of these configurations is presented below. The pond locations refer to the areas initially identified by DFG and DWR, including areas between elevations -228 to -232 and -232 to -234 feet.

1) **Contiguous SCH Ponds at Whitewater River**

- 900 acres of ponds at Whitewater River using the Whitewater 1 and Whitewater 2 areas.
- Areas with a seabed elevation from -228 to -234 feet.

2) **Contiguous SCH Ponds at New River**

- 2,400 acres of SCH ponds at the New River using New 2 and New 3, and part of New 1.
- Areas with seabed elevations from -228 to -234 feet, with over half the area between -228 and -232 feet.

3) **Contiguous SCH Ponds at Alamo River**

- 2,400 acres of ponds at Alamo River using the Alamo 1 and Alamo 2 areas.
- Areas with a seabed elevations from -228 to -232 feet.

4) **Contiguous SCH Ponds at New River**

- 2,400 acres of SCH ponds at the New River using New 2 and New 3, and part of New 1.
- Areas with seabed elevations from -228 to -234 feet, with over half the area between -228 and -232 feet.

5) **Contiguous SCH Ponds at Alamo River**

- 2,400 acres of ponds at Alamo River using the Alamo 1 and Alamo 2 areas.
- Areas with a seabed elevations from -228 to -232 feet.

6) **Contiguous SCH Ponds at Alamo River**

- 2,400 acres of ponds at Alamo River using the Alamo 1 and Alamo 2 areas.
- Areas with a seabed elevations from -228 to -232 feet.

7) **Contiguous SCH Ponds at New River**

- 2,400 acres of SCH ponds at the New River using New 2 and New 3, and part of New 1.
- Areas with seabed elevations from -228 to -234 feet, with over half the area between -228 and -232 feet.

8) **Contiguous SCH Ponds at Alamo River**

- 2,400 acres of ponds at Alamo River using the Alamo 1 and Alamo 2 areas.
- Areas with a seabed elevations from -228 to -232 feet.

9) **Dispersed SCH Ponds at New and Alamo Rivers**

- 4,800 acres of dispersed SCH ponds at the New and Alamo rivers using New 2, New 3, Alamo 1, and Alamo 2.
- Areas with seabed elevations from -228 to -234 feet, with over half the area between -228 and -23 feet 2.

10) **Dispersed SCH Ponds at Whitewater and New Rivers**

- 3,300 acres of SCH ponds at the Whitewater and New rivers using Whitewater 1, Whitewater 2, New 2, New 3, and a portion of New 1.
- Areas with seabed elevations from -228 to -234 feet.

11) **Dispersed SCH Ponds at Whitewater and Alamo Rivers**

- 3,300 acres of SCH ponds at the Whitewater and Alamo rivers using Whitewater 1, Whitewater 2, Alamo 1, and Alamo 2.
- Areas with seabed elevations from -228 to -232 feet.

12) **Dispersed SCH Ponds at Whitewater and Alamo Rivers**

- 5,700 acres of SCH ponds at the Whitewater, New, and Alamo rivers using Whitewater 1, Whitewater 2, New 2, New 3, Alamo 1, and Alamo 2.
- Areas with seabed elevations from -228 to -234 feet for maximum area or -228 to -232 feet for a smaller area.

B.2.2 Potential Project Components

Basic Project components and alternative ways of constructing those components were identified, including methods of diverting and conveying water from the rivers to the ponds, conveying saline water needed to maintain the appropriate range of salinities in the ponds, and potential means of treating suspended sediment. The components were combined in functional categories to aid in the comparison of components. The functional categories and associated components are as follows:

1) **Diversion Mechanisms**

a) Inline weir in river (brackish water)
b) Lateral weir in river (brackish water)
c) Pump water from the river (brackish water)
d) Pump shallow groundwater (saline water)
e) Pump water from the Sea (saline water)

2) **River Water (Brackish) Conveyance**

a) Open canal
b) Pipeline
c) Combination

3) **Saline Water Conveyance**

a) Pipeline – groundwater
b) Pipeline – seawater
c) Backwater channel
d) Tailwater Return Pump

4) **Suspended Sediment Management**

a) Sedimentation basin near diversion
b) Sedimentation basin near SCH ponds
e) No sediment management

5) **Power Supply**

a) Three-phase power
b) Diesel generator
c) Solar power

B.3 Criteria Used to Evaluate Sites and Project Components

Broad screening criteria were developed to allow sites and Project components to be compared, and potentially eliminated where appropriate. This screening was done through a combination of exclusionary criteria and evaluative criteria.

B.3.1 Exclusionary Criteria

Exclusionary criteria relate to those factors that are essential to the successful completion of the SCH Project. These criteria include (1) available water rights, (2) available land (ownership and accessibility), and (3) adequate water supply (quantity, quality, and seasonal availability).

B.3.2 Evaluative Criteria

These criteria were considered when determining the types of components that would included in the alternatives carried forward for detailed analysis and include (1) engineering feasibility/constructability, (2) relative cost-effectiveness (including capital cost and operations and maintenance) measured as cost per acre, (3) potential for physical environmental impacts, (4) compatibility with existing and planned land uses, and (5) ability to meet SCH schedule. Components were eliminated or refined based on these criteria.

B.3.3 Rating Definitions

Exclusionary Criteria

A potential site or component that failed to meet any one of the three exclusionary criteria would automatically be eliminated.

Evaluative Criteria

The purpose of applying the evaluative criteria was to eliminate Project components where appropriate and determine whether individual components would be feasible or practicable at each of the potential sites. The evaluative criteria considered and issues associated with each are described below.

Engineering Feasibility/Constructability

- Complexity of design
- Special equipment needs
- Land acquisition issues

Relative Cost-effectiveness (including Capital Cost and Operations and Maintenance)

- Level of capital expenditures
- Long-term operations and maintenance needs

Potential for Physical Environmental Impacts

- Conversion of Important Farmland to nonagricultural use
- Air emissions during construction, operations, and maintenance
- Impacts on biological resources (selenium ecorisk, special-status species, wetlands)
- Disturbance/destruction of cultural resources
- Unsuitable geologic/soil condition

Compatibility with Existing and Planned Land Uses

- Potential conflicts with future geothermal uses of sites
- Potential conflicts with existing and planned use of Sonny Bono National Wildlife Refuge
- Potential loss of hunting opportunities
- Potential conflicts with use of public recreational facilities at marina
- Potential conflicts with agricultural practices

Ability to Meet SCH Schedule

- Number of construction seasons
- Time required to obtain easements, permits, or approvals

B.4 Screening Process

The screening process for the concept alternatives to be carried forward into the engineering design and considered in the EIS/EIR included the following four steps:

1. Apply exclusionary criteria to eliminate potential sites or Project components that are dependent on land and/ or water availability.
2. Apply evaluative criteria to determine the comparative merits of individual Project components at each site.
3. Apply evaluative criteria to eliminate or retain individual Project components at each site.
4. Combine the sites and Project components into alternatives to be evaluated in the EIS/EIR.

Representatives of the Corps, DFG, DWR, and consultant team met and applied these step to develop an initial set of screened alternatives. Since that time, additional refinements have occurred based on input from the preliminary geotechnical study, Stakeholders, land use compatibility, special studies, the environmental impact analysis, and budgetary considerations. The results of this process are described below.

B.4.1 Exclusionary Criteria Screening Process Results

The results of the exclusionary criteria screening process for the potential SCH sites, including the locations of diversion and conveyance facilities needed to provide water to the SCH ponds, are discussed below.

Water Rights

A water right is legal permission to use a reasonable amount of water for a beneficial purpose such as swimming, fishing, farming, or industry. The Whitewater River is designated by the State Water

Resources Control Board as a fully appropriated stream from the Salton Sea to the headwaters. This distinction relates to the availability of water in the stream to divert for beneficial uses. A fully appropriated stream by definition does not have additional water available for diversion. The Metropolitan Water District of Southern California has applications pending for appropriative rights for essentially all the available water in both New and Alamo rivers. The Whitewater River sites were eliminated based on the lack of available water rights. The New and Alamo river sites were retained for further consideration.

A water right would not be needed to use Salton Sea water, which is carried forward as a source of saline water for the Project. In 1968, the California Legislature adopted a statute declaring the Salton Sea's primary use for the collection of agricultural drainage water, seepage, and other flows (Assembly Bill 461, 1968; Statutes 1968, Chapter 392). Use of water from an agricultural repository does not require a water right.

Available Land

Adequate land appears to be available at the New and Alamo river sites, which contain approximately 2,648 acres and 3,417 acres, respectively (New 1 – 879 acres; New 2 – 907 acres; New 3 – 862 acres) (Alamo 1 – 1,111 acres; Alamo 2 – 2,027 acres; Alamo 3 – 279 acres). Most of this land is owned by public entities, primarily Imperial Irrigation District (IID), which would facilitate its acquisition, although the land in the Wister Beach area is owned by multiple private parties. Land owned by the Torres Martinez Desert Cahuilla Indian Tribe (Torres Martinez Tribe) would be required to convey water to the Whitewater 1 and Whitewater 2 sites; the amount of available land is limited. Based on the larger area of available land, the New and Alamo river sites were retained for further consideration.

Available Water

The SCH ponds could be operated as brackish water, saline water, or blended water habitat. Different ponds could be operated under different salinities to test which salinity regime results in the best combination, or balance, of invertebrate and fish productivity, bird use, and seasonal fish survival (refer to Appendices D, Project Operations and E, Monitoring and Adaptive Management Framework. Sources of brackish water initially considered included river water, water directly from agricultural drains, and groundwater; while sources of saline water included Salton Sea water and groundwater.

River Water[1]

Assuming 6 feet of evaporation annually, the amount of water required to supply each of the SCH pond configurations outlined in Section B.2 each year is as follows:

- 900 acres = 5,400 acre-feet (af) (12 cubic feet per second [cfs] peak month)
- 2,400 acres = 14,400 af (32 cfs peak month)
- 3,300 acres = 19,800 af (44 cfs peak month)
- 4,800 acres = 28,800 af (62 cfs peak month)
- 5,700 acres = 34,200 af (76 cfs peak month)

[1] Water from the Colorado River is not a potential source of water for the SCH Project, as discussed in detail the Salton Sea Ecosystem Restoration Program Programmatic Environmental Impact Report (DWR and DFG 2007). Use of such water would require a change in the authorized uses of Colorado River water for fish and wildlife uses; additionally, the availability of surplus water is not expected to occur frequently, if at all.

Additional water would be required to maintain the salt balance or to flush the SCH ponds. The amount of water available seasonally and annually at each of the three rivers is shown in Table B-1.

Table B-1 Annual Flows in the New, Alamo, and Whitewater Rivers (acre-feet)

	New River		Alamo River		Whitewater River	
	October to March	April to September	October to March	April to September	October to March	April to September
Mean	593	633	780	913	72.5	71.4
Minimum	150	343	288	495	43	40
Maximum	2,000	3,000	4,000	4,500	185	137
Total	443,968		613,320		52,010	

Source: U.S. Geological Survey 2010a, b, c. Gages 10254730 Alamo River near Niland CA; 10255550 New River near Westmorland CA; and 10259540 Whitewater River near Mecca

Based on the information in Table B-2, water in the New and Alamo rivers is adequate to supply the SCH Project, and use of this water was retained for further consideration.

In the Whitewater River, flow is present at the downstream-most gage (Mecca), but is often zero about 7 miles upstream at the Indio gage. DWR has estimated that 58 percent of the flow entering the Salton Sea is from the Coachella Valley (either in the Whitewater River, via direct discharge in drains or via underflow, or effluent from the wastewater treatment plant). In the future, inflows from agricultural uses and treatment plant effluent will decrease because of water reuse occurring in the Coachella Valley. The Coachella Valley Water District (CVWD) is the primary water purveyor in the area, serving water to 60,000 irrigated acres and 102,000 customers (CVWD 2002). The water comes primarily from the Colorado River via the All American Canal and the Coachella Canal. CVWD also obtains water from groundwater, reclaimed wastewater, and a State Water Project contract delivered through the Colorado River Aqueduct. About 15,000 af of recycled wastewater is used within the CVWD service area (CVWD 2002). CVWD has prepared a water management plan that would attempt to reuse some of these return flows, especially the wastewater treatment plant effluent. Therefore, the accretions to the Whitewater River downstream of Indio will decrease as wastewater reuse and irrigation efficiency improves within the CVWD service area. Additionally, the Torres Martinez Tribe has indicated that it will have further need for Whitewater River water for future restoration efforts. Apart from its fully appropriated status, adequate water is not available from the Whitewater River; therefore, it was eliminated from further consideration.

Agricultural Drainwater

Agricultural drainwater was eliminated as a potential water source for a variety of reasons, including poorer water quality than that of the rivers (drainwater is primarily tilewater and not as diluted as river water; thus, its pollutants are more concentrated). Additionally, the availability of drainwater varies seasonally (not as much water is available when agricultural users are not discharging water); thus, it is less reliable than river water. Lastly, the agricultural drains are habitat for the Federally and state-listed desert pupfish (*Cyprinodon macularius*), and use of drainwater would reduce this habitat in violation of Federal and state laws intended to protect such species.

Salton Sea Water

The salinity of Salton Sea water is currently about 51 ppt. For reference, the ocean is about 35 ppt. Water from the Salton Sea is a viable source of saline water because adequate supplies are available now and in the future. Storage will decrease over time, but approximately 1,515,030 af of water are expected to be stored in the Sea in the year 2077 given implementation of the SCH Project (refer to Section 3.11, Hydrology and Water Quality). Even though the Salton Sea is receding, the saline water pipeline could be extended to access this water; therefore, accessing the Sea's saline water is feasible. Thus, this option was retained for further consideration.

Groundwater

The Project area is part of the Imperial Valley Groundwater Basin. Previous studies (Lawrence Livermore National Laboratory [LLNL] 2008) have found that production of groundwater in the central portion of the Imperial Valley is limited because of the low permeability of the aquifer and also poor groundwater quality. The low permeability is a consequence of the deposition of former lakebed sediments that comprise the Imperial Valley soils. Some of these sediments have low transmissivity and, therefore, do not produce significant amounts of groundwater. The groundwater is characterized as occurring in a shallow system (ground surface to 2,000 feet deep) and a deeper system (extending to bedrock). The shallow system in the Imperial Valley Groundwater Basin consists of low permeability lake deposits from 0 to 80 feet, a low-permeability aquitard from 60 to 450 feet, and alluvium down to about 1,500 feet (LLNL 2008). Well production data are limited for the Imperial Valley aquifer, but available data suggest the wells in the central portion of the aquifer (closest to the Project area) have the following characteristics:

- Production rates of less than 100 gallons per minute (0.2 cfs),
- Salinity generally ranged between 1,000 and 2,000 to as high as 15,700 parts per million, and
- Hydraulic conductivity of 0.6 foot/day (LLNL 2008).

Although groundwater in the central Imperial Valley aquifer has high salinity, this source is not a replacement for the Salton Sea as a source of high-salinity water for the Project (the salinity is less than the lowest pond salinity proposed). At this time, it appears that groundwater is not a suitable replacement supply for the river water used in the Project because of inadequate yield of the shallow groundwater and insufficient data regarding this source, including depth to groundwater, salinity, subsidence, and location of cost-effective production wells. Therefore, this option was eliminated from further consideration.

B.4.2 Evaluative Criteria Screening Process Results

The evaluative screening process was applied to the remaining Project components, and the results are summarized in Table B-2. Figures showing potential environmental constraints and land ownership at the three Project areas are presented in Attachment A. Key terms are defined in Attachment B.

Table B-2 Results of Evaluative Screening Process

Component	Status	Rationale
Diversion Mechanisms (Brackish Water)		
Inline weir	E	Construction and maintenance access issues would be extensive, involving an extended time period and specialized equipment needs. A temporary diversion would need to be put in place to construct the facility. A structure in the river with gates would be expensive from the standpoint of capital cost and maintenance. Sediment may accumulate behind the weir; the sediments may contain contaminants. Weir may block the movement of any fish present. Weir would raise the water-surface elevation and may adversely affect the upstream agricultural drains, causing flooding of agricultural land. This Project component must be permitted through a 401 Permit, which may delay the permitting process and Project schedule.
Lateral weir	R	A lateral weir may present construction access issues; however, these access issues would not be as great as constructing an inline weir. Also, the rivers would have no fixed grade control; if the rivers dropped because the Salton Sea dropped, the lateral weir would become less effective. Although the cost for the structure is moderately expensive, the cost considerations are less than for the inline weir. Sediment would not accumulate in the river channel, structure would not impede fish passage, and the weir would not cause as much habitat destruction as an inline weir, nor would the lateral weir back up water into the upstream agricultural drains. Installing a lateral weir would not affect current or planned land uses. The Corps generally considers a lateral weir a more accepted engineering control than an inline weir.
Pump water from river	R	This component involves a basic design of a pump system and associated piping. A large capital expense is involved for the facilities and to bring three-phase power to the Project. Energy use is the only substantive consideration; noise impacts could be mitigated. Installing this component would involve obtaining an easement from IID to bring in electricity, if needed, but would not substantively affect surrounding land uses. The only potential schedule delay could occur in trying to obtain an easement from IID.
River Water Conveyance		
Open canal	E	Would have to go far upstream to provide the head to convey the water to the SCH ponds. Ground and river elevation data suggest a deep channel is needed. The cost of excavation, lining the canal, and operations and maintenance of the canal would be high. A canal would require a large/wide right-of-way (50-60 feet) and a very large footprint during construction and operation. Construction would result in considerable air emissions and could adversely affect cultural resources (areas near rivers are

Table B-2 Results of Evaluative Screening Process

Component	Status	Rationale
		known to be particularly sensitive). The channel could also result in the permanent conversion of Important Farmland to nonagricultural use. Construction would result in temporary disturbance of farming operations. This facility would require extensive negotiations to acquire right-of-way easements from landowners and, therefore, result in a long schedule.
Pipeline	R	The cost would be less than an open channel. A pipeline would have a large footprint during construction and maintenance, thereby potentially affecting cultural resources, and would result in moderate air emissions during construction. Impacts on agricultural resources likely would be temporary because some crops could be planted over the pipeline. A pipeline would have a large footprint during construction and maintenance, but would have little to no permanent land use impacts. As with an open channel, a pipeline would require extensive negotiations with landowners for right-of-way.
Open canal and pipeline	E	This option would have the disadvantages of the open canal and would not result in benefits over the pipeline alone.
Saline Water Conveyance		
Backwater channel	E	Such a facility would require continuous upgrading and maintenance as the Salton Sea recedes. High maintenance costs would be involved because the Sea is receding, so it would be necessary to constantly “chase the Sea” to connect the Sea with the channel. Construction would occur in the “wet;” therefore, the channel has the potential to constantly collapse on itself, requiring reconstruction.
Pipeline	R	A pipeline conveyance from the Salton Sea would be relatively easy to design and construct. This conveyance would be relatively low cost and involve land that was mostly exposed playa. Additional pipe would have to be added as the Sea recedes, but is feasible. This facility would be constructed mostly on exposed playa and cause few impacts. This facility could be constructed quickly, within 6 months.
Tailwater return pump	R	Recirculation is easy to design and construct and would use the facilities that are in place for the SCH ponds. This element is inexpensive, consisting of a relatively short pipe and small pump. The pump may require frequent maintenance because of pond salinity. This facility could be constructed quickly, within 6 months.
Suspended Sediment Management		

Table B-2 Results of Evaluative Screening Process

Component	Status	Rationale
No sediment management	E	Sediment would be deposited in the SCH ponds, thereby affecting habitat function and conflicting with SCH Goal 1. In addition, extensive maintenance would be required to remove built-up sediment within the SCH ponds.
Sedimentation basin near SCH ponds	R	Retained as a necessary component of the alternatives using pumped diversion for river water. Design and construction of a sedimentation pond is not complicated and would not require new construction methods. It can also be designed into the SCH ponds. The cost of a joint facility would be less than a separate facility. A pond near the diversion would use land that is marginal farmland or playa. The settling pond would not be likely to conflict with surrounding land uses. The time required to obtain easements or a lease for a pond would be short.
Sedimentation basin near diversion	R	Retained as a necessary component of the alternatives using a pipeline to divert river water, despite potential impacts on Important Farmland and challenges associated with land acquisition since multiple private parties would be involved.
Selenium Treatment and Management		
Constructed wetlands (treat between river diversion and SCH)	E	Selenium treatment (all methods) was eliminated at this time due to the large cost involved, technical uncertainty associated with each of the methods, and the lack of a significant impact on breeding bird populations that would merit such an undertaking (refer to Section 3.4, Biological Resources, for additional discussion).
Controlled Eutrophication Process (algae) (treat between river diversion and SCH ponds)	E	See above.
Anaerobic bacteria (treat between river diversion and SCH ponds)	E	See above.
Cleaner source water (treat sources that drain into river, upstream of diversion)	E	See above.
Salinity gradient (water management within SCH ponds)	E	See above.
Power Supply		
Three-phase power	R	Adequate power is available nearby.
Diesel generators	E	Because the pumps may run 24 hours per day, a portable diesel generator would not be practical because of the need for

Table B-2 Results of Evaluative Screening Process

Component	Status	Rationale
		constant maintenance of fuel and also the emissions from the motor that drives the generator.
Solar power for pump energy supply	E	This supply would require solar panels, power inverter, transformer, and backup power supply. Solar panels produce from 10-12 watts per square foot of panel (World Watts no date). The saline and river pumps would draw between 100 to 900 kilowatts (100,000-900,000 Watts). At 11 Watts per square foot, this power requirement would necessitate between 0.2 and 1.9 acres of panels). In addition, there would have to be a hard power source for operating the pumps at night or cloudy days, and for accommodating the power surge associated with the start-up of a pump. These factors render the option of solar panels expensive, maintenance intensive, and impractical.

E = Eliminated, R = Retained

B.5 Development of EIS/EIR Alternatives

Based on the above analysis, six conceptual alternatives were developed that included two different locations and two methods of diverting and conveying the water to the SCH ponds. These alternatives would comply with NEPA and CEQA requirements to evaluate a reasonable range of alternative ways of implementing a project and CEQA's requirement to identify alternatives that would avoid or substantially lessen one or more of a project's significant environmental impacts. For example, those alternatives requiring gravity diversion would result in a significant impact on lands under Williamson Act contracts[2] (refer to Section 3.2, Agricultural Resources), whereas this impact would not occur under the alternatives requiring a pumped diversion. The latter generally would result in greater demand for power, however, as discussed in Section 3.6, Energy Consumption.

The initial alternatives included:

- **Alternative 1 – New River, Gravity Diversion:** 2,460 acres of ponds constructed on either side of the New River, upstream gravity diversion of river water, and independent and cascading pond units.
- **Alternative 2 – New River, Pumped Diversion:** 2,260 acres of ponds constructed on either side of the New River, pumped river diversion at the SCH ponds, and independent ponds.
- **Alternative 3 – Alamo River, Gravity Diversion:** 2,420 acres of ponds constructed on either side of the Alamo River, upstream gravity diversion of river water, and independent and cascading pond units.
- **Alternative 4 – Alamo River, Pumped Diversion:** 2,860 acres of ponds constructed on either side of the Alamo River, pumped river diversion at the SCH ponds, and independent ponds units.
- **Alternative 5 – New and Alamo Rivers, Gravity Diversion:** This alternative is a combination of Alternatives 1 and 3 (4,880 acres).
- **Alternative 6 – New and Alamo Rivers, Pumped Diversion:** This alternative is a combination of Alternatives 2 and 4 (5,120 acres).

These initial alternatives were subsequently refined, based on Stakeholder input, information about existing and proposed land uses in the Project area, special studies, geotechnical information, and budgetary considerations. Results of the preliminary geotechnical study indicated that construction would be more costly than originally anticipated due to soils that had low strength and were dispersive; would be subject to erosion from wave action; had the potential for compressibility, seepage, expansion, and liquefaction; and that could not support conventional construction equipment.

Refinements included modifying the configuration of the New River alternatives involving pumped diversion of river water. The configuration originally included a narrow, roughly 2-mile-long pond on the far western side that was eliminated due to the relatively high cost of berm construction required in order to obtain a comparatively small amount of habitat. Additionally, eliminating this area avoided channels carrying natural drainage. The alternatives that included both New and Alamo river sites were eliminated because the costs to construct habitat in both areas would have greatly exceeded available funds;

[2] Commonly referred to as the Williamson Act, the California Land Conservation Act of 1965 (Government Code sections 51200–51297.4) enables local governments to enter into contracts with private landowners that restrict specific parcels of land to agricultural or related open space use. In return, these landowners receive property tax assessments that are much lower than normal because they are based upon farming and open space uses rather than the property's full market value. Local governments receive an annual subvention of forgone property tax revenues from the State of California via the Open Space Subvention Act of 1971 (Government Code sections 16140–16154).

therefore, they were considered infeasible. Additionally, the portion of the alternatives that included Red Hill Bay was eliminated because the United States Fish and Wildlife Service (USFWS) has plans to develop shallow water habitat in this area as part of the Sonny Bono Salton Sea National Wildlife Refuge (NWR). (The USFWS also has a planned restoration project at the New River, and DWR and DFG are working in close coordination with NWR staff to avoid any conflicts between the two projects.) The refined alternatives being considered in the EIS/EIR are as follows:

- **Alternative 1 – New River, Gravity Diversion + Cascading Ponds:** 3,130 acres of ponds constructed on either side of the New River, upstream gravity diversion of river water, and independent and cascading pond units.
- **Alternative 2 – New River, Pumped Diversion:** 2,670 acres of ponds constructed on either side of the New River, pumped river diversion at the SCH ponds, and independent ponds.
- **Alternative 3 – New River, Pumped Diversion + Cascading Ponds:** 3,770 acres of ponds constructed on either side of the New River, pumped river diversion at the SCH ponds, and independent and cascading pond units.
- **Alternative 4 – Alamo River, Gravity Diversion + Cascading Ponds:** 2,290 acres of ponds constructed on northern side of the Alamo River, upstream gravity diversion of river water, and independent and cascading pond units.
- **Alternative 5 – Alamo River, Pumped Diversion:** 2,080 acres of ponds constructed on northern side of the Alamo River, pumped river diversion at the SCH ponds, and independent ponds units.
- **Alternative 6 – Alamo River, Pumped Diversion + Cascading Ponds:** 2,940 acres of ponds constructed on northern side of the Alamo River, pumped river diversion at the SCH ponds, and independent and cascading ponds units.

The actual design of the ponds and other facilities is being developed based on habitat requirements, results of special studies, bathymetry, engineering requirements, and Division of Safety of Dams requirements. Depths within the ponds would range from 0 to about 10 feet (0 would be at the shoreline and edges of berms and islands). Water deeper than 6 feet would be obtained by excavation within the pond because the maximum water depth at the berm constructed to contain water in the pond would be 6 feet (as measured from the water surface on the upslope side of the berm to the toe of the downstream side of the berm) to avoid Division of Safety of Dams jurisdiction. The berms would have 2 feet of freeboard above the pondwater surface to allow for wave run-up and safety. Based on existing topography, particularly near the New and Alamo rivers, large expanses of very shallow (less-than-1-foot) water are present. These expanses do not provide suitable habitat for fish, so excavation/grading in these areas would be needed to deepen the water, at least over part of the area. The excavated/graded material would be used for constructing islands and berms.

B.6 Other Alternatives Considered but Eliminated

Additional alternatives to the SCH Project were identified during the scoping process, including outreach to individual Stakeholder groups. These included the following:

- Use of agricultural drain water instead of river water (eliminated for reasons described above);
- Use of fresh (brackish) water (eliminated due to the potential for increased impacts associated with the bioaccumulation of selenium and the potential for increased mosquito populations due to growth of emergent vegetation).
- Use of fish hatcheries instead of raising fish in ponds (eliminated because this would not meet either of the two Project goals).

B.7 References

California Department of Water Resources (DWR) and California Department of Fish and Game (DFG). 2007. Salton Sea Ecosystem Restoration Program Final Programmatic Environmental Impact Report.

Holdren, C. Reclamation, unpublished data.

Coachella Valley Water District (CVWD). 2002. Final water management plan. Available online at: http://www.cvwd.org/news/publicinfo/Coachella_Valley_Final_WMP.pdf.

Lawrence Livermore National Laboratory (LLNL). 2008. Groundwater availability within the Salton Sea Basin. Prepared by A. Tompson, Z. Demir, J. Moran, D. Mason, J. Wagoner, S. Kollet, K. Mansoor, and P. McKereghan. January 29.

United States Geological Survey. 2010a. *Streamflow Measurements for the Nation, USGS 10254730 Alamo R Nr Niland CA*. Available online at: http://waterdata.usgs.gov/nwis/measurements/?site_no=10254730.

United States Geological Survey. 2010b. *Streamflow Measurements for the Nation, USGS 10255550New R Nr Westmorland CA*. Available online at: http://waterdata.usgs.gov/nwis/measurements/?site_no=10255550.

United States Geological Survey. 2010c. *Streamflow Measurements for the Nation, USGS 10259540 Whitewater R Nr Mecca*. Available online at: http://waterdata.usgs.gov/nwis/measurements/?site_no=10259540.

World Watts. No date. *Solar panels*. Available online at: http://worldwatts.com/panels.html.

ATTACHMENT A

Potential Environmental Constraints and Land Ownership

This Page Intentionally Left Blank

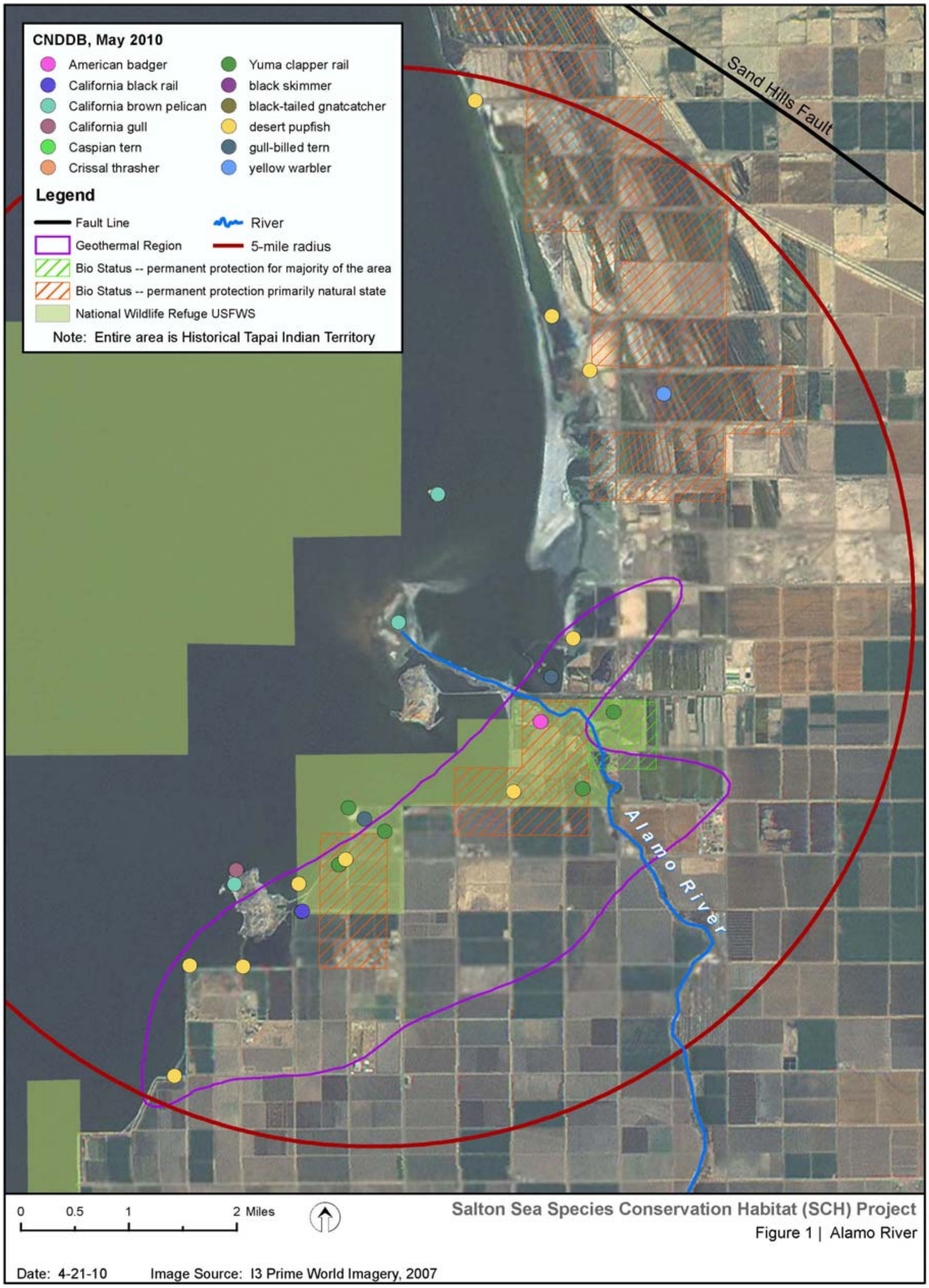

Figure 1 Potential Environmental Constraints at Alamo River Sites

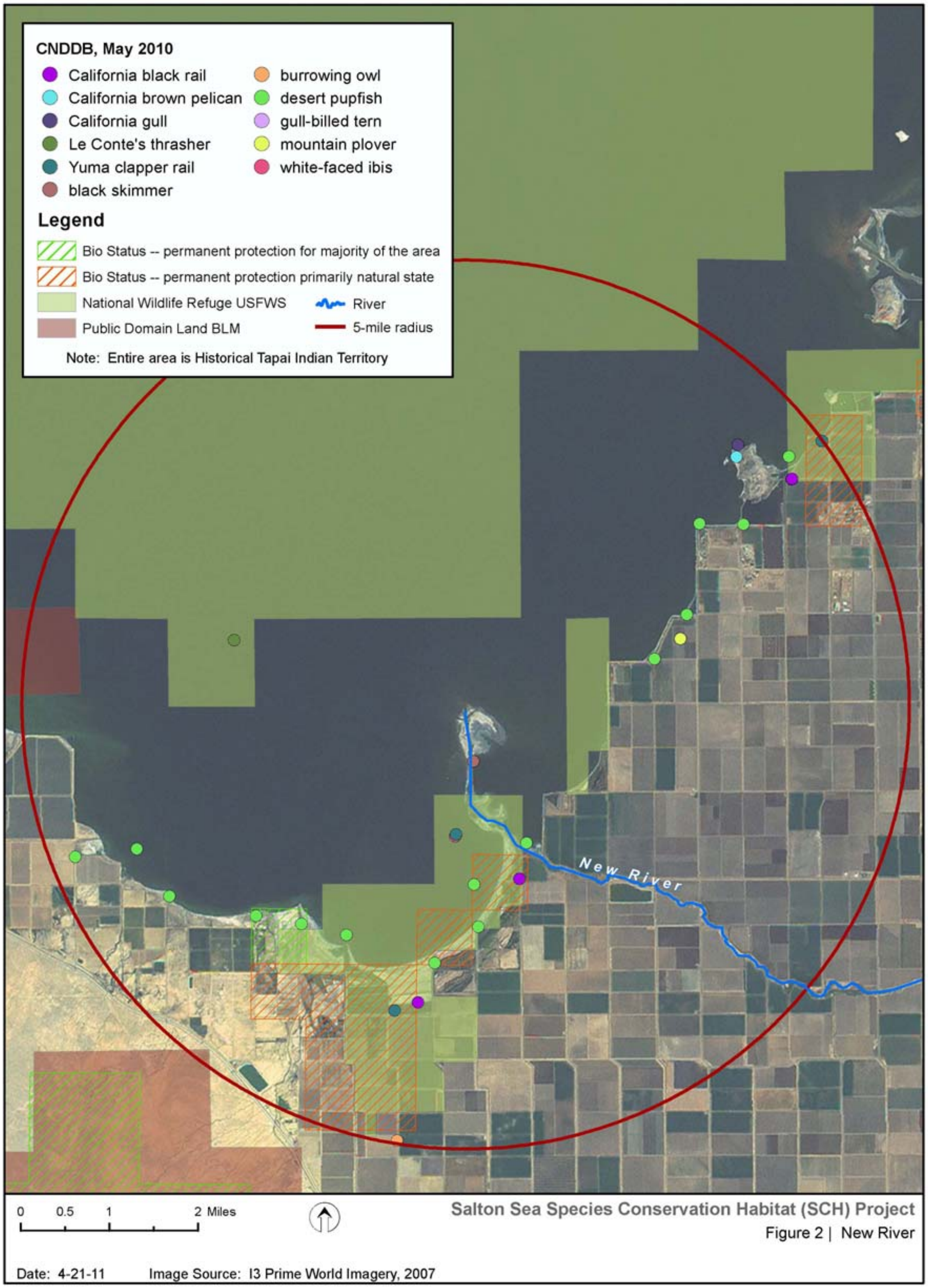

Figure 2 Potential Environmental Constraints at New River Sites

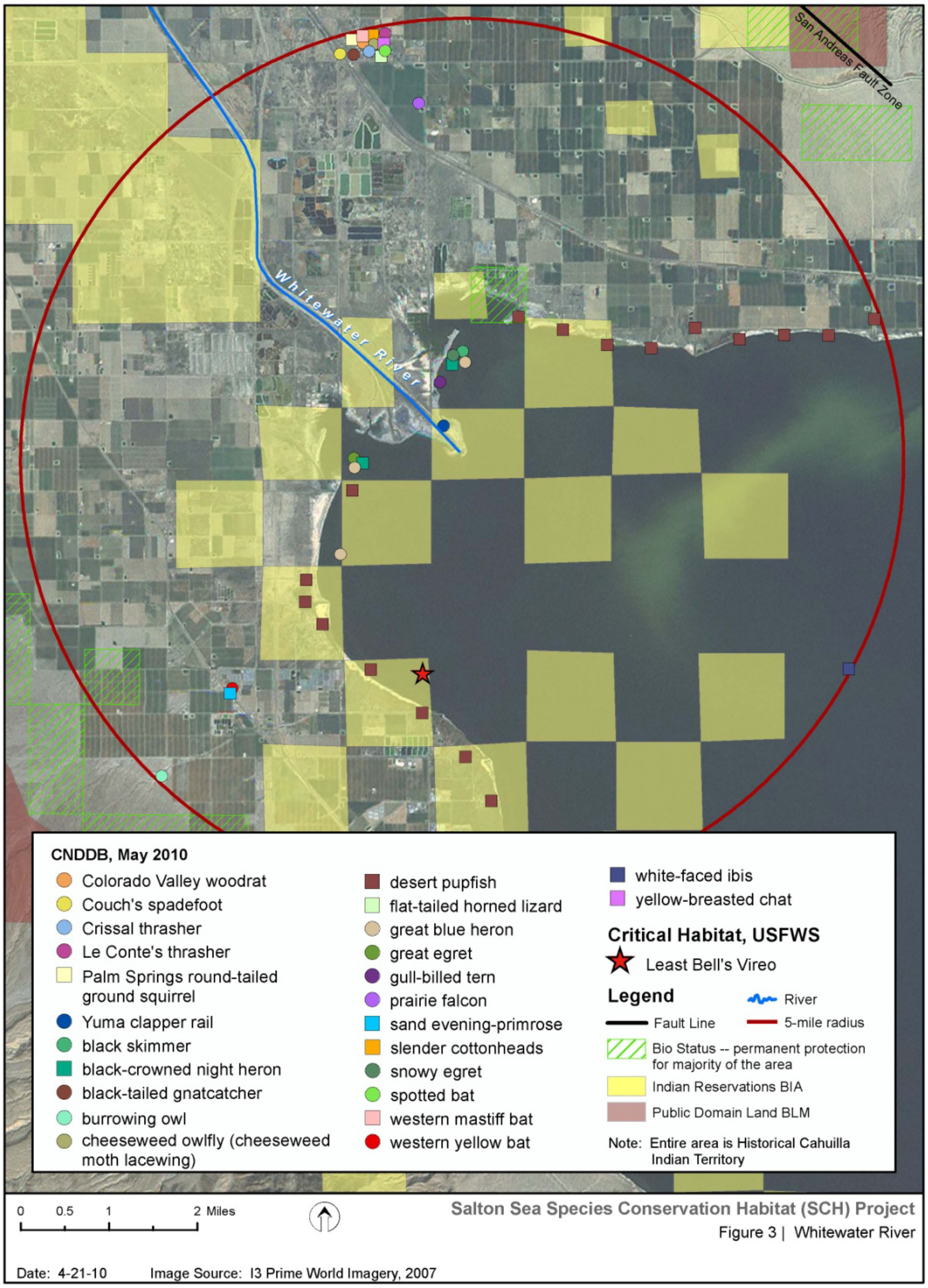

Figure 3 Potential Environmental Constraints at Whitewater River Sites

Land Availability
Alamo River – Acreage Available for SCH at -234 msl

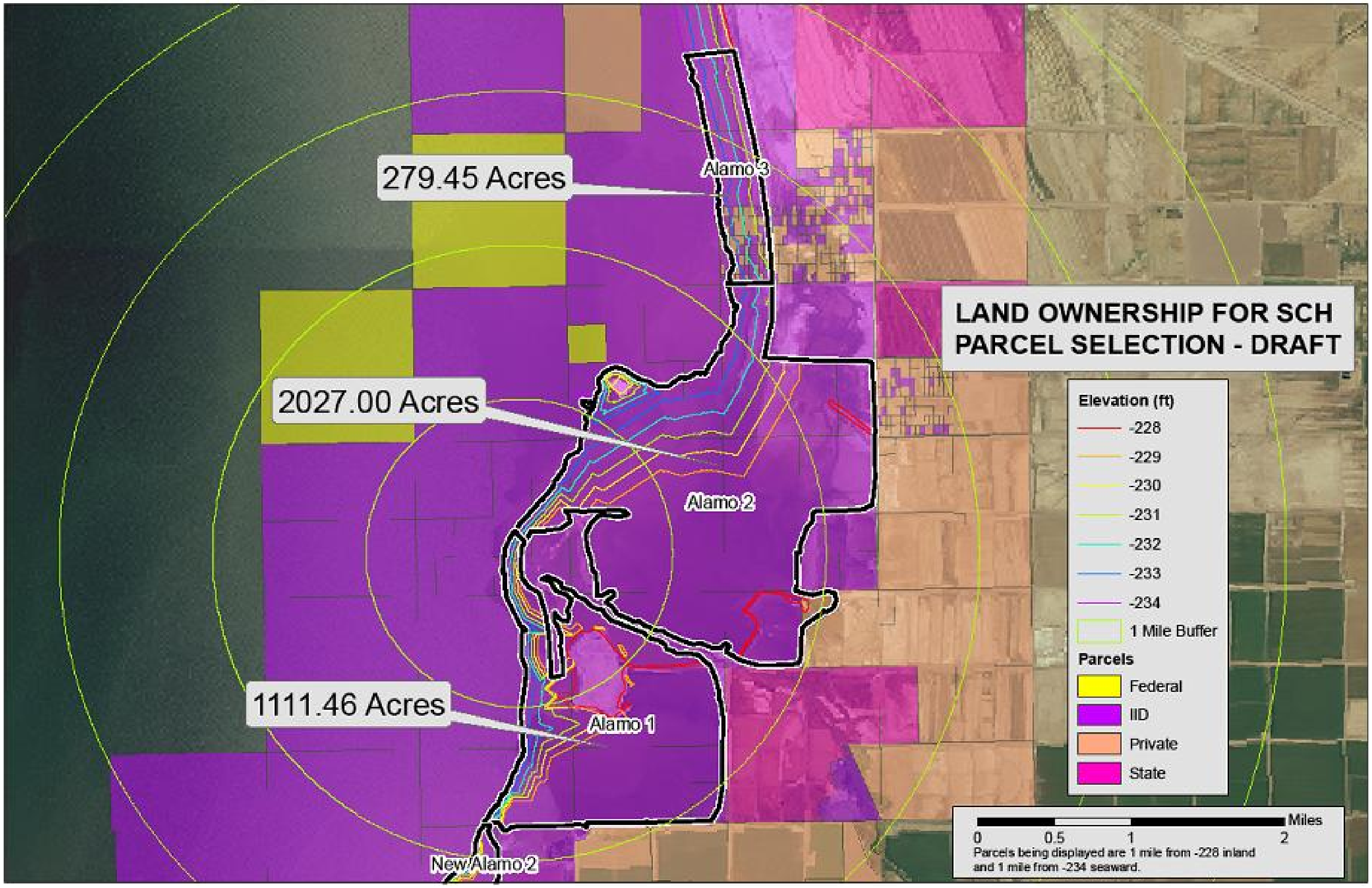

Figure 4 **Land Ownership at the Alamo River Sites**

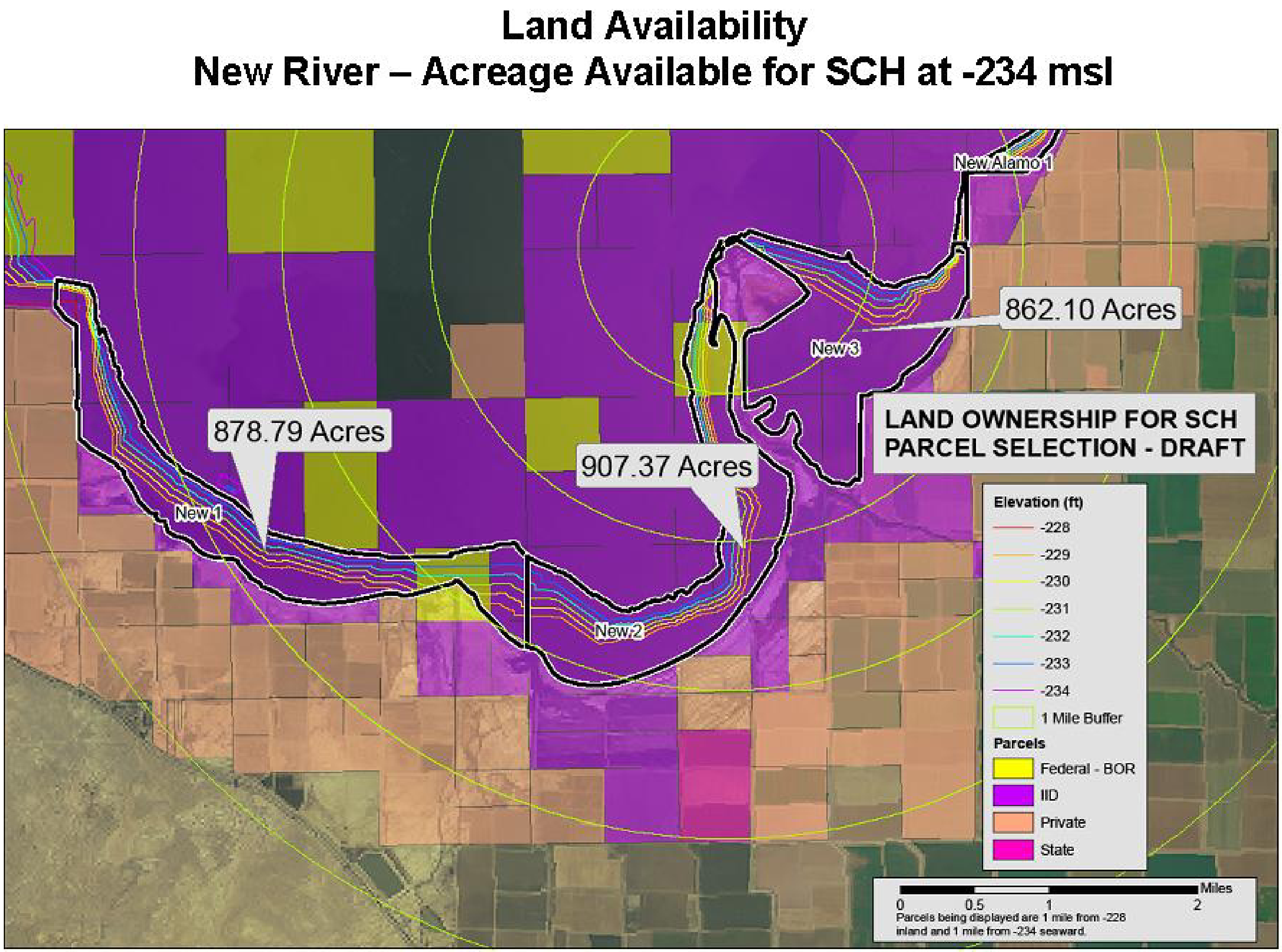

Figure 5 Land Ownership and Available Acreage at the New River Sites

Land Availability
Whitewater River – Acreage Available for SCH at -234 msl

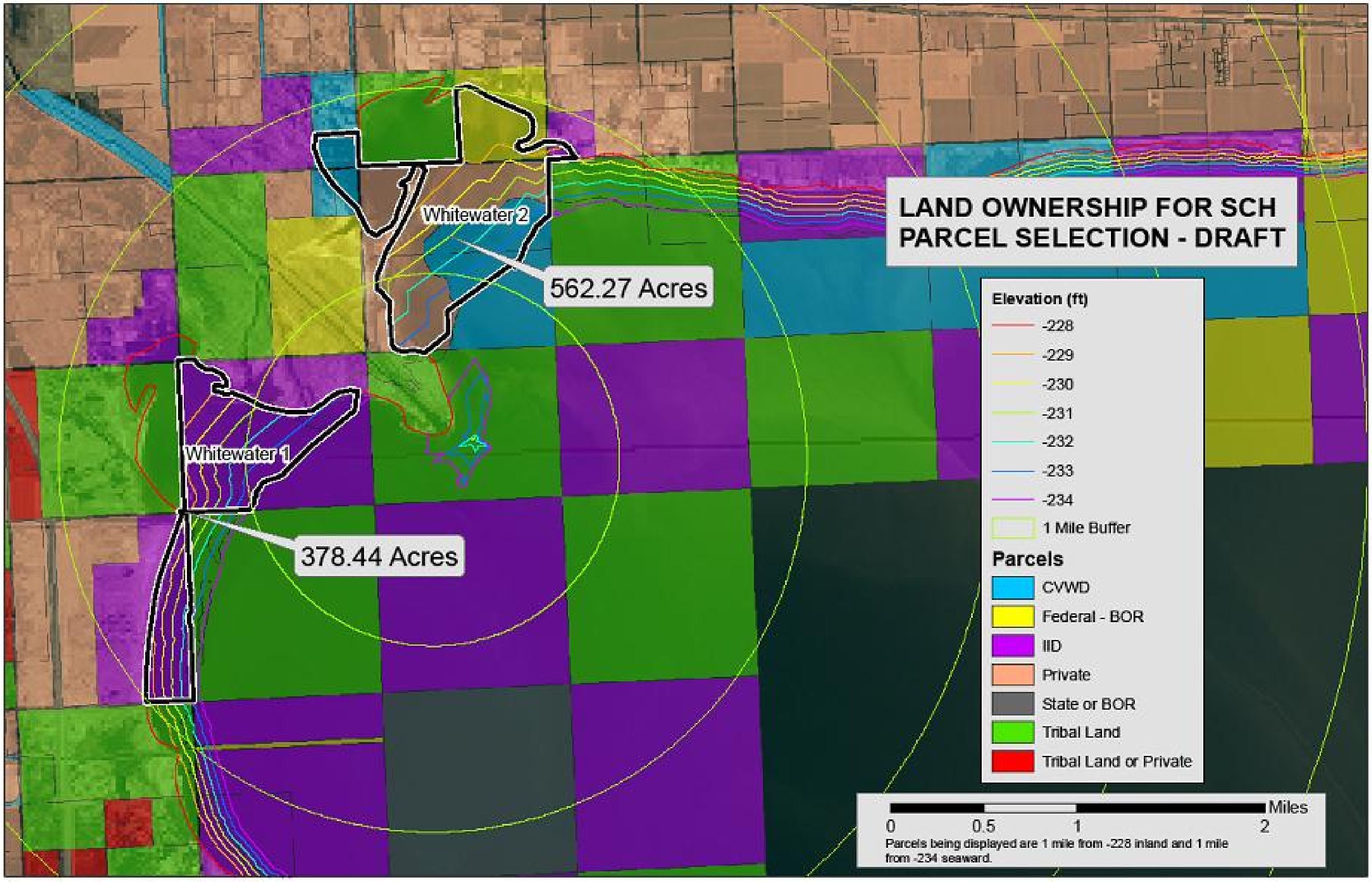

Figure 6 **Land Ownership and Available Acreage at the Whitewater River Sites**

ATTACHMENT B

Definition of Key Terms

This Page Intentionally Left Blank

Water Supply (Brackish) – This term refers to the low-salinity water supply that comes from the rivers and how it is delivered to the SCH ponds. The sources initially considered for this water supply were the New, Alamo, and Whitewater rivers. The options for conveying the water include a gravity system (pipeline or channel) from a point on the river upstream of the SCH ponds, a pumped system located near the SCH ponds, or a combination of a low-head lift and gravity flow from an upstream point.

Water Supply (Saline) – This term refers to the high-salinity water from the Salton Sea or saline shallow groundwater and how it is delivered to the SCH ponds to increase their salinity. The options include a pump and a pipeline from the Sea to the SCH ponds or an excavated channel from the Sea to the SCH ponds with a pump lift into the ponds. The excavated channel method was used at the nearby U.S. Geological Survey ponds and involved a channel that was excavated to a depth lower than the current Sea elevation along its entire length. The Sea flowed into this excavated area and was pumped out at a point near the ponds. With either delivery system, changes would be needed as the Sea recedes. With a pipeline, additional sections of pipe would be added to extend the pipeline to the Sea. With the channel method, the channel would need to be excavated deeper as the Sea's elevation declines. The third option for saline water is shallow groundwater that would be pumped from one or more wells near the SCH ponds.

Diversion – This term refers to the type of structure placed on a river used to deliver water to the SCH ponds. The water could be diverted by gravity flow, or it could be lifted by means of a pump. A gravity flow diversion would be a lateral weir where water flows through a structure in the river bank to either a pipeline or channel. The lateral weir structure would use gates or stop logs to control the water flowrate from the river, which would depend on the river's water-surface elevation of the river. As the river flow changed, the river's water-surface elevation would change, and so the differential between the water surface and the diversion structure would change. If the diversion flow rate were to be controlled, the gates or stop logs would need to be actively managed as the river's water surface changed. The other option is a lifted diversion in which the water is raised to a higher elevation than the river's water surface by means of a pump, which requires a power source. The diversion flowrate could be controlled by either staging multiple pumps or with a variable speed pump. An issue that needs to be considered is that as the Sea recedes, the river's elevation will get lower, causing the differential between the river's water surface and the diversion structure to decrease, which in turn would cause the ability to divert flow by gravity to decrease. An inline weir (a structure across the river channel) would raise the water-surface elevation for diversion. An inline weir is essentially a small dam that would fix the water surface upstream at a constant elevation regardless of the downstream (Sea) elevation. The elevation would, however, change relative to flow in the river. The disadvantage of the inline weir is that it is an obstruction in the channel during flood conditions.

Inflow Volume – This term refers to the amount of freshwater needed to moderate salinity during operation of the SCH ponds. The freshwater diversion rate could be equal to the water lost to evaporation, but because the diverted water contains some salt, the SCH salinity would increase over time with this diversion rate. Water could also be diverted in sufficient quantity to maintain a desired salinity. To achieve this desired salinity, the SCH ponds would have a continuous outflow to the Sea to remove saline water, and the diversion would be sufficient to replace evaporation and meet the outflow requirement to maintain the salt balance. A third potential diversion option would allow operators to quickly drain and refill the ponds, essentially flushing the ponds. The quantity of water for this option would be greater than either of the previous amounts. Inflow is what is entering the ponds, not what is coming off the rivers. Diversion volume would be greater than inflow volume.

Treatment – This term refers to treatment of the freshwater supply to remove selenium, suspended sediment, or other water quality constituents that could be detrimental to the Project by using pond treatment or mechanical treatment. The pond system could be operated to allow deposition of suspended sediment or treatment of other water quality constituents. Such a pond would need to be coordinated with the current understanding of selenium treatment. A treatment pond could be located adjacent to the SCH ponds or located near the diversion facility, upstream of the SCH ponds. A mechanical treatment system could be used to remove sediment or other water quality constituents but would typically be limited by the total flow it could reasonably treat.

Pond Design – This term refers to the depth and size of the individual SCH ponds. The size of the individual ponds considered for this analysis could range from approximately 100 acres to over 500 acres. A variety of pond sizes is needed to evaluate what size provides the best habitat for fish and the birds that forage on them, while also facilitating management and maintenance activities.

Depths within the ponds need to range from 0 to about 10 feet with 0 being at the shoreline and edges of berms and islands. Water deeper than 6 feet would be obtained by excavation within the pond because the maximum water depth at the berm constructed to contain water in the pond would be 6 feet (as measured from the water surface on the berm's upslope side to the toe of the berm's downstream side) to avoid Division of Safety of Dams jurisdiction. The berms would have 2 feet of freeboard above the pondwater surface to allow for wave run-up and safety. Based on existing topography, particularly near the New and Alamo rivers, large expanses of very shallow (less-than-1-foot) water are present. These expanses do not provide suitable habitat for fish, so excavation/grading in these areas would be needed to deepen the water, at least over part of the area. The excavated/graded material would be used for constructing islands and berms.

Pond Connectivity – This term reflects how the ponds interconnect and if they are independent or cascading. Independent ponds are self contained with their own water supply and drainage. These ponds would be operated to fill or drain as needed and would be managed for a specified salinity. Cascading ponds are interconnected ponds where one pond outflows to another pond. A control structure would regulate the flow between ponds. The ponds could be constructed with individual fill and drain facilities, or the fill could occur at the pond at the top of the cascade and the drain at the bottom pond. The water-surface elevation would decrease between ponds going down the cascade.

Pond Salinity – Salinity in the ponds could range from approximately 20 to 40 ppt, although this range could occasionally be exceeded depending on how the ponds are managed. Fish that would provide forage for a variety of bird species and that are being considered for use in the SCH ponds are freshwater to brackish water species, most of which can tolerate higher salinities, but those levels are not optimal for their growth. Invertebrates, such as pileworms and barnacles, that have done well in the Salton Sea in the past and could provide forage for fish and birds, are marine species that require salinity near 35 ppt. The risk of selenium accumulation and the resulting toxicity to birds (primarily to species that breed at the Sea) also needs to be considered in selecting salinity levels for the ponds.