ATTACHMENT 3

Draft 404(B)(1) ALTERNATIVES ANALYSIS

DRAFT 404(B)(1) ALTERNATIVES ANALYSIS
for the
Salton Sea Species Conservation Habitat Project

APRIL 2013

Draft 404(b)(1) Alternatives Analysis for Salton Sea Species Conservation Habitat Project

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ACRONYMS AND ABBREVIATIONS

Acronym/Abbreviation	Definition
˚C	degrees Celsius
˚F	degrees Fahrenheit
µg/g	micrograms per gram
µg/L	micrograms per liter
AA	assessment area
af	acre-feet
afy	acre-feet per year
BMP	best management practice
cfs	cubic feet per second
cm	centimeters
CNDDB	California Natural Diversity Database
Corps	U.S. Army Corps of Engineers
CRAM	California Rapid Assessment Method
CRBRWQCB	Colorado River Basin Regional Water Quality Control Board
dBA	A-weighted decibel
DDD	dichlorodiphenyldichloroethane
DDT	dichlorodiphenyltrichloroethane
DDE	dichlorodiphenyldichloroethylene
DFW	California Department of Fish and Wildlife
dw	dry weight
DWR	California Department of Water Resources
EIS/EIR	Environmental Impact Statement/Environmental Impact Report
EPA	Environmental Protection Agency
ESCP	Erosion and Sediment Control Plan
FEMA	Federal Emergency Management Agency
GIS	geographic information system
HMMP	Habitat Mitigation and Monitoring Plan
HUC	Hydrologic Unit Code
IID	Imperial Irrigation District
IP	Individual Permit
IWA	Imperial Wildlife Area
LEDPA	Least Environmentally Damaging Practicable Alternative
Leq	equivalent sound level
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
MM	Mitigation Measure
MOA	Memorandum of Agreement
msl	mean sea level
NEPA	National Environmental Policy Act

ACRONYMS AND ABBREVIATIONS

Acronym/Abbreviation	Definition
ng/L	nanograms per liter
NWP	nationwide permit
NWR	National Wildlife Refuge
OHWM	ordinary high water mark
PEC	Probable Effects Concentration
ppt	parts per thousand
PVC	polyvinyl chloride
Reclamation	Bureau of Reclamation
SCH Project or Project	Salton Sea Species Conservation Habitat Project
SHP	Saline Habitat Ponds
SR	State Route
SWPPP	Stormwater Pollution and Prevention Plan
SWRCB	State Water Resources Control Board
USDA-NRCS	U.S. Department of Agriculture–National Resource Conservation Service
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
UTM	Universal Transverse Mercator
WARM	warm freshwater habitat
ww	wet weight

Draft 404(b)(1) Alternatives Analysis for Salton Sea Species Conservation Habitat Project

1.0 INTRODUCTION

1.1 Regulatory Setting

Any activity requiring a Standard Individual Permit (IP) under section 404 of the Clean Water Act must undergo an analysis of alternatives in order to identify the Least Environmentally Damaging Practicable Alternative (LEDPA) pursuant to requirement of guidelines established by the United States (U.S.) Environmental Protection Agency (EPA), known as the Section 404(b)(1) Guidelines. The Section 404(b)(1) Guidelines prohibit discharge of dredge or fill material into waters of the U.S. if there is a “practicable alternative to the proposed discharge that would have less impact on the aquatic ecosystem, provided that the alternative does not have other significant environmental consequences” (40 CFR 230.10(a)). An alternative is practicable “if it is available and capable of being done after taking into consideration cost, existing technology, and logistics in light of the overall project purposes” (40 CFR 230.10(a), 230.3(q)). “If it is otherwise a practicable alternative, an area not presently *owned* by an Applicant which could reasonably be obtained, utilized, expanded or managed in order to fulfill the basic purpose of the proposed activity may be considered” (40 CFR 230.10(a)(2)).

If the proposed activity would involve a discharge into a special aquatic site, such as a wetland, the Section 404(b)(1) Guidelines distinguish between those projects that are water dependent and those that are not. A water-dependent project is one that requires access to or proximity to or siting within a special aquatic site to achieve its basic purpose, such as a marina. A non-water-dependent project is one that does not require access to or proximity to or siting within a special aquatic site to achieve its basic purpose, such as a housing development.

The Section 404(b)(1) Guidelines establish two presumptions for non-water-dependent projects that propose a discharge into a special aquatic site, such as wetlands. First, it is presumed that there are practicable alternatives to non-water-dependent projects, “unless clearly demonstrated otherwise” (40 CFR 230.10(a)(3)). Second, “where a discharge is proposed for a special aquatic site, all practicable alternatives to the proposed discharge which do not involve a discharge into a special aquatic site are presumed to have less adverse impact on the aquatic ecosystem, unless clearly demonstrated otherwise” (40 CFR 230.10(a)(3)). The thrust of the guidelines is that applicants should design proposed projects to meet the overall project purpose while avoiding impacts on aquatic environments. This approach is emphasized in a Memorandum of Agreement (MOA) between the EPA and the U.S. Army Corps of Engineers (Corps) concerning the determination of mitigation under the Clean Water Act Section 404(b)(1) Guidelines (EPA 1990), as modified by the Corps and EPA Final Mitigation Rule (33 CFR 325, 332; 40 CFR 230). The MOA articulates the Guidelines’ “sequencing” protocol as first, avoiding impacts; second, minimizing impacts; and third, providing practicable compensatory mitigation for unavoidable impacts and no overall net loss of functions and services.

In addition to requiring the identification of the LEDPA, the Section 404(b)(1) Guidelines mandate that no discharge of dredged or fill material shall be permitted if it causes or contributes to violations of any applicable state water quality standard (40 CFR 230.10(b)(1)), violates any applicable toxic effluent standard or prohibition (40 CFR 230.10(b)(2)), jeopardizes the continued existence of any endangered or threatened species or destroys or adversely modifies critical habitat (40 CFR 230.10(b)(3)), or causes or contributes to significant degradation of waters of the U.S. (40 CFR 230.10(c)).

1.2 Basic and Overall Project Purpose

Basic Project Purpose – The basic project purpose comprises the fundamental, essential, or irreducible purpose of the proposed action and is used by the Corps to determine whether an applicant's project is water dependent (i.e., whether it requires access or proximity to or siting within a special aquatic site). The basic purpose for the SCH Project is aquatic habitat restoration. The basic Project purpose is water dependent. Title 40 CFR Section 230.10(a)(3) sets forth rebuttable presumptions that (1) alternatives for non-water dependent activities that do not involve special aquatic sites are available and (2) alternatives that do not involve special aquatic sites have less adverse impact on the aquatic environment. Because the Project is water dependent, these rebuttable presumptions do not apply (40 CFR 230.10[a][3]).

Overall Project Purpose – The overall project purpose serves as the basis for the Corps' section 404(b)(1) alternatives analysis and is determined by further defining the basic project purpose in a manner that more specifically describes the applicant's goals for the project, and which allows a reasonable range of alternatives to be analyzed. The overall Project purpose is to develop a range of aquatic habitats along the exposed shoreline of the Salton Sea that would support fish and wildlife species dependent on the Salton Sea in Imperial County, California.

The proposed Project is water dependent and focused on restoration of aquatic habitat. Therefore, the majority of the Project footprint is within Corps' jurisdictional areas, although associated infrastructure and construction staging areas are located in adjacent upland areas. The scope of the Federal review is normally defined by 33 CFR part 325, Appendix B, which states: "…the district engineer should establish the scope of the NEPA document to address the impacts of the specific activity regarding the Department of the Army permit and those portions of the entire Project over which the district engineer has sufficient control and responsibility to warrant Federal review."

The Corps' regulations require the Corps to determine if their "scope of review" or "scope of analysis" should be expanded to account for indirect and/or cumulative effects of the issuance of a permit (33 CFR part 325, Appendix B). Typical factors considered in determining "sufficient control and responsibility" include:

- Whether or not the activity constitutes merely a link in a corridor-type project;
- Whether aspects of the upland facility in the immediate vicinity of the regulated activity affect the location and configuration of the regulated activity;
- Extent to which the entire project would fall within Corps jurisdiction; and
- Extent of Federal cumulative control and responsibility.

The SCH Project involves the restoration of saline habitat ponds and does not constitute merely a link in a corridor-type project. The Project purpose is to restore aquatic habitat and as such is a water dependent activity, therefore the upland facilities are dictated by the location and configuration of the regulated activity. The Project is 4,065 acres and contains a total of 2,748 acres of wetland and non-wetland waters of the U.S. distributed throughout the Project site. Jurisdictional waters of the U.S. constitute 68 percent of the 4,065-acre site. In addition, the Project site also supports species that are Federally listed as threatened or endangered, which include desert pupfish, California least tern, least Bell's vireo, southwestern willow flycatcher, and Yuma clapper rail. Based on 33 CFR part 325, Appendix B, and the evaluation above, sufficient Federal control and responsibility exists to warrant expanding the scope of analysis to include the entire Project footprint. Given the overall Project purpose, the extent and distribution of the Corps' jurisdictional areas throughout the Project site, and in consideration of the Endangered Species Act issues involved, the Corps has determined there exists sufficient cumulative Federal control to require National Environmental Policy Act (NEPA) review to include analysis of environmental impacts on the upland portions of the Project site in addition to the Corps' jurisdictional areas. In particular, the upland portions of the Project area are necessary for the practical construction and operation of the Project. As such, all access road and pipeline routing within non-jurisdictional areas are within the scope of analysis. Therefore, the appropriate scope of analysis for the Federal review of the proposed Project consists of the entire Project footprint. In these upland areas, the Corps will evaluate impacts on the environment, alternatives, mitigation measures, and the appropriate state or local agencies with authority to implement such measures if they are outside the authority of the Corps.

1.3 Location

The Project site is located at the southern end of the Salton Sea in Imperial County, California (Figures 1 and 2). The Project would involve a blend of brackish river water from the New River and saline water from the Sea to maintain an appropriate salinity range within constructed ponds.

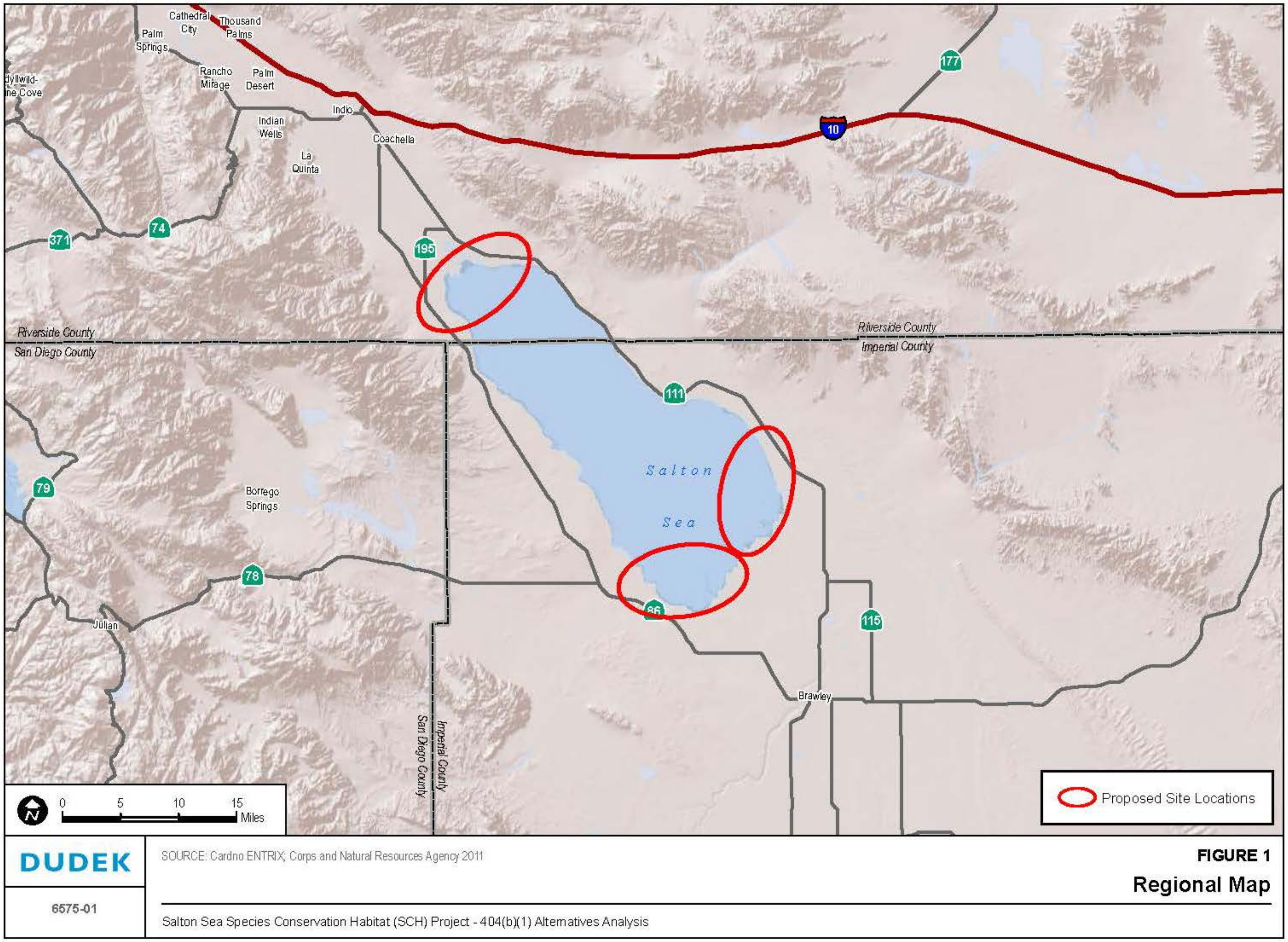


Figure 1 Regional Map

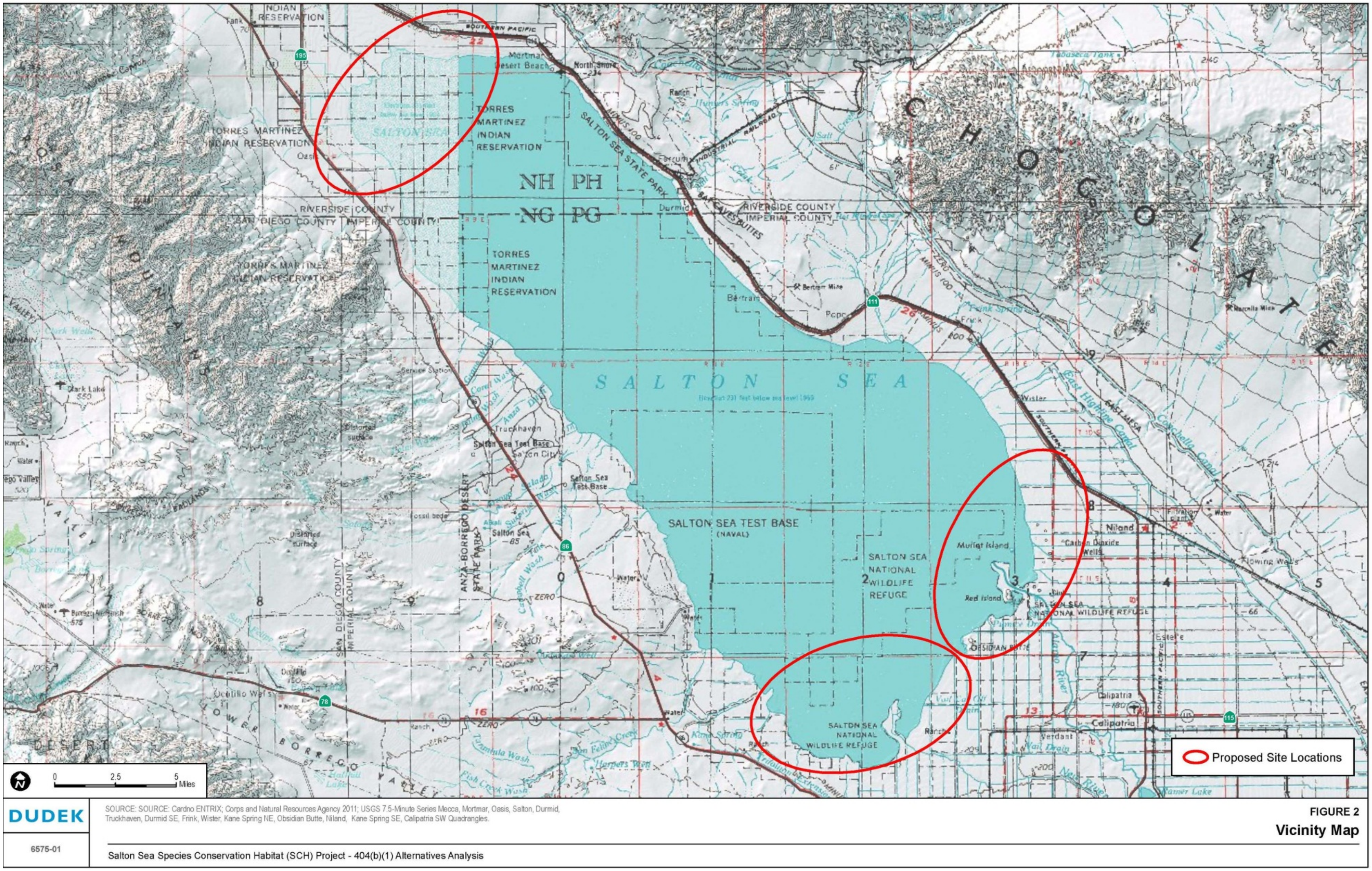


Figure 2 Vicinity Map

1.4 Proposed Project Description

The California Department of Fish and Wildlife (DFW), on behalf of the California Natural Resources Agency, proposes to construct and operate the SCH Project, which would restore shallow water habitat lost due to the Salton Sea's ever-increasing salinity and reduced area as the Sea recedes. The SCH ponds would use available land at elevations less than -228 feet mean sea level (msl) (the former Sea level in June 2005).

The SCH Project would use the large bay to the northeast of the New River (East New), the shoreline to the southwest (West New), and the shoreline continuing to the west (Far West New). Cascading ponds would be attached to each of the pond units (Figure 3). The ponds would be constructed with the necessary infrastructure to allow for the management of water into and through the Project area (Figure 4). The newly created habitat would be contained within low-height berms. The water supply for the SCH Project ponds would be a combination of brackish river water and saline water from the Sea, blended to maintain an appropriate salinity range for target biological benefits.

The SCH Project is designed as a proof-of-concept project in which several Project features, characteristics, and operations could be tested under an adaptive management framework for approximately 10 years after completion of construction (until 2025). By then, managers would have had time to identify those management practices that best meet the Project goals. After the proof-of-concept period, the Project would be operated until the end of the 75-year period covered by the Quantification Settlement Agreement (2078), or until funding was no longer available.

The SCH ponds would be constructed on recently exposed playa following the existing topography (ground surface contours) where possible using a range of design specifications. The ground surface within the SCH ponds would be excavated with a balance between cut and fill to acquire material to build the berms and habitat islands. Specifically, the SCH water depth at the exterior berms would range between 0 and 6 feet (measured from the water surface to the Sea-side toe of the berm); the maximum depth within the SCH ponds would be up to 12 feet in excavated holes, and the maximum water surface elevation would be at -228 feet msl.

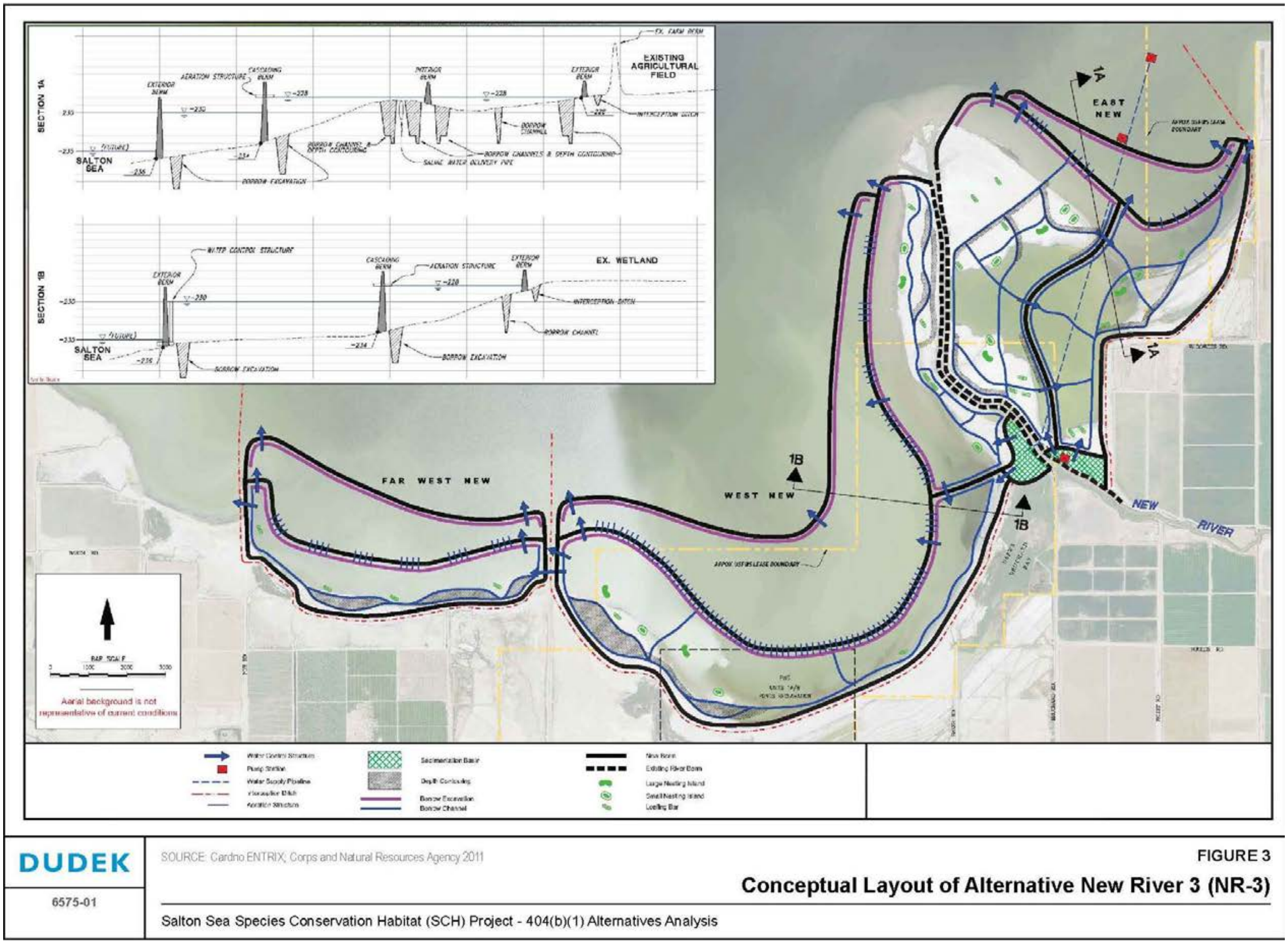


Figure 3 Conceptual Layout of Alternative New River 3 (NR-3)

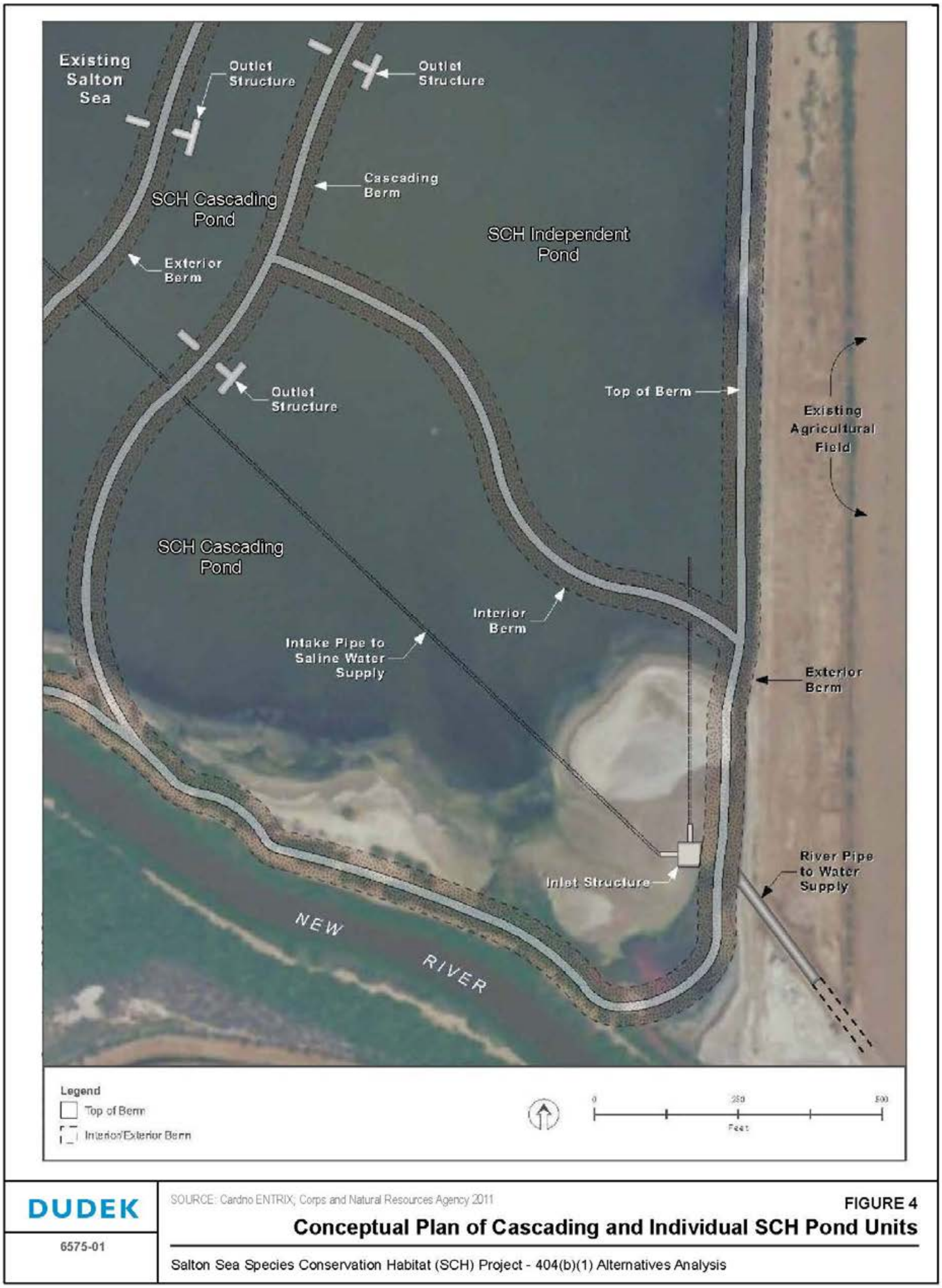


Figure 4 Conceptual Plan of Cascading and Individual SCH Pond Units

Each component of the SCH ponds is described in more detail in Section 1.5. However, the proposed Project would have the following components:

- **River Water Source.** Water would be pumped from the New River at the SCH Project's southern edge using a low-lift pump to a sedimentation basin on each side of the river. A metal bridge structure would be used to support the diversion pipes across the river.

- **Saline Water Source.** A saline pump would be located to the north of East New on a structure in the Salton Sea. Water would be delivered to the pond intakes through a pressurized pipeline.

- **Sedimentation Basin.** Two sedimentation basins would be located within the SCH Project area. They would serve the pond units east and west of the New River. Water would be released from each basin to a distribution system serving the individual ponds. The basins would total 70 acres and would be fenced to prevent unauthorized access.

- **Pond Layout.** The Project would consist of several independent pond units at Far West New, West New, and East New. Within each pond unit, interior berms would form individual ponds. The ponds at Far West New would receive their water supply from a pipeline from West New. Cascading ponds would be connected to each of the pond units. These cascading ponds would drain to the Sea.

- **Water Surface Elevation.** The water surface elevation in the ponds would be a maximum of -228 feet msl. The maximum depth from the water surface in each pond unit to the downstream toe of the confining berm would be 6 feet. The water surface elevation in the cascading ponds would be from 2 to 4 feet lower than the elevation in the independent ponds.

- **Berm Configuration.** Exterior berms would be placed at an elevation of -234 feet msl to separate the ponds from the Sea. The cascading berms would be placed at elevations of -236 or -238 feet depending on the pond location, site conditions, and the Sea elevation at the time of construction.

- **Pond Connectivity.** Interior berms would subdivide the independent pond units, and gated control structures would be present in the interior berms to allow controlled flow between individual ponds. Each individual pond would have an ungated overflow structure that connects directly to the Sea with an overflow pipe that would be sized to handle the overflow from a 100-year rainfall on the pond.

- **Borrow Source.** The borrow source for berm material would be from excavation trenches along the exterior berm, shallow excavations, and borrow swales. The borrow swales would create deeper channels within an individual pond.

- **Agricultural Drainage and Natural Runoff.** Agricultural drains operated by Imperial Irrigation District (IID) terminate at the beach along the southern end of the independent pond units. This drainage would be collected in an interception ditch. Natural runoff from watersheds to the southwest of the SCH Project area is also present in two drains that intersect the Project. The exterior berms would be aligned so as not to interrupt the flowpath of the occasional stormflows from these watersheds to the Sea.

- **Tailwater Return.** A tailwater system could be provided for the SCH Project.

- **Pond Size.** The sizes of the individual ponds would range from 150 to 720 acres.

1.5 Components Used to Develop Alternatives

The following Project components were identified and evaluated as part of the process of developing a range of Project alternatives that would meet the basic and overall Project purpose. Each component is described in detail below along with how each component applies to the six alternatives including the proposed Project.

1.5.1 Pond Units

Ponds would be constructed through a process of excavation (i.e., borrow), berm construction, depth contouring, and installation of water control structures.

1.5.1.1 Pond Unit Type

Each pond unit could be either independent or cascading (Figure 4). An independent pond unit would have one inflow point for brackish and saline water that could be subdivided into multiple smaller ponds. Water would be conveyed between the smaller ponds through a gated pipe, and the ponds would have similar water surface elevations. A cascading pond unit would be attached to an independent pond unit on the outboard (Sea) side and would receive water from an independent unit. In this case, the water surface in each pond would differ by about 2 to 4 feet for Alternatives NR-1 and NR-3. For Alternatives AR-1 and AR-3, the difference would be about 5 feet. Cascading ponds would be used to help aerate the water in the lower pond unit (Figure 4).

1.5.1.2 Berms

Berms would be constructed to impound water to create and subdivide ponds. Up to four berm types would be constructed as part of the Project alternatives:

- **Exterior berm.** Exterior berms would define the outer boundary of an SCH pond unit (either cascading or independent). These berms would separate the Sea from the SCH ponds and the SCH ponds from the interception ditch and adjacent land uses above -228 feet msl.

- **Interior berm.** Interior berms would subdivide the SCH pond unit into individual smaller ponds.
- **Cascading berm.** Cascading berms would separate a cascading pond from an independent pond and would contain facilities to cascade the water from one pond to another (applicable only to Alternatives NR-1, NR-3, AR-1, and AR-3).
- **Improved river berm.** The improved river berm would separate the ponds from the river and be an elevated berm on top of the existing ground along the river.

The berms would be placed to achieve the desired pond size, shape, bottom configuration, and orientation. The exterior berm would be placed with the downstream (Sea-side) toe of the berm at an elevation of -234 feet msl for independent ponds and at a lower elevation for cascading ponds. In both cases, the berms would be located so that under the maximum pond water elevation, the difference between the water surface elevation in the pond and the downstream toe of the berm, would be 6 feet or less. The exterior berm may be protected with riprap or other materials on the outboard (Sea) side. Interior berms would have riprap or other bank protection on the berm slopes above and below the high-water line.

Berms would be constructed by two methods, both involving impacts on potential jurisdictional areas. “In the dry” construction activities would occur in exposed playa areas where the berm would be located at an elevation higher than the Salton Sea’s elevation at the time of construction. In the near-term, however, the exterior berm, especially with a cascading pond unit, would be in direct contact with the Sea. “In the wet” construction may require a barge-mounted dredge to excavate the material for the berm. The berm-side slopes were determined based on Project-specific geotechnical analyses (refer to Appendix C, Geotechnical Investigations, of the Environmental Impact Statement/Environmental Impact Report [EIS/EIR]). A berm would include a single-lane, light-duty vehicle access road on top and turnouts every 0.5 mile. Based on preliminary geotechnical analyses, the foundation after berm placement would consolidate, thus requiring an approximately 10.5-foot-high berm to yield an 8-foot berm.

Construction “in the wet” would result in wave action against the seaward toe of the berms during both construction and the period the level of the Sea was above the toe of the berm. Protective measures would be implemented in order to prevent wave action from eroding the berm fill. Several construction techniques could be used, all of which involve the placement of a barrier on the Sea side of the construction area to intercept the wave action. The techniques would be examined during the final Project design, including sacrificial soil barrier, rubble rock mound, sheet pile barrier, timber breakwater, Geotube®, large sand bags, and floating tire breakwater. Detailed information about each technique is provided in Section 2.4.1.3 of the SCH Project's Draft EIS/EIR (Corps and Natural Resources Agency 2011).

1.5.1.3 Borrow Excavations

On-site material would be used to construct the berms and habitat features (i.e., islands). The amount of excavated material would be balanced with the amount of fill needed for constructing the berms and other features, thus eliminating the need for importing embankment material with the exception of imported riprap and gravel. The borrow areas generally would be adjacent to channels, swale channels, and shallow excavations. Swales and channels would be excavated within the ponds by scrapers and excavators to a depth of 2 feet or more. They ultimately would serve as habitat features that connect shallow and deep areas of a pond. Shallow borrow areas would be from the highest and driest ground and would provide water depths of approximately 2 feet in areas that would otherwise have very shallow water of less than 1 foot. Any of the above-mentioned areas may serve as borrow sites. The source of borrow material within the Project footprint would be determined by the type of material needed for berm construction, taking into account berm construction methods, geotechnical properties of the playa material, and habitat requirements.

1.5.1.4 Depth Contouring

The channels excavated for borrow material to construct berms and islands would create habitat diversity. In addition, features such as swales would be used to achieve greater diversity of depths and underwater habitat connectivity. Borrow channel flowline elevations may not be low enough if the material were too saturated or unsuitable for embankment. There may also be areas within the pond units in which the native material was unsuitable for borrow, yet a channel was still desired to provide a connection to other deeper water habitat areas. In these cases, a hydraulic dredge would provide greater depth to borrow channels or create new channels through areas with soft soils. Soils removed as dredge spoils would be placed either within the Project pond areas or outside of the exterior berm in the Sea, but within the Project footprint.

1.5.2 Water Supply and Water Control Structures

The water supply for the Project would come from the brackish New or Alamo rivers, depending on the alternative, and the Salton Sea. The salinity of the river water is currently about 2 parts per thousand (ppt), and the Sea is currently about 51 ppt. For reference, the ocean is about 35 ppt. Blending the river water and seawater in different amounts would allow for a range of salinities to be used in the ponds. Detailed modeling studies performed for this Project showed that increasing salinity through evapoconcentration (allowing the salinity to increase by evaporating the fresh water and leaving the salts behind) would not produce higher salinity ponds in a reasonable time frame (Appendices D and J of the Draft EIS/EIR). The saline diversion would occur from pumps placed on a structure in or adjacent to the Sea. The river diversion would occur either by a gravity diversion from an upstream location or pumps located near the SCH ponds.

1.5.2.1 Inflow and Outflow Structures

The water supply would enter into the ponds through an inflow structure. This structure would connect to a pumped or gravity flow system for the river and a pumped system for the saline water. A single inflow structure would distribute the water to individual ponds within a unit. The brackish water and saline water inflows could be either separate systems delivering water to a pond or combined to premix water of different salinities.

Outflow structures would be included in all SCH ponds. The outflow structure would consist of a concrete riser with removable flash boards and an outlet pipe. The flash boards could be removed to adjust the water surface elevation of a pond or to reduce the water level elevation in an emergency. The top of the structure would be a weir at least 2 feet below the top of the berms to maintain the maximum water surface at the -228 feet msl elevation (6 feet deep at the outlet). The structure and the outflow pipe would be sized to handle normal pond flow-through and overflow during a 100-year rainfall event. Because the ponds would not have an uncontrolled connection to the river, the outflow structure would not have to handle flood flows entering from the river.

Water control structures would allow for the controlled supply and conveyance of water through the pond units. These structures would be managed to adjust the rate of flow and maintain desired water surface elevations in individual ponds. Structures could be placed to allow water to flow between pond units in which an independent supply is not cost effective, or to provide flexibility in the management of water resources supplied to the ponds.

1.5.2.2 River Diversion Gravity Diversion Structure

For alternatives that consider supplying river water to the Project via gravity diversion (Alternatives NR-1 and AR-1 [Alternatives 1 and 4 in the Draft EIS/EIR]), a water control structure would be constructed at the diversion location along the bank of the New or Alamo rivers. The structure would be a series of pipes to extract water laterally from the river, and discharge it into an adjacent sedimentation basin. From the sedimentation basin, the water would be delivered by gravity to the SCH ponds through large-diameter brackish water pipelines. The diversion would be located, at a minimum, a distance upstream that would have a sufficient water surface elevation at the river to run water through the diversion pipes, sedimentation basin, and brackish water pipeline to the SCH ponds.

1.5.2.3 Brackish Water Pipeline

The gravity brackish water pipeline that conveys water from the sedimentation basin to the SCH ponds would consist of several large-diameter polyvinyl chloride (PVC) pipes buried along the route, which is not yet identified because it is dependent on availability of land from willing owners and the ability to negotiate a lease or easement from such owners. It is estimated that three 5-foot-diameter pipes are necessary to minimize velocity in the pipeline, thereby minimizing head loss.

1.5.2.4 River Diversion Pump Stations

A pump station would be required for alternatives using a river water diversion located at the Project site (Alternatives NR-2, NR-3, AR-2, and AR-3 [Alternatives 2, 3, 5, and 6 in the Draft EIS/EIR]) because the water surface elevation in the river is below the design elevation of -228 feet msl. A single pump station could pump directly into sedimentation basins located on either side of the river for delivery to the SCH ponds. The pump station would have multiple pumps to allow variable diversion rates. In addition, multiple pumps would allow individual maintenance without eliminating the entire diversion. Power to operate the pumping station would be supplied from existing three-phase power lines owned by IID.

1.5.2.5 Saline Water Supply Pump Station

Saline water would be pumped from the Salton Sea, which has a lower water surface than that of the SCH pond units. Alternatives include locating it on a platform in the Sea, which would require three-phase power to be brought to the station. The pump station may be relocated farther out as the Sea recedes and as pumps require replacement or maintenance. Another option would excavate a channel to bring the water to a pump station located closer to the Project site. This option would require less pipeline and a shorter run of utility lines, but would require the channel be maintained and deepened as the Sea recedes. Because the Sea gets progressively more saline as it recedes, at some point salinity balance may be achieved through a tailwater return system or similar process.

1.5.2.6 Tailwater Return Pump

A pump located at the far end of a SCH pond, or series of SCH ponds, could be utilized to return water that otherwise would be discharged to the Sea back to the top of the system. This method is for promoting the movement and flow of water through the SCH ponds while conserving water resources. It also could serve to aerate the water.

1.5.2.7 Boat Ramps

Boat ramps would allow boat access for monitoring and maintaining the ponds, Project features, and habitat conditions. A boat launch would accommodate a vehicle and trailer of approximately 46 feet in length with appropriate room for turn-around before the ramp. The ramp would extend about 30 feet into the water and require a 3-foot depth at the end of the ramp. Precast concrete barriers on the windward side of the ramp would protect the boat during launch and recovery.

1.5.3 Additional Project Components

1.5.3.1 Power Supply

Three-phase, 480-volt electrical power to operate the pumps would be provided by existing aboveground power lines operated by IID. Aboveground electrical power lines would be modified to prevent bird collisions and electrocutions (e.g., bird deterrents).

1.5.3.2 Sedimentation Basin

A sedimentation basin would be needed for all alternatives to remove the suspended sediment from influent river water before it enters the SCH ponds. For alternatives considering a gravity diversion, the basin would be located at the point of diversion. For pumped diversion alternatives, basins would be located at the SCH ponds on one or both sides of the river. The sedimentation basin would detain water for approximately 1 day to allow suspended sediment to settle to the bottom of the basin.

The basin would be divided into two sections, alternately labeled the active basin and the maintenance basin. The maintenance basin would be dried for sediment removal. This basin would then become the active basin and the other side would be dried. Excavated material would be used in the SCH ponds to maintain berms, construct new habitat features, or stockpile for eventual use at the SCH Project.

1.5.3.3 Interception Ditch/Local Drainage

SCH berms would be located to allow natural runoff to flow to the Sea unimpeded. Existing drainage ditches located along the Salton Sea’s perimeter discharge agricultural drainwater to the Sea. An interception ditch would be excavated along the existing shoreline to collect the drainwater and route it around the Project ponds. Ditch design would prevent the Project from causing water to back up in these drains, thus preventing the discharge of drainwater to the Sea, as well as mitigate the potential of the higher water in the ponds creating a localized shallow groundwater table higher than that which currently exists on neighboring properties. The interception ditch also would maintain connectivity among pupfish populations in drains adjacent to the Project, allowing fish movement along the shoreline between drains, which is a requirement of IID's Water Conservation and Transfer Project.

1.5.3.4 Aeration Drop Structures

For cascading ponds, small-diameter pipes with variable placement in the cascading berm would allow flow from the upper pond to the lower pond. The 2- to 5-foot elevation difference (depending on the alternative), would create localized zones of increased dissolved oxygen.

1.5.3.5 Bird Habitat Features

Each pond would include several islands for roosting and nesting to provide habitat for birds that is relatively protected from land-based predators. One to three nesting islands suitable for tern species and three to six smaller roosting islands suitable for cormorants and pelicans are anticipated. The islands would be constructed by excavating and mounding up existing playa sediments to create a low-profile embankment approximately 1 to 4 feet above waterline. The nesting islands (0.3 to 1.0 acre) would have an elliptical and undulating shape with sides that gradually slope to the water (8 to 9 percent slope). The roosting islands would be V-shaped or linear, approximately 15 feet wide and 200 feet long, with steep sides to prevent nesting. Orientation of most or all roosting islands would be along the prevailing wind fetch, but it could be varied for a subset of islands if deemed necessary to test habitat preference and island performance (i.e., erosion susceptibility) for future restoration implementation.

The overall pond unit could also include one or two very large nesting islands from 2 to 10 acres with rocky substrate for double-crested cormorants (*Phalacrocorax auritus*) and gulls. The islands would be constructed by mounding sediments to create a tall profile (up to 10 feet), and armoring with riprap to create rocky terraces. However, the amount of fill required to construct such an island is large and may be cost prohibitive. If this option proves infeasible, these features would be eliminated from the final Project design.

The number and placement of islands would be determined by the pond size, shape, and depth, as well as available budget. To the extent possible, islands would be placed at least 900 feet from shore and in water with a minimum depth of 2.5 feet to discourage access by land-based predators such as coyotes (*Canis latrans*) and raccoons (*Procyon lotor*).

An alternative island habitat technique would construct islands to float on the pond's surface rather than requiring conventional excavation and placement of playa sediment. In addition to islands, snags or other vertical structures (5 to 15 per pond) could be installed in the ponds to provide roosting or nesting sites. They could be dead branches or artificial branching structures mounted on power poles. They would be optional features for a SCH pond, depending on presence of existing snags and roosts, availability of materials, and cost feasibility.

1.5.3.6 Fish Habitat Features

The SCH ponds would provide suitable water quality and physical conditions to support a productive aquatic community including fish. The Project would incorporate habitat features to increase microhabitat diversity and provide cover and attachment sites (e.g., for barnacles). The type and placement of such features would depend on habitat needs of different species, site conditions, and feasibility, and would vary to test performance of different techniques. Examples of habitat features considered include swales or channels, hard substrate on berms, bottom hard substrate, and floating islands. A detailed description of the potential fish habitat features is provided in Section 2.4.1.20 and Appendix D of the SCH Project's Draft EIS/EIR (Corps and Natural Resources Agency 2011).

1.5.3.7 Operational Facilities

A trailer or other temporary structure would be located near the ponds and would provide office space for permanent employees. Bottled water would be brought in for potable uses, and power would be provided to the facility. A self-contained waste system would substitute for septic tanks or sewerage. Boats and other equipment would be stored at the Imperial Wildlife Area's (IWA's) Wister Unit in existing facilities.

1.5.3.8 Fish Rearing

A goal of the SCH Project is to raise fish to support piscivorous (fish-eating) birds. To accomplish this goal, a supply of fish that can tolerate saline conditions must be available for initial stocking of the SCH ponds and for possible restocking if severe fish die-offs occur. The SCH ponds would be stocked initially with fish species currently in the Salton Sea Basin, such as California Mozambique hybrid tilapia (*Oreochromis mossambicus x O. urolepis hornorum*) and other tilapia strains in local waters. If necessary to obtain sufficient numbers for stocking, fish may be collected from local sources, and then bred and raised at one or more of the private, licensed aquaculture facilities in the area (within 15 miles of all alternative sites).

1.5.3.9 Public Access

The SCH Project is not specifically designed to accommodate recreation because provision of recreational opportunities is not a Project goal. Nevertheless, certain recreational activities could be available to the extent they are compatible with the management of the SCH ponds as habitat for piscivorous birds dependent on the Salton Sea and nearby sensitive resources. Such activities include day use, hiking, bird watching, and non-motorized watercraft use. Management plans may require that certain areas be seasonally closed to human activities to avoid disturbance of sensitive birds. When bird nesting is observed by SCH managers, human approach would be limited by posted signs. Hours of public access would be restricted in the early morning during hot weather when nesting birds could be present. Fish would not be intentionally stocked for the purpose of providing angling opportunities. Nevertheless, such opportunities may be provided at the SCH ponds, in particular for tilapia. Fish populations would be monitored as a metric of the SCH Project's success. If populations become well established and appear to provide fish in excess of what birds are consuming, angling may be allowed. Waterfowl hunting may also be allowed, consistent with protection of other avian resources.

1.5.3.10 Land Acquisition

The SCH ponds would be located on land owned by IID and the Federal government. It would be leased from IID for the Project's duration and include a cooperative agreement with the U.S. Fish and Wildlife Service (USFWS). Much of the land where the ponds would be located is already leased by IID to the USFWS for the management of the Sonny Bono Salton Sea National Wildlife Refuge (NWR). An agreement between DFW and USFWS would be established prior to construction of the SCH Project to ensure compatibility between NWR uses and the SCH Project. Other Project facilities, such as pump stations, pipelines, or access roads, may be located on IID land, public right-of-way, or private land. On private land, easements would be obtained from willing landowners only. If an easement cannot be negotiated with a landowner, the proposed facilities would be located elsewhere. The easement would be structured to avoid precluding the continued use of the property by the landowner. Land in easement disturbed during construction would be returned to the preexisting condition, except at the sites of permanent facilities, such as pump stations, diversion works, and pipeline access manholes.

2.0 ALTERNATIVES ANALYSIS

2.1 Off-Site and No Project Alternatives

As required by the Section 404(b)(1) Guidelines, the Corps evaluated alternative project sites to determine if there is an alternative site available on which the proposed Project could be constructed that would involve fewer impacts on aquatic resources than the proposed Project and would not have concomitant adverse impacts on other sensitive resources such as listed species. This involved a two-step review. First, alternative sites were subject to a detailed evaluation of the key siting criteria required for similarly sized, aquatic habitat restoration projects. The "key siting criteria" are described below. The second part is a practicability review that is described in Section 2.3.

Key siting criteria used to evaluate alternatives are:

1. **Available land (ownership and accessibility):** Sufficient land must be either owned by the Natural Resources Agency or available for use for the SCH Project either through lease, access agreements, sale, transfer, or other such legal agreement. In that case where land is either leased, transferred, or sold, there must be a landowner(s) willing to enter into such an agreement.

2. **Adequate water supply (quantity, quality, and seasonal availability):** Assuming 6 feet of evaporation annually, the amount of water necessary to supply the SCH ponds each year ranges from 5,400 acre-feet (af) for 900 acres of SCH ponds to 34,200 af for 5,700 acres of SCH ponds (this water is lost to evaporation and does not include water that is circulated in the ponds to maintain salt balance or discharged to the Sea to flush ponds). This volume of water would be necessary throughout the year and would be provided from a water right obtained by the Natural Resources Agency or an agreement with an existing water rights holder. 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, of the Draft EIS/EIR).

2.2 Screening of Off-Site and No Project Alternatives

The California DFW and Department of Water Resources (DWR), on behalf of the Natural Resources Agency, initially identified three generalized locations for the SCH ponds, based on the potential availability of contiguous acreage and the potential availability of a nearby, suitable water supply. The most suitable areas initially identified were located near the mouths of the New, Alamo, and Whitewater rivers (Figure 2).

In addition to evaluation of the potential locations for SCH ponds, potential alternative sources of water were evaluated. These sources include river water, agricultural drainwater, Salton Sea water, and groundwater. Agricultural drainwater and groundwater were eliminated from consideration based on the factors described below.

Agricultural Drainwater: Drainwater purely from agricultural sources was eliminated as a potential water source for a variety of reasons, but primarily due to the seasonal variation in agricultural discharge. This seasonality means that the minimum necessary volume of water would not reliably be available throughout the year. Furthermore, agricultural drainwater has consistently 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). There are also known hotspots of selenium within agricultural areas. Lastly, the agricultural drains are habitat for the Federally and state-listed desert pupfish (*Cyprinodon macularius*), and use of drainwater would reduce this habitat potentially conflicting with Federal and state laws intended to protect such species.

Groundwater: The Project area is part of the Imperial Valley Groundwater Basin. Previous studies (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 poor groundwater quality. The low permeability is a consequence of the deposition of former seabed 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 ranging 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 is saline, this source is not a replacement for the Salton Sea as a source of saline water for the Project (the salinity is less than the lowest pond salinity proposed). Based on best available information, 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. Additionally, insufficient data exist regarding this supply including depth to groundwater, yield, salinity, subsidence, and location of cost-effective production wells, to carry this supply forward in the Project. This supply can be reevaluated at a later time if additional data are available. Therefore, this option was eliminated from further consideration.

2.2.1 Whitewater River Site Alternative

The Whitewater River flows into the Salton Sea at the northwestern end of the Sea. At this location, approximately 900 acres of pond area could potentially be developed through the SCH Project (Figure 2). These lands are not directly adjacent to the river, but are slightly offset to the northeast (563 acres) and southwest (378 acres) of the river. The sites have an elevation between -228 and -234 feet. The land is owned by IID, U.S. Department of Interior, the Torres Martinez Desert Cahuilla Indian Tribe (Torres Martinez Tribe), and various private entities.

Siting Criteria Review: The Whitewater River Site Alternative was eliminated as an off-site alternative for the proposed Project because water rights and an adequate water supply are not available at the Whitewater River. The Whitewater River is designated by the State Water Resources Control Board (SWRCB) as a fully appropriated stream from the Salton Sea to the headwaters; thus, no water would be available for the SCH Project. Due to existing and projected demands on the Whitewater River by the Coachella Valley Water District and the Torres Martinez Tribe, there is not adequate water available to support a large restoration project (see Appendix B of the Draft EIS/EIR). This site does not meet the water rights and adequate water supply siting criteria. With regard to the available land criterion, IID’s ownership is in a checkerboard pattern, mixed with lands owned by the Torres Martinez Tribe. Tribal land would be required to convey water to ponds at the Whitewater River site. Considering the Tribe has not been willing to participate in the SCH Project, acquiring Torres Martinez tribal lands for the proposed project is not likely.

2.2.2 Alamo River Alternatives

The Alamo River flows into the Salton Sea at the southeastern end of the Sea. At this location, approximately 2,400 acres of pond area could potentially be developed through the SCH Project (Figure 2). These lands are directly adjacent to the river to the north (2,306 acres) and southwest (1,111 acres) of the river. The sites have an elevation between -228 and -232 feet. IID, DFW, and various private entities own the land.

Siting Criteria Review: The Alamo River Alternatives meet the Corps siting criteria (adequate water and land are available from IID) and were analyzed for practicability, the results of which are described below.

Because the Alamo River was comparable to the New River in regard to the key general siting criteria, multiple detailed alternatives were analyzed at the Alamo River (Alternatives AR-1, AR-2, and AR-3; Section 2.3.1).

2.2.3 No Project/No Federal Action Alternative

Under the No Project/No Federal Action Alternative, the Corps would not issue a permit for the SCH Project, and no components of the SCH Project would be constructed. The No Project/No Federal Action Alternative is intended to reflect existing conditions plus changes that are reasonably expected to occur in the foreseeable future if the Project is not implemented. An SCH Project alternative could not be constructed without a Federal action because any SCH Project alternative would require diversion of flows from a riverine source, and such a diversion would require discharge within the jurisdictional limits of the riverine system (e.g., New River). Furthermore, although there are non-jurisdictional areas of exposed playa within the Salton Sea, jurisdictional wetlands still occur in and around these non-jurisdictional exposed playas, and it would be infeasible to design a project completely within the non-jurisdictional areas only. Thus, the No Federal Action Alternative is the same as the No Project Alternative.

Under the No Project/No Federal Action Alternative, the Salton Sea would continue to recede as water levels decline over the years. Reduced inflows in future years would result in the Salton 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 (process by which a water body acquires a high concentration of nutrients [e.g., nitrates and phosphates]), and related anoxia (decrease in oxygen) and algal productivity. The most serious and immediate threat to the Salton Sea ecosystem is the loss of fishery resources that support piscivorous birds.

The No Project/No Federal Action Alternative would not achieve the overall Project purpose of restoring aquatic habitat along the exposed shoreline of the Salton Sea. The No Project/No Federal Action Alternative would not be subject to the cost, logistic, or technology criteria because there would be no cost threshold or modification of logistics to evaluate. Therefore, the No Project/No Federal Action Alternative is not carried forward for comparison purposes.

2.3 Practicability of Alternatives

The following criteria were used to screen the practicability of off-site and on-site alternatives: overall Project purpose, cost criteria, logistics criteria, and environmental impacts.

Overall Project Purpose: To be practicable, an alternative must meet the overall Project propose, which is to develop a range of aquatic habitats along the exposed shoreline of the Salton

Sea that would support fish and wildlife species dependent on the Salton Sea in Imperial County, California.

Cost Criteria: The construction costs for each alternative were compared to the proposed Project. The estimated costs for each alternative were developed based on a measure of the size of overall grading/construction and the individual unit costs for various facilities that make up the alternative conceptual design. The Corps has determined that the practicability of alternatives with regard to cost criteria is based on the cost to construct each alternative compared to the construction costs for the proposed Project (estimated to be $80.9 million). To meet the cost criteria an alternative must not substantially increase the cost of construction.

Logistics Criteria: These criteria include issues related to the complexity of the Project design based on individual site characteristics, special equipment needs, and land acquisition issues. As such, these criteria focus on the key components required to achieve the basic and overall Project purpose. The following logistical criteria were developed to evaluate practicability:

1. **Disruption of agricultural drainage systems:** An alternative may be considered impracticable if construction and operation result in the likely disruption of agricultural drainage systems, including subterranean tile drains due to the highly sensitive nature of the drainage systems potentially affected and the number of agricultural enterprises potentially affected.

2. **Long-term soil stability:** The practicable construction of the Project depends on the ability to reliably use borrow excavations from constructed ponds to construct berms and for those berms to remain stable. Factors that negatively affect soil stability, such as high geologic activity (e.g., mud pots) may result in future repairs and re-design with associated costs that could not be absorbed by the Project.

Technology Criteria: The Corps determined that technology would have no bearing on the practicability analysis because all alternatives analyzed propose the use of the water conveyance and pond construction technology to create aquatic habitat (e.g., gravity or pumped water conveyance and ponds constructed of excavations and berms). An alternative technology for creating aquatic habitat that does not involve the conveyance of water to areas that can hold and support water has not been identified. A number of potential Project components were evaluated in the Draft EIS/EIR, Appendix B, Table B-2 (Corps and Natural Resources Agency 2011).

Environmental Criteria: Environmental impacts due to the implementation of the alternatives were not used to eliminate an alternative in this section. An alternative that may have larger short-term environmental impacts may also result in larger long-term environmental benefits; therefore, alternatives that meet the practicability criteria listed above are carried forward throughout the document. The environmental impacts and expected benefits for each practicable alternative are fully analyzed in Section 4.0 of this document.

2.3.1 Practicability of Off-Site Alternatives

Three off-site alternatives are evaluated (Figure 5), each involving constructing ponds along the north side of the Alamo River. Each of these alternatives is evaluated for practicability based on the criteria outlined above. All practicable off-site and on-site alternatives will then be compared to determine which is the least environmentally damaging.

2.3.1.1 Alamo River, Gravity Diversion + Cascading Pond (Alternative AR-1)

Alternative AR-1, identified as Alternative 4 in the EIS/EIR, would construct 2,290 acres of ponds on the northern side of the Alamo River (Figure 6). River water would be pumped into the sedimentation basin via an upstream gravity diversion. This alternative would include both independent and cascading pond units. Alternative AR-1 would consist of the following facilities:

- A gravity structure on the Alamo River;
- Saline water pump at Red Hill with associated pipeline;
- Sedimentation basin (at upstream location) adjacent to the river;
- Independent and cascading pond units at Morton Bay defined by exterior and interior berms with control structures to regulate water flows;
- Borrow material from pond excavations, including borrow swales to create deeper channels;
- An interception ditch to direct flows from agricultural drains; and
- A tailwater return system.

Overall Project Purpose: This alternative would meet the overall Project purpose.

Cost Criteria: This alternative would require construction costs of $39.9 million, which is 49 percent less than the cost of the proposed Project; therefore, this alternative meets the cost criteria.

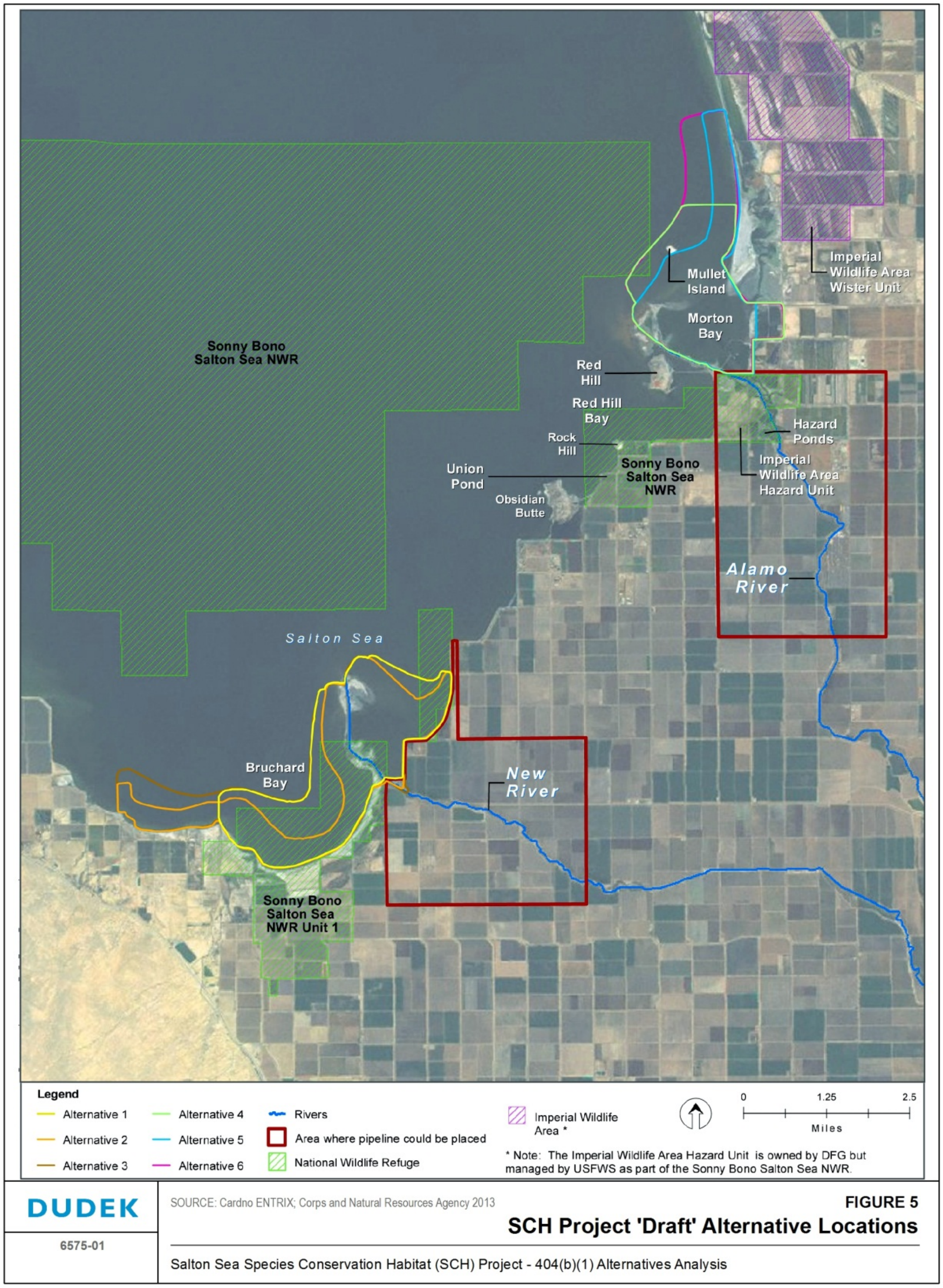


Figure 5 SCH Project Alternative Locations

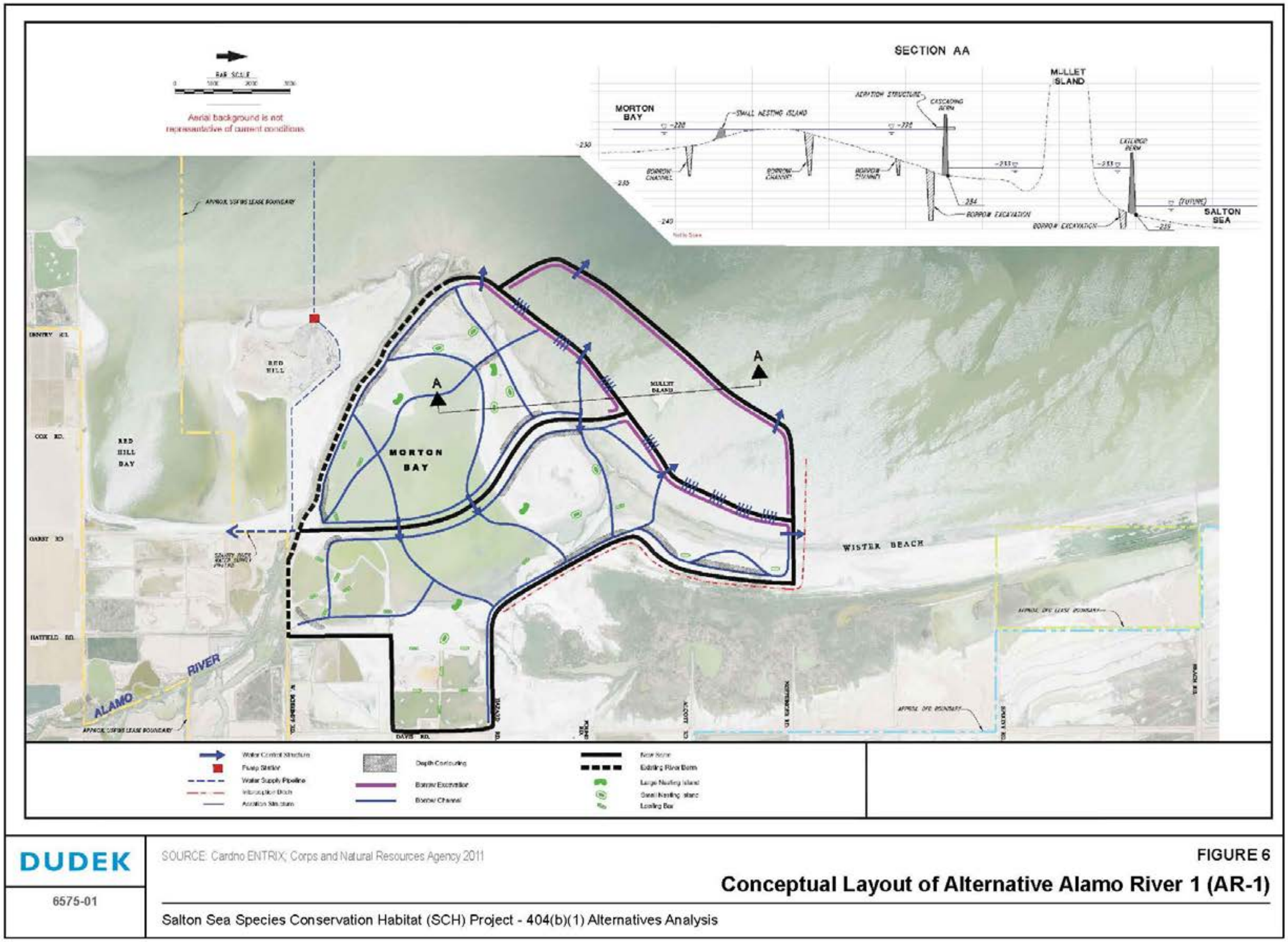


Figure 6 Conceptual Layout of Alternative Alamo River 1 (AR-1)

Logistics Criteria:

1. **Disruption of agricultural drainage systems –** The gravity water supply structure proposed under this alternative would bisect existing farmland that relies on a subterranean tile drain system with the potential to permanently alter drainage patterns. Such alterations could result in a loss of farmland productivity and/or a requirement to ensure adequate drainage across the fields adjacent to the gravity water supply structure through maintenance of various drainage facilities. This alternative is not considered practicable because it would either require substantial land acquisition of agricultural fields adjacent to the Project and potential liability for loss of farmland productivity and/or the ongoing maintenance of drainage facilities to offset potential drainage alterations.

2. **Long-term soil stability –** This site is subject to high geologic activity as evidenced by the presence of mud pots east of the Alamo River in Morton Bay. These conditions may result in the release of carbon dioxide gas that could erode and undermine the berms, causing them to fail. Berms would need to be reconstructed in a different location, thus potentially requiring redesign and reconstruction costs. Based on the criteria for this evaluation, this alternative would not be practicable due to poor long-term soil stability.

Based on the evaluation of logistics criteria, although AR-1 is constructible, it is not considered practicable due to substantially increased potential disruption of agricultural drainage systems and poor long-term soil stability compared with the proposed Project.

2.3.1.2 Alamo River, Pumped Diversion (Alternative AR-2)

Alternative AR-2, identified as Alternative 5 in the EIS/EIR, would construct 2,080 acres of ponds on the northeastern side of the Alamo River (i.e., Morton Bay) (Figure 7). A river diversion would be installed at the SCH pond site and consist of a low-lift pumped diversion. This alternative would include independent pond units only. Alternative AR-2 would consist of the following facilities:

- A low-lift pump station on the Alamo River;
- Saline water pump in the Sea with associated pipeline;
- Sedimentation basin adjacent to the river;
- Independent pond units at Morton Bay and Wister Beach with an interior berm to form individual ponds within the Morton Bay independent pond unit;
- Borrow material from pond excavations including borrow swales to create deeper channels;
- An interception ditch to direct flows from agricultural drains; and
- A tailwater return system.

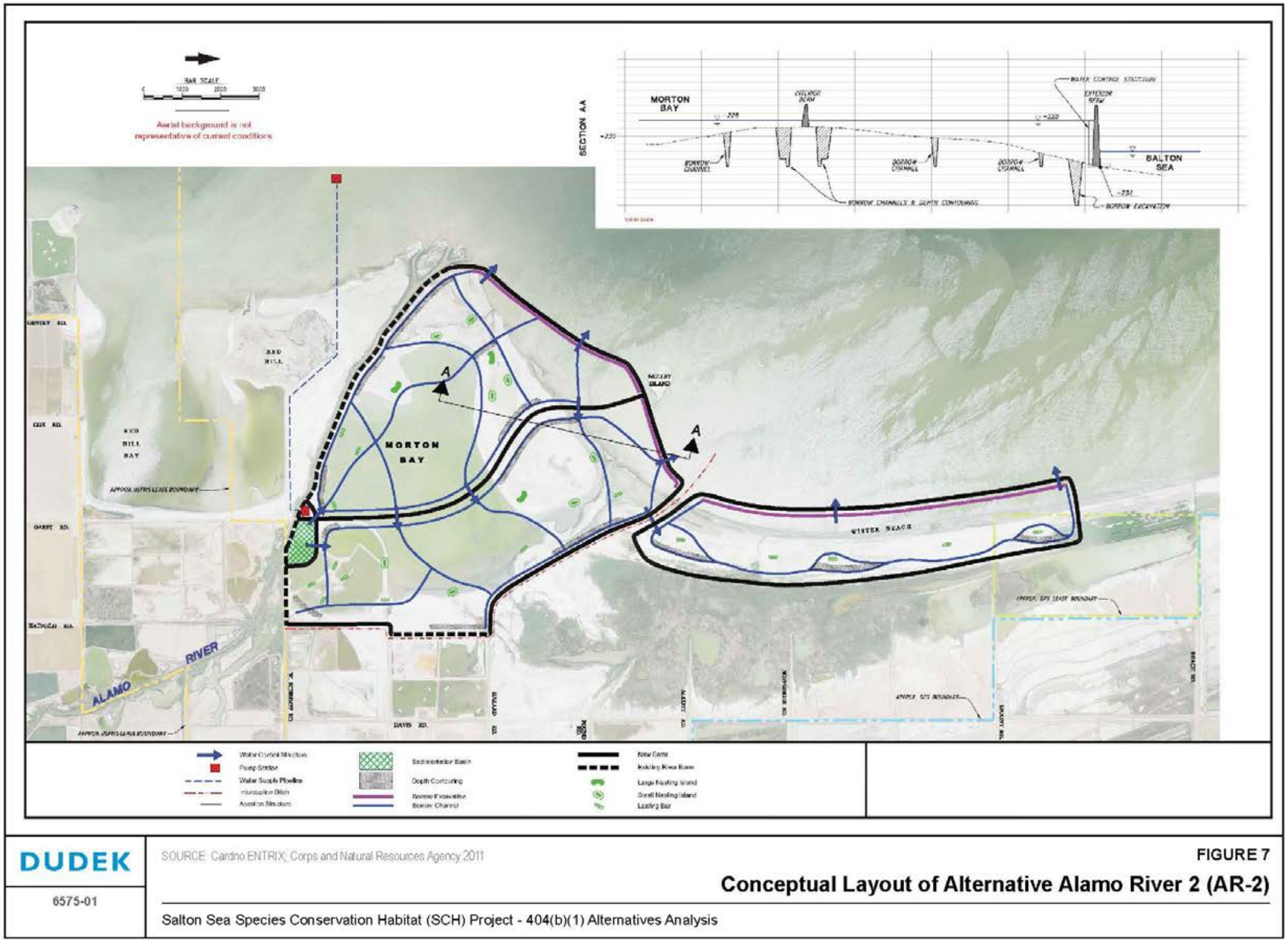


Figure 7 Conceptual Layout of Alternative Alamo River 2 (AR-2)

Overall Project Purpose: This alternative would meet the overall Project purpose.

Cost Criteria: This alternative would require construction costs of $30.9 million, which is 38 percent less than the cost of the proposed Project; therefore, this alternative meets the cost criteria.

Logistics and Constructability Criteria:

1. **Disruption of agricultural drainage systems –** The low-lift pump station water supply structure proposed under this alternative would not require bisecting existing farmland and would therefore have limited potential to permanently alter drainage patterns within agricultural areas. This alternative is therefore considered practicable under this criterion.
2. **Long-term soil stability –** This site is subject to high geologic activity as evidenced by the presence of mud pots east of the Alamo River in Morton Bay. These conditions may result in the release of carbon dioxide gas that could erode and undermine the berms, causing them to fail. Berms would need to be reconstructed in a different location, thus potentially requiring redesign and reconstruction costs. Based on the criteria for this evaluation, this alternative would not be practicable due to poor long-term soil stability.

Based on the evaluation of logistics criteria, although Alternative AR-2 is constructible and would not pose a substantial risk to agricultural drainage systems, it is not considered practicable based on insufficient long-term soil stability.

2.3.1.3 Alamo River Pumped Diversion + Cascading Ponds (Alternative AR-3)

Alternative AR-3, identified as Alternative 6 in the EIS/EIR, would construct 2,940 acres of ponds on the northern side of the Alamo River (Figure 8). A pumped river diversion at the SCH ponds would be included in the Project design, as well as both independent and cascading pond units. Alternative AR-3 would consist of the following facilities:

- A low-lift pump station on the Alamo River;
- Saline water pump at Morton Bay with associated pipeline;
- Sedimentation basin adjacent to the river;
- Independent pond units at Morton Bay and Wister Beach with a cascading pond in each and an interior berm to form individual ponds within the Morton Bay independent pond unit;
- Borrow material from pond excavations including borrow swales to create deeper channels;
- An interception ditch to direct flows from agricultural drains; and
- A tailwater return system.

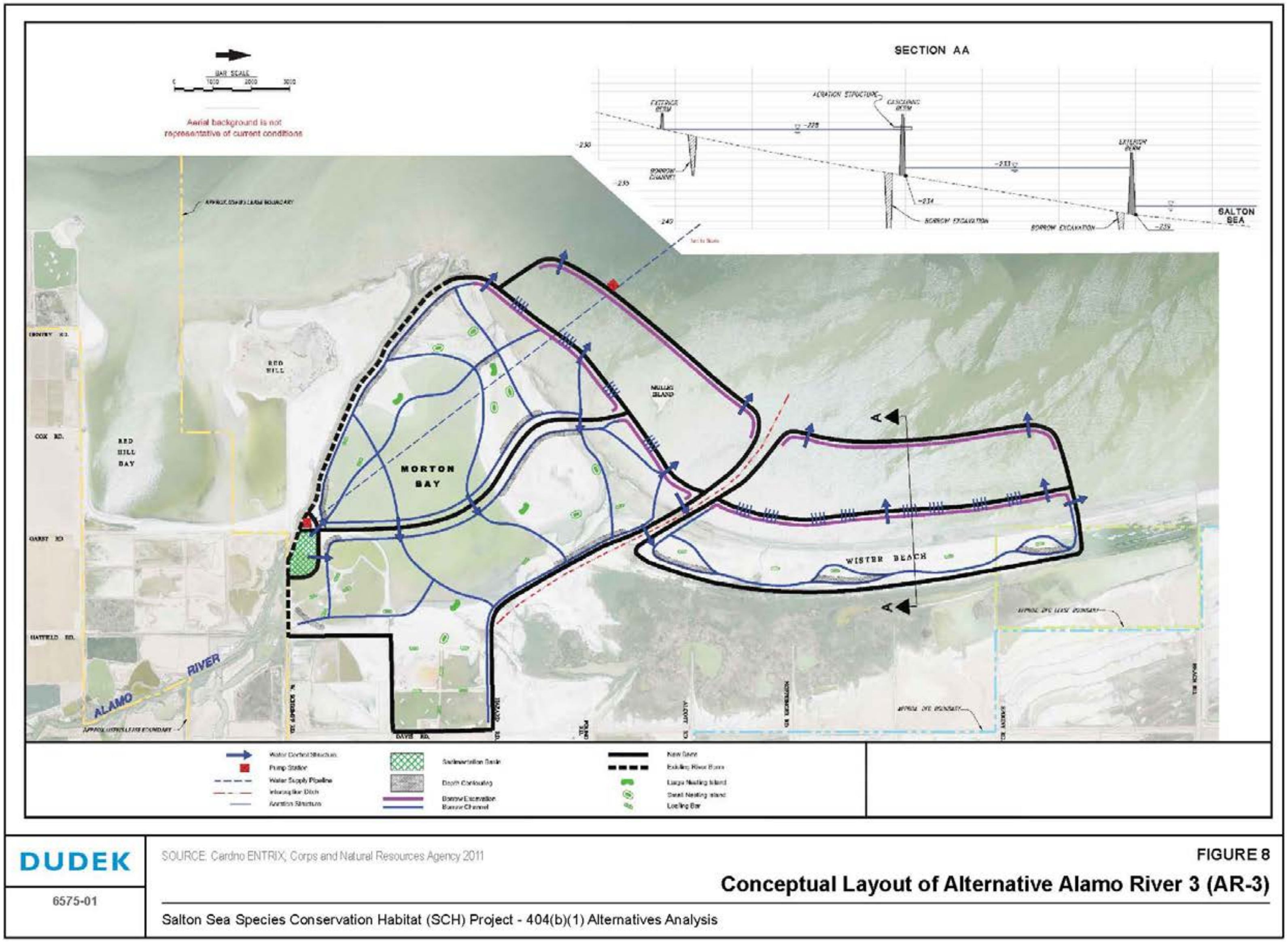


Figure 8 Conceptual Layout of Alternative Alamo River 3 (AR-3)

Overall Project Purpose: This alternative would meet the overall Project purpose.

Cost Criteria: This alternative would require construction costs of $43.5 million, which is 54 percent less than the cost of the proposed Project; therefore, this alternative meets the cost criteria.

Logistics Criteria:

1. **Disruption of agricultural drainage systems –** The low-lift pump station water supply structure proposed under this alternative would not require bisecting existing farmland and would therefore have limited potential to permanently alter drainage patterns within agricultural areas. This alternative is therefore considered practicable under this criterion.

2. **Long-term soil stability –** This site is subject to high geologic activity as evidenced by the presence of mud pots east of the Alamo River in Morton Bay. These conditions may result in the release of carbon dioxide gas that could erode and undermine the berms, causing them to fail. Berms would need to be reconstructed in a different location, thus potentially requiring redesign and reconstruction costs. Based on the criteria for this evaluation, this alternative would not be practicable due to poor long-term soil stability.

Based on the evaluation of logistics and constructability criteria, although Alternative AR-3 is constructible and would not pose a substantial risk to agricultural drainage systems, it is not considered practicable based on poor long-term soil stability.

2.3.2 Practicability of On-Site Alternatives

The following on-site alternatives consider various pond and pump configurations located at the New River outlet to the Salton Sea (Figure 5).

2.3.2.1 New River, Gravity Diversion + Cascading Ponds (Alternative NR-1)

Alternative NR-1, identified as Alternative 1 in the EIS/EIR, would construct a total of 3,130 acres of ponds on both sides of the New River (East New and West New) and would include an upstream gravity diversion of river water and independent and cascading pond units (Figure 9). Alternative NR-1 would consist of the following facilities:

- A lateral structure on the New River to allow gravity flow of brackish water via pipelines to the SCH ponds;
- Saline water pump on a platform in the Salton Sea and associated pressurized pipeline;
- Sedimentation basin (at upstream location) adjacent to the river;

- Independent and cascading pond units;
- Borrow material from pond excavations including borrow swales to create deeper channels;
- An interception ditch to direct flows from agricultural drains; and
- A tailwater return system.

Overall Project Purpose: This alternative would meet the overall Project purpose.

Cost Criteria: This alternative would require construction costs of $73.1 million, which is 90 percent less than the cost of the proposed Project; therefore, this alternative meets the cost criteria.

Logistics Criteria:

1. **Disruption of agricultural drainage systems –** The gravity water supply structure proposed under this alternative would bisect existing farmland that relies on a subterranean tile drain system and has the potential to permanently alter drainage patterns. Such alterations could result in a loss of farmland productivity and/or a requirement to ensure adequate drainage across the fields adjacent to the gravity water supply structure through maintenance of various drainage facilities. This alternative is not considered practicable because it would either require substantial land acquisition of agricultural fields adjacent to the Project and potential liability for loss of farmland productivity and/or the ongoing maintenance of drainage facilities to offset potential drainage alterations.

2. **Long-term soil stability –** The New River SCH sites do not have mud pot geologic features, as found east of the Alamo River in Morton Bay. Therefore, the potential for gas releases to erode and undermine the berms is minimal and the alternative is considered practicable based on a long-term soil stability criteria.

Based on the evaluation of logistics criteria, although Alternative NR-1 is constructible and would not have substantial soil stability issues, it is not considered practicable due to potential disruption of agricultural drainage systems.

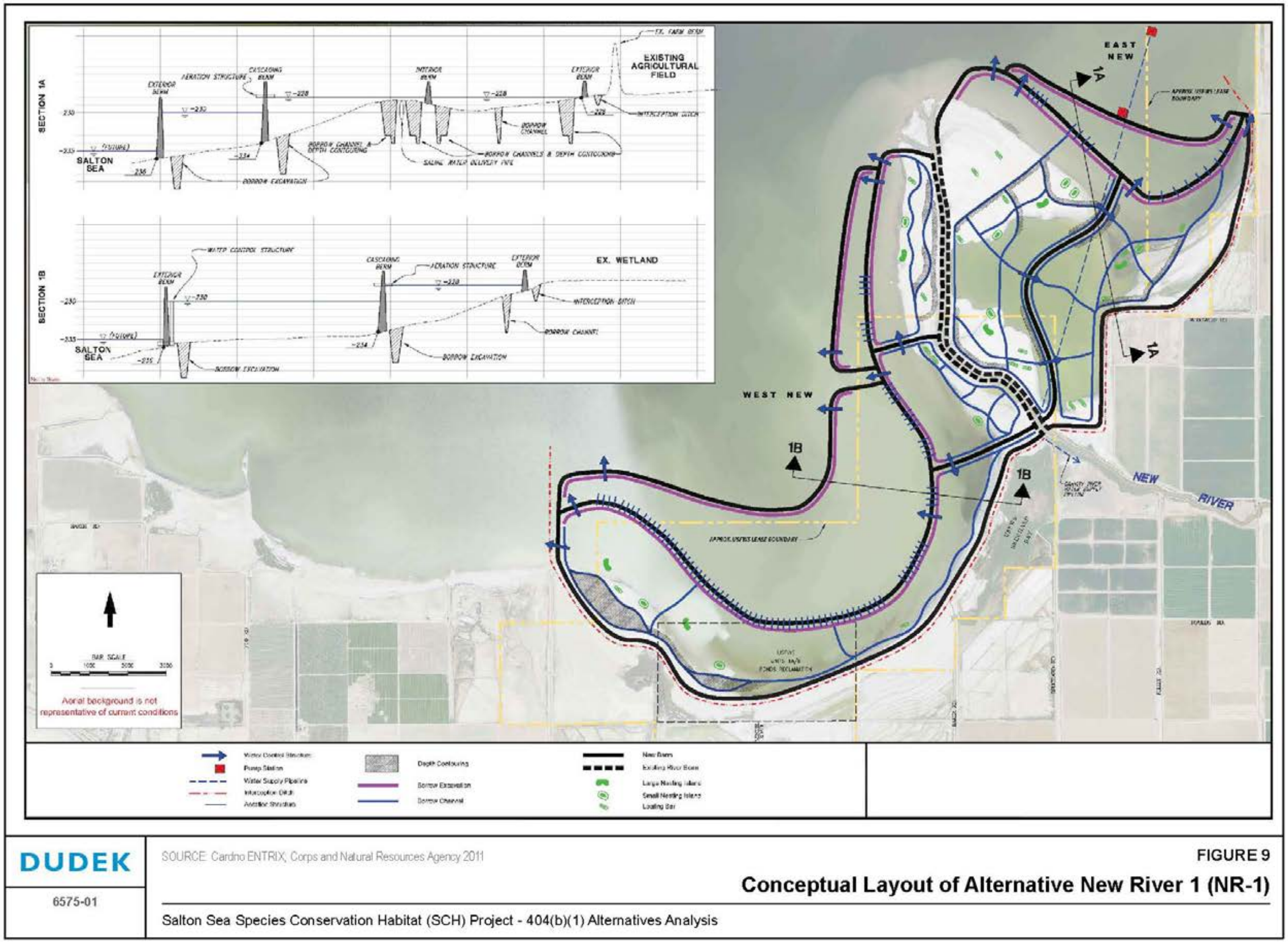


Figure 9 Conceptual Layout of Alternative New River 1 (NR-1)

2.3.2.2 New River, Pumped Diversion (Alternative NR-2)

Alternative NR-2, identified as Alternative 2 in the EIS/EIR, would construct a total of 2,670 acres of ponds on both sides of the New River (East New, West New, and Far West New) and would include pumped river diversion at the SCH ponds and independent ponds (Figure 10). Alternative NR-2 would consist of the following facilities:

- A low-lift pump station on the New River and metal bridge structure to support diversion pipes;
- Saline water pump on a structure in the Salton Sea with associated pressurized pipeline;
- Two sedimentation basins adjacent to the river;
- Several independent pond units;
- Borrow material from pond excavations, including borrow swales to create deeper channels;
- An interception ditch to direct flows from agricultural drains; and
- A tailwater return system.

Overall Project Purpose: This alternative would meet the overall Project purpose.

Cost Criteria: This alternative would require construction costs of $53.7 million, which is 66 percent less than the cost of the proposed Project; therefore, this alternative meets the cost criteria.

Logistics Criteria:

1. **Disruption of agricultural drainage systems –** The low-lift pump station water supply structure proposed under this alternative would not require bisecting existing farmland and would therefore have limited potential to permanently alter drainage patterns within agricultural areas. This alternative is therefore considered practicable under this criterion.

   Long-term soil stability – The New River SCH sites do not have mud pot geologic features, as found east of the Alamo River in Morton Bay. Therefore, the potential for gas releases to erode and undermine the berms is minimal, and the alternative is considered practicable based on a long-term soil stability criterion.

Based on the evaluation of logistics and constructability criteria, Alternative NR-2 is constructible and would not present substantially worsened logistical conditions compared with the proposed Project (i.e., no substantial increase in risk of agricultural drainage system disruption or lack of soil stability). Therefore, this alternative is carried forward to Section 4.0 of this document.

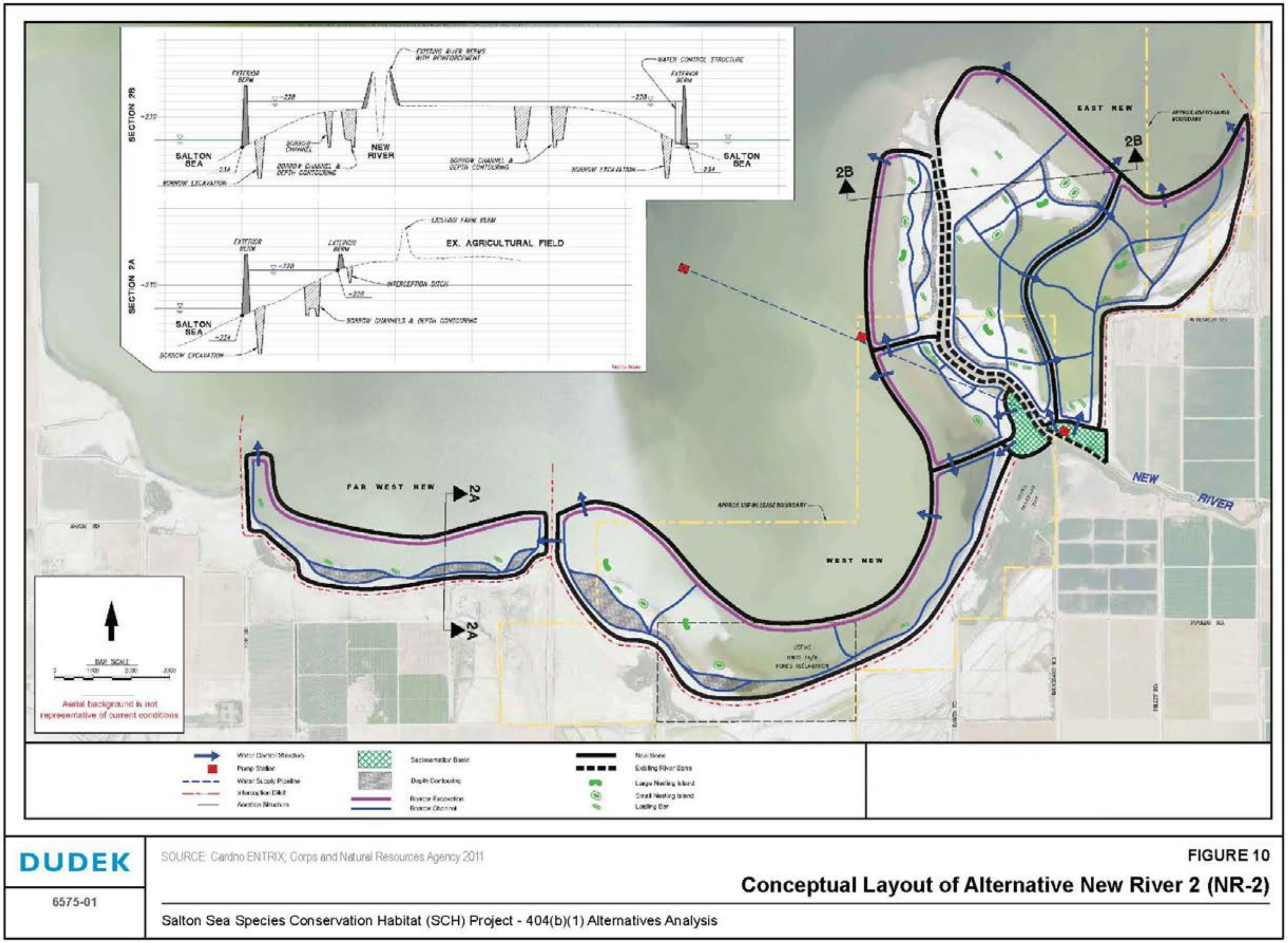


Figure 10 Conceptual Layout of Alternative New River 2 (NR-2)

2.3.2.3 New River Pumped Diversion + Cascading Ponds (Alternative NR-3; Applicant's Proposed Project)

Alternative NR-3, identified as Alternative 3 in the EIS/EIR, would construct up to 3,770 acres of ponds on both sides of the New River (East New, West New, and Far West New) and would include pumped diversion of river water and independent ponds extended to include Far West New and cascading pond units (Figure 3). Alternative NR-3 is the applicant's proposed Project and would consist of the following facilities:

- A low-lift pump station on the New River;
- Saline water pump on a structure in the Salton Sea with associated pressurized pipeline;
- Two sedimentation basins adjacent to the river;
- Several independent pond units with interior berms to form individual ponds and cascading ponds that would drain to the Sea;
- Borrow material from pond excavations including borrow swales to create deeper channels;
- An interception ditch to direct flows from agricultural drains; and
- A tailwater return system.

Overall Project Purpose: This alternative would meet the overall Project purpose.

Cost Criteria: This alternative would require construction costs of $80.9 million. This alternative is the applicant's proposed Project; therefore, it meets the cost criteria.

Logistics and Constructability Criteria:

1. **Disruption of agricultural drainage systems –** The low-lift pump station water supply structure proposed under this alternative would not require bisecting existing farmland and would therefore have limited potential to permanently alter drainage patterns within agricultural areas. This alternative is therefore considered practicable under this criterion.

2. **Soil stability –** The New River SCH sites do not have mud pot geologic features, as found east of the Alamo River in Morton Bay. Therefore, the potential for gas releases to erode and undermine the berms is minimal, and this alternative conforms with this criterion.

Based on the evaluation of logistics and constructability criteria, Alternative NR-3 is constructible and would not present substantial logistical issues with regard to agricultural drainage system disruption or soil stability. Therefore, this alternative is carried forward to Section 4.0 of this document.

2.3.3 Summary of Practicability

Project alternatives were screened for practicability based on achieving the overall Project purpose, cost, and logistics criteria. The logistics criteria consisted of evaluation of the potential for disruption of agricultural drainage systems and long-term soil stability. All Project alternatives would achieve the overall Project purpose and all would meet the cost criteria.

Those Project alternatives that would require gravity diversion of water from the New or Alamo rivers (Alternatives AR-1 and NR-1) are not considered practicable based on the logistics criteria related to potential disruption of agricultural drainage systems.

Of Alternatives AR-2, AR-3, NR-2, and NR-3, those located at the Alamo River are not considered practicable based on the logistics criteria, related to potential long-term soil stability issues due to mud pots located east of the Alamo River in Morton Bay. Table 1 presents a summary of the evaluation of the alternatives to the criteria established.

Alternatives NR-2 and NR-3 are both evaluated in Section 4.0 of this document.

Table 1
Comparison of the Alternatives to the Established Criteria

Alternative	Overall Project Purpose	Cost	Logistics
AR-1	Yes	Yes	No
AR-2	Yes	Yes	No
AR-3	Yes	Yes	No
NR-1	Yes	Yes	No
NR-2	Yes	Yes	Yes
NR-3 (Proposed Project)	Yes	Yes	Yes

3.0 EXISTING CONDITIONS

3.1 General Description

The site of the proposed Salton Sea SCH Project (Alternative NR-3) is located at the southern end of the Salton Sea, near the mouth of the New River, in Imperial County, California (Figures 1 and 2). The Project site is partially located within the Sonny Bono Salton Sea NWR. The SCH Project comprises approximately 4,065 acres, which includes 3,770 acres of pond construction area and 295 acres within six potential staging areas.

The latitude and longitude of the approximate center of the site is 33° 6' 13.8" N and 115° 42' 2.8" W. The Universal Transverse Mercator (UTM) coordinates for the approximate center are UTM Easting (meters) 621230 and UTM Northing (meters) 3663549. The study area lies within the Westmorland West and Obsidian Butte 7.5-minute quadrangles. The SCH Project site is located within Township 12 South, Range 12 East, and Sections 13 and 14, and 23 through 29 as mapped by the U.S. Geologic Survey (USGS).

3.1.1 Jurisdictional Determination

Table 2 shows the jurisdictional waters within the study area.

Table 2
Comparison of the Alternatives to the Established Criteria

Jurisdictional Waters Types	Acres
Lacustrine Non-Wetland Waters	2173
Riverine Non-Wetland Waters	15
Lacustrine Vegetated Wetlands	349
Lacustrine Unvegetated Wetlands	196

3.1.1.1 Non-Wetland Waters

Non-wetland waters include both lacustrine waters, areas below the Ordinary High Water Mark (OHWM) of the Salton Sea, riverine waters, areas below the OHWM of the New River, or one of several agricultural drains within the Project area (Figure 11).

Lacustrine Waters

The physical characteristics normally used to determine OHWM seen at the Salton Sea can be considered unreliable because they are likely relic hydrology indicators left as the Sea continues to recede. Therefore, the OHWM for the Salton Sea and the limits of the lacustrine waters are defined by the recorded high water surface elevation for the most recent period representing "normal circumstances" for purposes of this delineation by excluding records during potential drought periods, per Corps guidance (Corps 1982). Detailed information regarding the determination of the OHWM can be found in the jurisdictional delineation report (Dudek and Chambers 2012). The total lacustrine non-wetland Waters of the U.S. present in the Project area is 2,173 acres (Figure 11).

Figure 11 Jurisdictional Resources

Riverine Waters

The Salton Sea is a traditional navigable water (Corps and Natural Resources Agency 2011), and drainages that were observed within the Project area were evaluated for their connectivity to the Sea. Twenty-five drainages (New River and 24 agricultural drains) were observed within the Project area that channel water in the general direction of and discharge into the Salton Sea. Each drainage exhibited signs of an OHWM, and the OHWM widths ranged from 2 feet up to 30 feet. The drainages contained unvegetated channels within the OHWM, and many had associated wetland vegetation. The drainages receive hydrology primarily from agricultural runoff and receive additional hydrology from direct precipitation and local stormwater runoff. The total riverine non-wetland waters of the U.S. present in the Project area is 15 acres (24,300 linear feet) (Figure 11).

3.1.1.2 Wetlands

Positive indicators for all three wetland parameters (hydrophytic vegetation, hydric soils, and wetland hydrology) were present as patches throughout the Project area. Vegetation was not present throughout the entirety of the wetlands; however, the vegetation that did exist within the wetlands was established with dense areal coverage.

Vegetated Wetlands

Vegetated wetlands are based on observation of current indicators of hydrophytic vegetation, hydric soils, and hydrology (i.e., three criteria per the Corps manual and supplement [Corps 1987, 2008]) during field investigations conducted by Chambers and Dudek. These jurisdictional areas were mapped around several agricultural drain outlets along the Salton Sea shoreline, as well as lands adjacent to the New River. These wetlands are mostly located above the OHWM of the Salton Sea; however, some areas extend below the OHWM. The vegetated wetlands comprise approximately 349 acres of the Project area.

Unvegetated Wetlands

Unvegetated wetlands include a few specific areas that have recent indicators of hydric soils and hydrology (similar to those listed above for vegetated wetlands), but may not support vegetation due to historical or current disturbance, including high salinity. A bay-like area is present north of the New River where a gate control structure has been placed by the USFWS in the north bank of the New River, allowing a drainage to form and water to be conveyed into an area that would otherwise likely be an exposed playa. The lack of hydrophytic vegetation in this area is likely due to high salinity. The extent of unvegetated wetlands in this area was determined through interpretation of a 2012 aerial photograph (Bing Maps 2012). Additional areas along the Salton Sea include exposed playas surrounded by wetland vegetation and proximate to agricultural drains. In the potential staging areas, unvegetated wetlands include a wide drainage ditch and portions of agricultural fields that support hydric soils and are proximate to the New River, thus providing a potential source of hydrology. Unvegetated wetlands occupy 196 acres of the Project area.

3.1.2 Condition of Jurisdictional Resources

3.1.2.1 CRAM

The State of California and Federal agencies that comprise the California Wetlands Monitoring Workgroup[1] are promoting the use of rapid assessment methods as a core tool to evaluate aquatic resource conditions. Dudek evaluated the baseline condition of the SCH Project area in August and November 2011 utilizing the California Rapid Assessment Method (CRAM; Collins et al. 2008), which is the most widely used wetland rapid assessment method in the state (www.cramwetlands.org).

To evaluate the ecological condition of the aquatic resources that would be affected by the proposed Project, Dudek conducted assessments within agricultural drainages leading to the Sea, the New River, and along the southern shoreline of the Salton Sea. A functional assessment was completed using the most recent version of CRAM, version 5.0.2 (Collins et al. 2008). Twelve assessment areas (AAs) were evaluated, including eight riverine and four lacustrine (Figure 12) (Dudek 2012). The eight riverine AAs include four AAs located along the New River and four agricultural drainages. Three wetland classification sub-types as defined in CRAM were identified within the Project area: riverine (confined), riverine (non-confined), and lacustrine.

In general, the CRAM analysis revealed that both the riverine and lacustrine AAs trended toward higher CRAM scores in the buffer and landscape context, medium scores in the hydrology categories, and low to medium scores in the physical structure and biotic structure.

Buffer and Landscape Context: Relative to the other attributes measured by CRAM, the Buffer and Landscape Context scored the highest in both riverine and lacustrine AAs. The riverine AAs scored between 55.9 and 93.4; when agricultural drainages were excluded; scores were between 73.3 and 93.4 for this attribute. The lacustrine AAs scored between 72.9 and 93.4 for buffer and landscape connectivity. In all AAs, buffers were present and there were few or no buffer interruptions (e.g., paved roads, developments) within the 250-meter and 500-meter study areas. The high abundance of non-native vegetation lowered some of the AA scores.

[1] The California Wetlands Monitoring Workgroup is a subcommittee of the California Water Quality Monitoring Council (Senate Bill 1070).

Figure 12 Assessment Areas Overview Map

Hydrology: The agricultural drainages and the New River have distinct hydrologic characteristics, which is the primary reason that the CRAM scores for this attribute have a greater differential than that of the other three attributes. The agricultural drainages function to convey irrigation runoff from the adjacent agricultural fields into the Sea and are primarily unnatural drainage courses. These drainages have fluctuating perennial flow that varies seasonally based on the agricultural activities occurring in the surrounding area. The New River is a natural stream course that has been altered substantially to benefit the surrounding agricultural uses. The New River is bermed along both margins within the Project area to prevent floodwaters from reaching the adjacent lands. The New River is also perennial and fluctuates seasonally, although it carries a substantially larger volume of water compared to the agricultural drainages.

The riverine AAs scored between 50.0 and 83.4 in the Hydrology attribute, with a combined average of 66.7 (average of 56.3 for the New River and 77.1 for the agricultural drainages). The Hydrologic Connectivity metric score was high within the AAs associated with the agricultural drainages, indicating that water that flows through these drainages is able to flow laterally within the floodplain without encountering hillsides, terraces, or other obstructions. The hydrologic connectivity for the New River AAs scored lower because the river is bermed on either side and is therefore confined to the main channel. Both the New River and the agricultural drainages were indicative of channels approaching equilibrium with few indicators of degradation and/or aggradation, although the relatively stable conditions are largely manufactured through periodic management activities (e.g., dredging, berming, and vegetation clearing).

The Hydrology attribute for the lacustrine AAs scored low to moderate. Three of the lacustrine AAs scored 66.7 in the Hydrology attribute while one, LAC-04, scored 75.0. The low scores for this attribute were largely due to low scores for the Water Source metric, which measures the freshwater sources that affect the dry season condition. In the case of the Salton Sea, these water sources are predominantly artificial, resulting in a low metric score. The Hydroperiod (i.e., frequency and duration of inundation) and Hydrologic Connectivity (ability of water to flow into or out of wetlands) metrics had moderate scores. Features that affected the Hydroperiod and Hydrologic Connectivity scores were unnatural filling or inundation and limited lateral movement of floodwaters due to constructed berms and elevated access roads. When compared to the other three attribute scores, the average Hydrology attribute scored the second highest after Buffer and Landscape Context.

Physical Structure: The Physical Structure attribute received the lowest scores of any of the CRAM attributes for both riverine and lacustrine AAs. The riverine AAs scored low in the Physical Structure attribute–between 25.0 and 37.5. Within all of the riverine AAs, the physical structure consisted of a mostly uniform slope with little to moderate micro topography, resulting in relatively low scores for topographic complexity. The lacustrine AAs are on the shore of the

Sea, which is often mostly barren and relatively flat. Consequently, the physical structure characteristics within the lacustrine AAs were minimal (25.0 to 37.5).

Biotic Structure: The vegetation communities associated with the riverine AAs had little biotic structural diversity, either in type and distribution of vegetation communities or in overlap of tall, medium, and short plant layers. Scores for biotic structure ranged between 27.8 and 55.6. The majority of the AAs also were either dominated or co-dominated by non-native vegetation. These features are representative of a highly disturbed ecosystem, which was reflected in the low Biotic Structure attribute scores for both the New River and the agricultural drainages.

The lacustrine AAs are on the shore of the Sea, which is mostly barren, and there are large swaths of the shore that could not be evaluated with CRAM because they did not support at least 5 percent vegetative cover. Scores for biotic structure ranged between 44.5 and 61.2. Within the areas that did have at least 5 percent vegetative cover, the biotic structural diversity was minimal. There was little overlap of plant layers, few vegetation communities/complexes, few dominant species, and the dominant species was often invasive.

The scoring for riverine and lacustrine AAs is summarized in Figures 1 and 2, respectively.

Chart 1
SCH Riverine Final Attribute

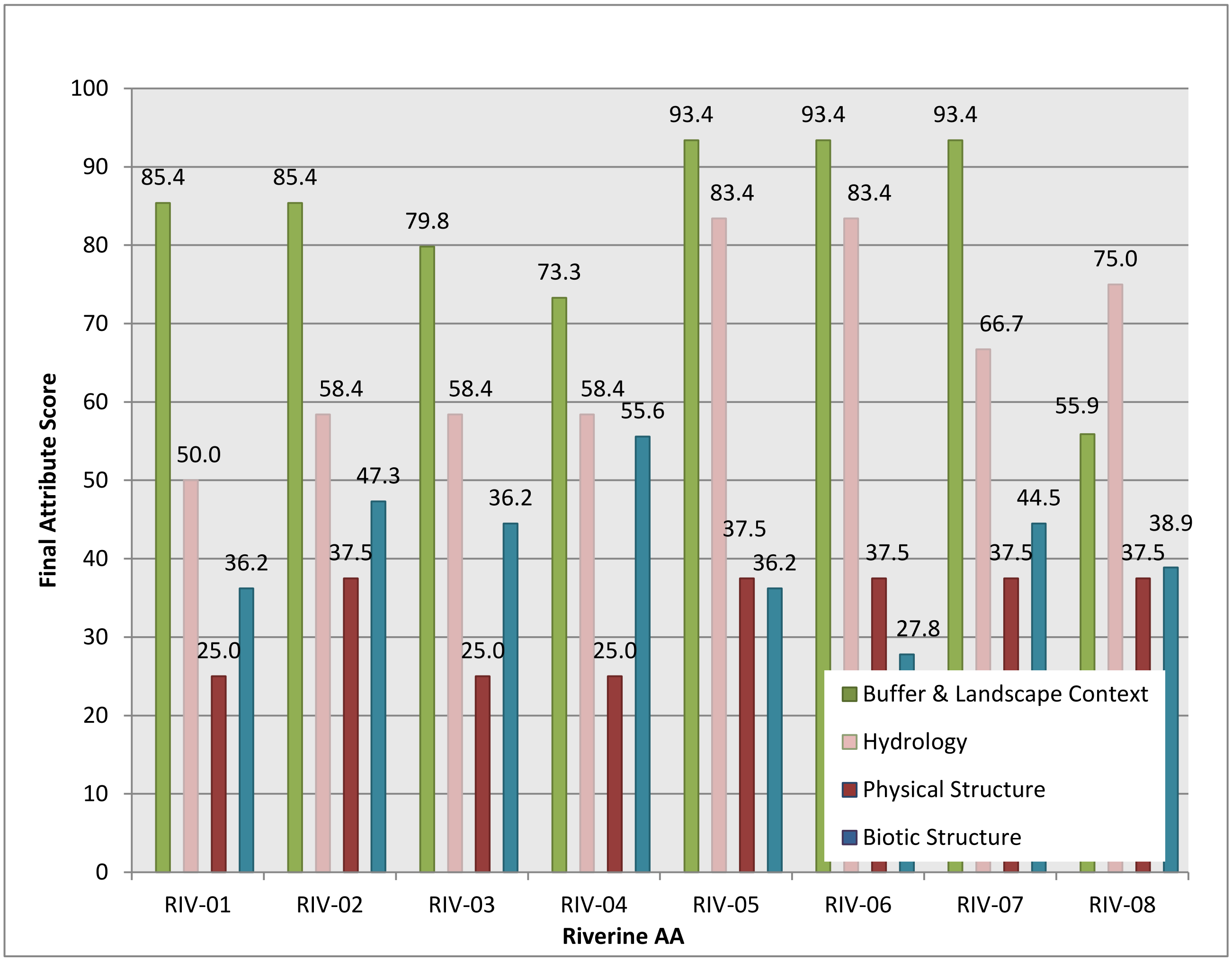
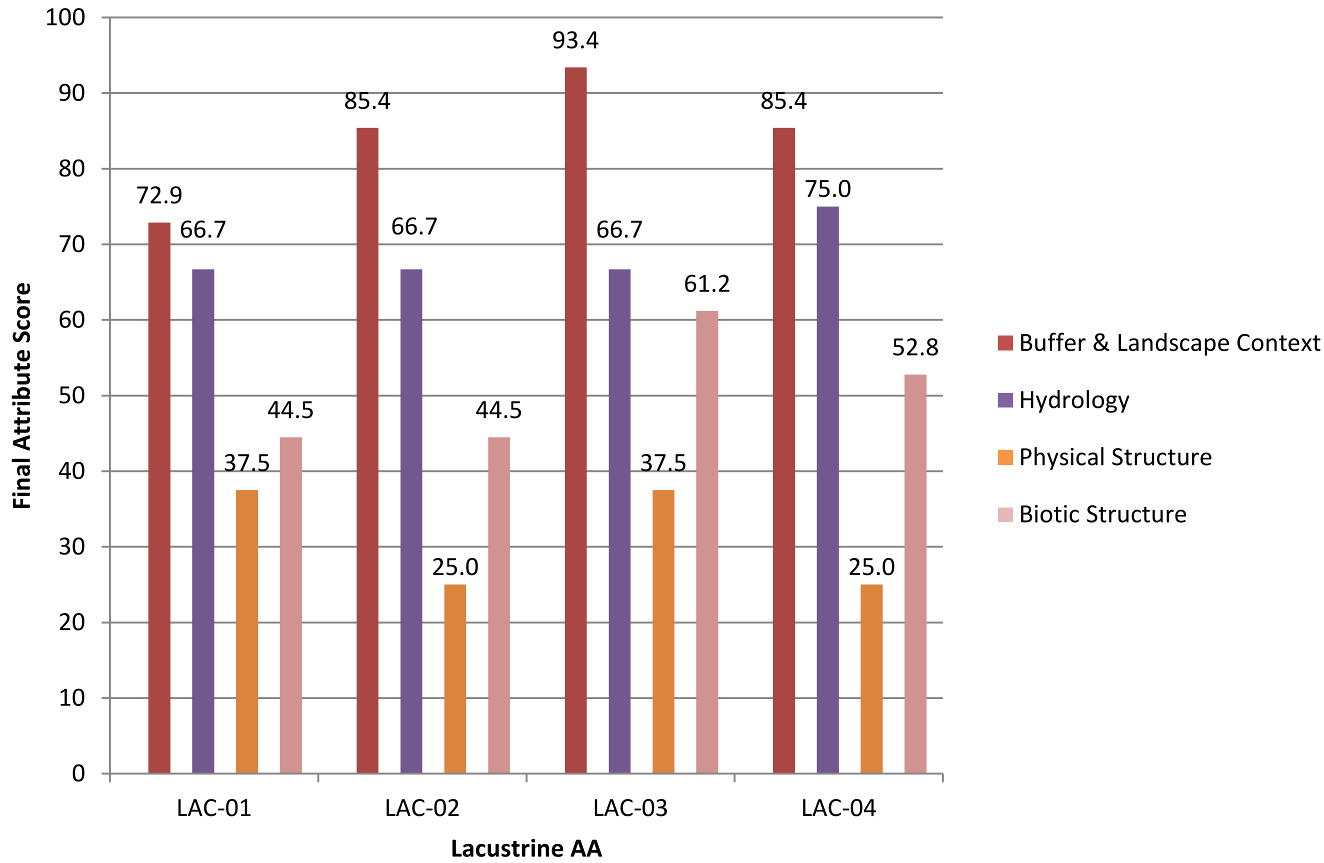


Chart 2
Lacustrine Final Attribute Scores



Upon completion of the proposed SCH Project, the baseline data collected during this assessment would be used as comparative data to evaluate the SCH Project relative to Project goals. While it is anticipated that the future conditions of portions of the proposed Project would be evaluated using CRAM, the functions and services of the baseline condition may not be directly compared to the post-Project conditions because of the substantial reconfiguration of the land to develop the ponds. However, these results can be used to compare post-Project results to current conditions in order to determine changes of the functions and services of the wetlands and waters due to the implementation of the proposed Project.

3.2 Physical and Chemical Characteristics

3.2.1 Physical Substrate Determinations

3.2.1.1 Soil Survey

The U.S. Department of Agriculture Natural Resource Conservation Service (USDA-NRCS) Web Soil Survey indicates 10 soil types within the Project site; the Sea is mapped as water (USDA-NRCS 2012). The soil types include:

- Fluvaquents, saline – These soils are formed on basin floors from alluvium that has been derived from mixed sources (USDA-NRCS 2012). The poorly drained soils are found around the edge of the Salton Sea and are subject to periodic flooding. The stratified lacustrine deposits can range from fine sand to silty clay (Knecht 1980).
- Holtville silty clay, wet – These soils are formed on basin floors from alluvium that has been derived from mixed sources. Holtville soils are well drained with low surface runoff and slow permeability in the upper clay layer (Knecht 1980). The hazard for erosion is slight for this soil type (County of Imperial 2006).
- Imperial silty clay, wet – These soils are slowly permeable, and the water table is located at approximately 10 to 36 inches below the surface. The surface runoff for this soil type is slow, and the erosion hazard is slight (Knecht 1980).
- Imperial-Glenbar silty clay loams, wet, 0 to 2 percent slopes – These soils consist of 40 percent Imperial and Glenbar soils mixed with 20 percent of other minor components. The Glenbar series consists of very deep, well-drained soils that formed in stratified stream alluvium (USDA 2009a). The water capacity for these soils is high to moderate, and both soils are moderately well drained (USDA-NRCS 2012).
- Indio loam, wet – These soils are a composite of alluvium or eolian deposits derived from mixed sources (USDA-NRCS 2012). The Indio series consists of well-drained to moderately well-drained soils. The soils are moderately permeable, and the water table is 3 to 5 feet, or deeper, below the surface (Knecht 1980).
- Indio-Vint complex – Indio soils are described above. The Vint series soils are also a composite of alluvium or eolian deposits derived from mixed sources (USDA-NRCS 2012). These soils are somewhat excessively drained with very slow runoff and moderately rapid permeability (USDA 2009b). The Indio-Vint complex consists of 35 percent Indio soils, 30 percent Vint soils, and 35 percent minor components (USDA-NRCS 2012).

- Meloland very fine sandy loam, wet – This soil series is also a composite of alluvium or eolian deposits derived from mixed sources (USDA-NRCS 2012). These soils are well drained with low to medium surface runoff and slow permeability (USDA 2005).
- Meloland and Holtville loams, wet – This soil series contains 40 percent Holtville soils and 40 percent Meloland soils with 20 percent minor components. These soils are described above.
- Rositas fine sand, wet, 0 to 2 percent slopes – Similar to the soils described above, Rositas soils are a composite of alluvium or eolian deposits derived from mixed sources (USDA-NRCS 2012). These soils are somewhat excessively drained with negligible to low runoff and rapid permeability (USDA 2006).
- Vint loamy very fine sand, wet – These soils are described under the Indio-Vint complex.

3.2.1.2 In-Sea Soils

In-Sea soils are derived from lacustrine (lake) evaporites (deposits) and are summarized below (Natural Resources Agency 2007):

- Sea Floor Deposits – The first layer, Salton Sea Floor Deposits, is composed of recently deposited, very soft to loose, highly plastic clays to silty fine sands. The thickness of this layer ranges from 0 to 21 feet, with the greatest thickness occurring in the southern and mid-Sea areas.
- Soft Lacustrine Deposits – The Soft Lacustrine Deposits were found to underlie the seafloor deposits over much of the Salton Sea's area. These materials consist of highly plastic, soft to very soft clays ranging in thickness from 0 to 26 feet. The thickest deposits were found in the Whitewater River delta and the mid-Sea's easterly area.
- Upper Alluvial Deposits – The Upper Alluvial Deposits are interspaced between the Soft and Stiff Lacustrine Deposits and are predominant near the Salton Sea's perimeter. These deposits are described as composed of loose to dense silty fine sands with interbedded silt and sand lenses ranging in thickness from 0 to 26 feet. The thickest deposits were found in the Salton Sea's northeastern, southwestern, and west-central margins.
- Upper Stiff Lacustrine Deposits – The Upper Stiff Lacustrine Deposits underlying both the Soft Lacustrine and Upper Alluvial Deposits are composed of predominantly stiff to very stiff, highly plastic clays ranging in thickness from 4 to 31 feet. The thickest deposits were found in the mid-Sea's eastern and southeastern areas; the latter is near the Alamo River delta.
- Lower Alluvial Deposits – The Lower Alluvial Deposits are similar to the Upper Alluvial Deposits except that their density is greater, ranging in consistency from medium dense

to dense. These deposits were predominant in the southern Salton Sea, ranging from 0 to 22 feet in thickness.

- Lower Stiff Lacustrine Deposits – The Lower Stiff Lacustrine Deposits likely underlie the entire Salton Sea and have a thickness much greater than 100 feet. This layer is primarily hard plastic clay.

3.2.2 Water Circulation, Fluctuation, and Salinity Determinations

3.2.2.1 Salton Sea

The Salton Sea is located in the Salton Trough, a northern extension of the Colorado River Delta. The Sea's bottom elevation is about 278 feet below msl, and the water surface elevation between October 2010 and September 2011 (the most recent water year for which USGS has published data [2011 water year]) was between -231.0 and -232.0 feet msl (USGS 2011). The Sea's total volume is approximately 7.2 million af, with a current maximum depth of 46 feet. With about 350 square miles of surface area, the Salton Sea is the largest water body in California. It measures about 35 miles along a northwest/southeast axis by about 15 miles at its widest point. The total shoreline measures about 120 miles (Natural Resources Agency 2007).

The Salton Sea is a terminal water body that receives water from the New, Alamo, and Whitewater rivers, along with numerous small streams, precipitation, and groundwater. The only outflow from the Sea is through evaporation and seepage. Formed in 1905 through 1907 from Colorado River flood flows, the current Salton Sea is supported primarily by agricultural return flows. These return flows have decreased in recent time because of several factors, including reduction in water orders from farmers during the last 10 years, reduced flows from Mexico, and lower precipitation, all of which have also contributed to the decline in flows in the New and Alamo rivers. Recent Salton Sea elevations show the elevation peak around May 1995 and a decreasing trend to the end of the 2011 water year (i.e., from October 2010 to September 2011). Inflow to the Sea from the Imperial Valley is projected to continue to decline, mainly due to decreased volume of agricultural runoff, from the current annual average of 1,029,620 acre-feet per year (afy) to 723,940 afy (with adjustment for the Quantification Settlement Agreement) by 2020 (Natural Resources Agency 2007). The combined inflow from Imperial Valley and Mexico to the Salton Sea represents about 86.3 percent of the total inflow to the Sea. Coachella Valley accounts for 8.5 percent of the total inflow to the Sea. The total salt loading to the Sea from these sources is 92.6 and 5.8 percent, respectively (Natural Resources Agency 2007). Figure 3.11-3 of Section 3.11, Hydrology and Water Quality, in the Draft EIS/EIR (Corps and Natural Resources Agency 2011) shows the relative magnitude of annual flow to the Sea from the three major tributaries .

Wastewater discharges enter the Salton Sea from numerous municipal wastewater systems in Imperial and Coachella valleys. Wastewater effluent is discharged to the New River, Alamo

River, or Coachella Valley Stormwater Channel and eventually flows to the Sea. In the future, wastewater effluent is expected to decline as more water is recycled and overall municipal wastewater flows decrease because of water conservation measures.

3.2.2.2 New River

The New River originates in the Mexicali Valley of northern Mexico and terminates where it flows into the Salton Sea. It receives runoff from several sources, primarily agricultural drainage conveyed to the river by subsurface drains, as well as wastewater treatment plant flows. The New River watershed is predominantly at or below sea level. Rainfall in Imperial Valley is less than 2 inches annually, but the New River receives up to 10 inches each year in the southwestern portion of the watershed located in northern Mexico (Hely and Peck 1964).

The New River flow is measured at a gage near Westmorland (USGS gage #10255550) and at the international boundary with Mexico (USGS gage #10254970). The annual flow (based on water year) for water years 1944 through 2010 at the Westmorland gage has ranged from 360,459 to 536,100 af, with an average of 443,272 af. Both IID and USGS measured the New River flow independently before March 2005. Since that time, both agencies have cooperatively collected streamflow data for the river. Daily flow data at the USGS stream flow gage near Westmorland indicate that the flows from 1944 to date show a median flow for each month that ranged from 521 cubic feet per second (cfs) (December) to 732 cfs (April). The 90 percentile flow (90 percent of all flows are greater) is 423 cfs (December) while the minimum 10 percentile flow (only 10 percent of flow is greater) is 848 cfs (April) (Table 3). The range in any month between the 10 and 90 percentile ranges from 200 to 240 cfs. The Westmorland gage provides data rated “Good” for 74 percent of its history.

3.2.2.3 Agricultural Drains/Natural Watercourses

IID is the agricultural water purveyor in Imperial Valley, providing water from the Colorado River through the All American Canal. IID receives and delivers about 90 percent of the 3.2 million af of irrigation water delivered from the Colorado River (LLNL 2008). IID also provides a network of drainage channels that receive water from on-farm subsurface drainage systems. Detailed information regarding the drainage network is shown on Figure 3.11-6 in Section 3.11 of the Draft EIS/EIR (Corps and Natural Resources Agency 2011). This drainage water is then conveyed to the New River, Alamo River, or directly to the Salton Sea. Agricultural drainage from Imperial Valley directly to the Sea comprises about 10 percent of total Imperial Valley contribution to the Sea’s inflow, which is estimated at 93,848 afy (Natural Resources Agency 2007).

Within Alternative NR-3, 24 agricultural drainages are classified as ephemeral waterways, have demonstrated signs of an OHWM, and have contained, unvegetated bottoms. Many of the drainages discharge directly into the Salton Sea. Seven drainages are used for agricultural purposes and are concrete-lined; however, those drainages demonstrated a definable OHWM and are hydrologically connected to drainages that discharge directly into the Salton Sea. The 24 drainages directed both seasonal stormwater runoff and agricultural runoff directly to the Sea (Chambers Group, Inc. 2012).

Table 3
Statistical Representation of Mean Daily Stream Flow

New River (cfs)			
Month	*90%*	*Median*	*10%*
October	517	620	756
November	445	540	687
December	423	521	661
January	436	535	669
February	481	582	708
March	559	678	811
April	607	732	848
May	554	659	786
June	487	589	688
July	483	586	698
August	481	590	714
September	494	594	729

Source: USGS 2010

3.2.2.4 Flooding

The Project area was defined by the Federal Emergency Management Agency (FEMA) in 1984 as a special flood hazard area. The New and Alamo rivers, along with the land between both rivers within 4.5 miles of the Salton Sea, are listed as Zone A.

The Zone A delineation refers to flood boundaries that are set using approximate methods (an estimation of the flood boundary) rather than a detailed hydraulic model. Therefore, the depth of flooding is not presented on the flood maps but is assumed to be less than 1 foot (typically how Zone A is represented). The area where the proposed SCH ponds would be located is shown on the flood map as within the Sea's inundation area. That is, it is not in the flood hazard area because it is part of the Sea.

3.2.2.5 Salinity

The Colorado River Basin Regional Water Quality Control Board's (CRBRWQCB's) (2006) water quality objective for total dissolved solids (salinity) at the Salton Sea is to stabilize salinity at 35,000 milligrams per liter (mg/L) or 35 ppt. Average salinity in the Sea in 2010 was 51,829 mg/L (approximately 52 ppt) (C. Holdren, Reclamation, unpublished data). Between about 2004 and 2007, average salinity in the Sea increased by approximately 13.1 percent. Lower salinity conditions frequently occur near the tributaries and near the Sea's shoreline due to dilution by inflows. Higher salinity generally occurs in the Sea's center. Imported Colorado River water is the primary source of salts in the Sea's watershed. It is used to irrigate fields, and the salts in the water are carried off by tailwater or tilewater into surface drains. Imperial Valley contributes a greater salt load to the Sea than does the Coachella Valley (Natural Resources Agency 2007).

The New River has an average salinity of 2,636 mg/L (C. Holdren, Reclamation, unpublished data). Between about 2004 and 2007, average salinity in the New River increased by approximately 23.6 percent. Although salinity is increasing in the New River, salinities are still below the CRBRWQCB's (2006) water quality objective of 4,000 mg/L for total dissolved solids (salinity) (Corps and Natural Resources Agency 2011).

3.2.3 Suspended Particulate/Turbidity Determinations

Sediment loading to the Salton Sea comes from the New, Alamo, and Whitewater rivers, numerous natural watercourses that flow into the Sea, and also the individual drains and canals that directly enter the Sea. Total suspended solids, a measure of the sediment load, have been measured in the New River. These data indicate that the total suspended solids for the New River average 217 mg/L (Corps and Natural Resources Agency 2011). Assuming an average annual New River flow of 845 cfs, then the annual sediment loading to the Sea is 132,000 tons/year for the New River (Corps and Natural Resources Agency 2011).

3.2.4 Contaminant Determinations

The CRBRWQCB Water Quality Control Plan (2006) provides general surface water quality objectives for the Colorado River Basin Region. These water quality objectives are compared below, by constituent of concern, to seasonal water quality data collected by the U.S. Bureau of Reclamation (Reclamation) in the Salton Sea and its tributaries in 2004 through 2010 (C. Holdren, Reclamation, unpublished data) (Table 4).

Table 4
Comparison of Water Quality Objectives with Current Conditions (2004-2010 Mean Annual)

Current Conditions			
Constituent	*Objective*	*Salton Sea*	*New River*
Suspended solids (mg/L)	—	39	217
Total dissolved solids (salinity) (mg/L or ppt)	35 ppt (Sea) 4 ppt (Rivers)	51,829 mg/L 52 ppt in 2010	2,636 mg/L 2.6 ppt
Nitrate and nitrites (NO_3/NO_2) (µg/L)	—	209	4,142
Ammonia (NH_3) (µg/L)	—	1,157	1,750
Total phosphorus (µg/L)	35 (Sea)	103	976
Orthophosphate (µg/L)	—	42	536
Selenium (µg/L)	5 (Sea)	1.34	3.18
Dissolved oxygen (mg/L)	5 (New River)	—	3.2–11.5

Source: C. Holdren, Reclamation, unpublished data
Note: Objectives from CRBRWQCB 2006

3.2.4.1 Selenium

Selenium is present in the water, sediment, and biota of the Salton Sea. Most of the selenium entering the Salton Sea originally comes from the upper Colorado River in water used to irrigate agricultural fields in the Imperial and Coachella valleys. Selenium becomes concentrated by agricultural usage and is discharged from subsurface tile drains into surface drains that flow into the Sea either directly or via tributaries (Saiki et al. 2010). Selenium concentrations in agricultural drains vary widely (0.79 to 79.1 micrograms/liter [µg/L]), averaging 4.18 µg/L in selected IID drains monitored in 2005 through 2009 (Saiki et al. 2010). Total selenium concentration was 3.2 µg/L in the New River in 2004 through 2010 (C. Holdren, Reclamation, unpublished data) (Table 4). Future scenarios modeled in the *Salton Sea Ecosystem Restoration Program Programmatic Environmental Impact Report* suggested that selenium in the New River will not exceed 10 µg/L by 2075 (Natural Resources Agency 2007).

Selenium enters the Salton Sea as highly soluble salt (primarily as selenate and selenite) and accumulates in the anoxic sediments on the Salton Sea floor (Natural Resources Agency 2007). Waterborne concentrations are rapidly reduced to less than 2 µg/L as selenium assimilates into biota and settles as part of the organically rich sediments. The anoxic nature of the Sea sediments is important in trapping the selenium in insoluble, non-bioavailable forms of selenite, elemental selenium, and selenide. The CRBRWQCB's (2006) water quality objective for selenium is 5 μg/L (4-day average).

Selenium concentrations in sediment were measured in 2010 at proposed Project sites adjacent to the mouths of the New and Alamo rivers. Mean selenium concentrations were 1.1 milligrams per kilogram (mg/kg) (range 0.54 to 2.3 mg/kg). The majority of sediment samples (63 percent) were less than 1 mg/kg of selenium and are considered "low risk." The remaining 37 percent of the samples were between 1 and 4 mg/kg (only two samples exceeded 2.5 mg/kg) and were considered in the "level of concern" category. No sample exceeded the "toxicity threshold" value of 4 mg/kg (Amrhein and Smith 2011). The sediment threshold categories "low risk," "level of concern," and "toxicity threshold" are derived from the National Irrigation Water Quality Program's (NIWQP's) *Guidelines for Interpretation of the Biological Effects of Selected Constituents in Biota, Water, and Sediment: Selenium* (1998). According to these guidelines, "low risk" or "no effect" concentrations of selenium, less than 1 mg/kg, produce no discernible adverse effects on fish or wildlife and are typical of background concentrations in uncontaminated environments. "Level of concern" concentrations, between 1 and 4 mg/kg of selenium, rarely produce discernible adverse effects but are elevated above typical background concentrations. Selenium concentrations of 4 mg/kg or greater, "toxicity threshold," appear to produce adverse effects on some fish and wildlife species (NIWQP 1998).

Oxidized selenium is present in the exposed playa sediments, and rewetting the sediments could result in a "flush" of selenium released into the pond water (Natural Resources Agency 2007; Amrhein et al. 2011). An experiment measured water-soluble selenium released from wetted sediment samples taken from the SCH Project area and incubated up to 235 days with low-salinity water (2 ppt and 13.7 ppt) (Amrhein et al. 2011; see also Appendix I of the Draft EIS/EIR [Corps and Natural Resources Agency 2011]). Sediment selenium concentrations were positively related to organic carbon, but the oxidation rates and amount released into water did not appear to be affected by carbon content, salinity, location, or depth of sample core. Rather, the release of selenium appeared controlled by the amount of oxidizable iron present in sediments. If iron was present, the oxidized selenium adsorbed onto the iron and remained in the sediment, and less selenium dissolved into pond water.

3.2.4.2 Temperature

The CRBRWQCB's (2006) water quality objective for temperature is that the receiving water's temperature should not be altered by waste discharges unless demonstrated that the temperature alteration does not adversely affect the receiving water's designated beneficial use. Water temperature was monitored at three sampling sites toward deep areas of the Sea in 1999 (Holdren and Montaño 2002, cited in Natural Resources Agency 2007) and 2004 through 2010 (C. Holdren, Reclamation, unpublished data). The Sea's water surface temperatures ranged from a low of 12.8 degrees Celsius (˚C) (55.1 degrees Fahrenheit [˚F]) in February

2009 to a high of 36.5˚C (97.7˚F) in August 1999 (C. Holdren, Reclamation, unpublished data; Holdren and Montaño 2002). The Salton Sea is a polymictic lake (a lake having no stable thermal stratification), which can stratify and mix many times during the year.

In the New River, water surface temperature was measured quarterly from 2004 through 2010. Temperatures were lowest in February 2009 (11.7˚C [53.1˚F]) and highest in July 2006 (31.1˚C [88.0˚F]) (C. Holdren, Reclamation, unpublished data).

3.2.4.3 Dissolved Oxygen

Dissolved oxygen is of particular concern at the Salton Sea because it is essential to support survival of fish and other aquatic organisms. Surface water (technically referred to as the epilimnion or epilimnetic water) is often supersaturated with respect to dissolved oxygen for several months during daylight hours, while water at the Sea's bottom near the seabed (also referred to as the hypolimnion or hypolimnetic water) is virtually devoid of dissolved oxygen (Holdren and Montaño 2002, cited in Natural Resources Agency 2007; Anderson and Amrhein 2003, cited in Natural Resources Agency 2007). Dissolved oxygen supersaturation is often caused by photosynthetic production of oxygen during the daytime. Dissolved oxygen concentrations are a function of the geometry of the water body, wind fields, algal production, and biological and chemical oxygen demand in the water body (Natural Resources Agency 2007).

Thermal stratification leads to accumulation of chemically reduced compounds in the hypolimnion. The anaerobic microbial decomposition of organic matter in an anoxic hypolimnion produces hydrogen sulfide and ammonia, constituents that are toxic to most aquatic life. When wind action mixes hypolimnetic and surface waters and breaks down stratification, these toxic components are distributed throughout the water column and deplete dissolved oxygen. These mixing events have been linked with massive fish kills (Schladow 2004, cited in Natural Resources Agency 2007), which are observed during all seasons, including some that result from low water temperatures.

A dissolved oxygen concentration of about 4 to 5 mg/L is generally considered necessary for most aquatic species. Tilapia can tolerate infrequent very low dissolved oxygen concentrations, generally less than 2 mg/L (FAO 1986, cited in Natural Resources Agency 2007) and briefly 1 mg/L (personal communication, K. Fitzsimmons 2010). The CRBRWQCB's (2006) water quality objective for dissolved oxygen of all designated "warm freshwater habitat (WARM)" surface waters within the Colorado River Basin states that dissolved oxygen should not be reduced below the minimum level of 5 mg/L. In addition, the CRBRWQCB's (2010a) total maximum daily load for dissolved oxygen in the New River is 5 mg/L.

Vertical profiles of dissolved oxygen were measured in the Salton Sea 1999 (Holdren and Montaño 2002, cited in Natural Resources Agency 2007) and 2004 through 2010 (C. Holdren, Reclamation, unpublished data). Dissolved oxygen ranged from 20.6 mg/L and greater than 370 percent saturation in the surface water to 0 in the bottom water. A period of severe dissolved oxygen depletion during August and September 1999 (0.21 mg/L as surface dissolved oxygen on September 8, 1999) coincided with extensive fish kills (Holdren and Montaño 2002, cited in Natural Resources Agency 2007).

In the New River, dissolved oxygen ranged from 11.5 mg/L in November 2008 to a low of 3.2 mg/L in July 2006 (C. Holdren, Reclamation, unpublished data).

3.2.4.4 Nutrients

The Salton Sea is a eutrophic to hypereutrophic water body characterized by high nutrient concentrations, high algal biomass as demonstrated by high chlorophyll a concentrations, high fish productivity, low clarity, frequent very low dissolved oxygen concentrations, massive fish kills, and noxious odors (Setmire 2000, cited in Natural Resources Agency 2007). The eutrophic conditions appear to be controlled (i.e., limited) by phosphorus. In addition, nutrients can stimulate the overproduction of algae, which can lead to low dissolved oxygen and the production of hydrogen sulfide (Natural Resources Agency 2007).

Phosphorus

Phosphorus is an essential nutrient for plant and algal growth. Setmire et al. (2001, cited in Natural Resources Agency 2007) identified phosphorus as the limiting nutrient at the Salton Sea, and others (Holdren and Montaño 2002, cited in Natural Resources Agency 2007; Schladow 2004, cited in Natural Resources Agency 2007) have supported this conclusion. Phosphorus is present in water bodies in many forms, including soluble and particulate organic phosphates from algae and other organisms, inorganic particulate phosphorus, polyphosphates, and soluble orthophosphates. Soluble orthophosphate is assimilated by phytoplankton and therefore is an important indicator of productivity and quality. Total phosphorus is another indicator of the maximum level of productivity of a water body (Natural Resources Agency 2007). Eutrophic lakes are typically associated with total phosphorus concentrations of 16 to 386 µg/L, which is very productive for warm water fisheries.

In the Salton Sea, levels of soluble orthophosphates during 2004 to 2010 were lowest during the spring and summer months and highest during the winter months, correlating with typical seasonal algal growth patterns. Total phosphorus concentrations were lowest in the spring and summer months and highest in the fall and winter months, with peak concentrations as high as 756 µg/L (C. Holdren, Reclamation, unpublished data). The Sea's concentration of phosphorus was nearly the same in 1968/69 as in 1999 despite a 100 percent increase in external phosphorus loading (Setmire et al. 2001, cited in Natural Resources Agency 2007), which indicates an effective phosphorus removal mechanism in the Salton Sea. The annual average total phosphorus concentration for 2004 to 2010 was 103 µg/L (C. Holdren, Reclamation, unpublished data), which exceeds the draft total maximum daily load target of 35 µg/L (CRBRWQCB 2006).

In the New River from 2004 to 2010, average levels of soluble orthophosphates were 536 µg/L (Table 4) (C. Holdren, Reclamation, unpublished data). Similar to the Salton Sea, during the summer months levels of soluble orthophosphates and total phosphorus were lowest. Total phosphorus concentrations were highest during the fall months at the New River. Average annual concentrations of total phosphorus were 976 µg/L (C. Holdren, Reclamation, unpublished data).

Nitrogen

Nitrogen is present in water bodies in several forms. Ammonia is the form most readily used by phytoplankton and is typically found in water with low oxygen concentrations. Bacteria can break ammonia down to form nitrite, which, in turn, is converted to nitrate. Nitrate is commonly found in surface water. Nitrogen in the inflows to the Salton Sea is primarily in nitrate-nitrite form. Nitrate-nitrite levels in the rivers were approximately 20 to 30 times greater than in the Sea (Table 4) (C. Holdren, Reclamation, unpublished data).

Most of the nitrogen in the Salton Sea consists of ammonia and organic nitrogen. High levels of ammonia indicate frequent reducing conditions in the Sea and contribute to anoxia and fish kills. The annual mean concentration of ammonia for 2004 through 2010 was 1,157 µg/L in the Sea and 1,750 µg/L in New River (Table 4) (C. Holdren, Reclamation, unpublished data).

3.2.4.5 Pesticides and other Contaminants

The New River is highly polluted from agricultural runoff, sewage from Mexico, and discharges from manufacturing plants in Mexico, and it is listed as impaired under section 303(d) of the Clean Water Act for a wide range of pollutants (EPA 2012). Causes of impairment for the New River include, but are not limited to, the following: trimethylbenzene, chlordane, chloroform, chlorpyifos, copper, dichlorodiphenyltrichloroethane (DDT), diazinon, dieldrin, mercury, meta-para xylenes, nutrients, organic enrichment, pesticides, and selenium. Pollutants in the New River flow into the Salton Sea and contribute to impairment of the Sea for nutrients, salinity, and selenium.

A large percentage of the water the Salton Sea receives is from agricultural runoff, which contains numerous pesticides and heavy metals at levels that can be toxic to aquatic organisms (de Vlaming et al. 2004 and Phillips et al. 2007, cited in Wang et al. 2011). Concentrations of pesticides in sediments and water correlate with their seasonal usage in the adjacent agricultural areas (LeBlanc and Kuivila 2008, cited in Wang et al. 2011). Concentrations were highest near the shoreline and mouth of inflowing rivers, but levels dropped below detection off shore.

In 2010, levels of chlorinated insecticides and pyrethroids were measured in water of the New River and in the bed sediments at potential SCH pond sites (Wang et al. 2011; see also Appendix J, Summary of Special Studies, in the EIS/EIR [Corps and Natural Resources Agency 2011]). In the water (four samples), most organochlorine pesticides were <1.5 nanograms per liter (ng/L) or were not detected. Chlorpyrifos was the most frequently detected, but only one sample at the New River (80 ng/L) exceeded the DFW Hazardous Assessment Criteria (14 ng/L 4-day average) (Siepmann and Finlayson 2000, cited in CRBRWQCB 2008). Of pyrethroids, permethrin (3.3 to 7.5 ng/L) was the most commonly detected, and fenpropathrin (New River, 11.6 ng/L) was detected once at elevated levels.

Sediment concentrations of pesticides were also measured in 2010 at exposed playa and submerged sites (Wang et al. 2011). Samples were taken at three depths (0 to 5 centimeters [cm], 5 to 15 cm, and 15 to 30 cm deep) in order to discriminate potential differences in deposition of legacy (i.e., organochlorines) and current-use pesticides. Total sediment pesticide concentrations detected ranged from 0.2 to 120 nanograms per gram [ng/g]. Sediment pesticide concentrations, particularly organochlorines, were greatest at the mouth of the New River. DDT and its metabolites were detected in all samples, and dichlorodiphenyldichloroethylene (DDE) was the predominant pesticide residue. In general, the concentrations of organochlorine pesticides were higher in the 5 to 30 cm depth interval than in the 0 to 5 cm depth interval (more recent deposition). This correlation equates with the banning of most organochlorine pesticides, including DDT, in the U.S. in the 1970s. Mean DDE concentrations at the New River were 1.14 to 6.52 ng/g at the surface (0 to 5 cm deep) and 0.89 to 9.10 ng/g subsurface (5 to 15 cm and 15 to 30 cm deep) (Table 5). Organochlorine pesticide concentrations showed a pattern of decreasing concentration with distance from the river mouth. The highest DDE concentrations were documented in East New (Wang et al. 2011). Lower concentrations of DDE were documented at the Mid New River site (Wang et al. 2011). The lowest DDE concentrations were documented at the Far West New River site (Wang et al. 2011).

Table 5
DDE Concentrations in Sediment at SCH Project Area (ng/g)

Location	Surface Mean (# samples)	Surface Maximum	Subsurface Mean (# samples)	Subsurface Maximum
New River – East	6.52 (11)	23.71	9.10 (21)	41.16
New River – Middle	2.78 (15)	7.99	5.44 (29)	33.51
New River – Far West	1.14 (6)	2.90	0.89 (13)	2.41

Source: Calculated from raw data in Wang et al. 2011. Surface (0 to 5 cm deep) and Subsurface (5 to 15 cm and 15 to 30 cm deep). Nondetect values were defined as 0.01 ng/g for purpose of calculating means. Samples were pooled for air-exposed and submerged sites within each

Table 5
DDE Concentrations in Sediment at SCH Project Area (ng/g)

location.

The frequency of surface sediment samples exceeding a sediment guideline of 31.3 ng/g total DDE (Probable Effects Concentration [PEC]; MacDonald et al. 2000, cited in CRBRWQCB 2008) was none at New River sites. The frequency of subsurface samples exceeding the PEC was 10 percent at New River East (41.16 ng/g maximum), 3 percent at New River Middle (33.51 ng/g maximum), and none at New River West. Mean DDE sediment concentrations (0 to 5 cm deep) were measured at nearby sites by USGS from 2006 to 2008 (Miles et al. 2009). For comparison, 0 to 5 cm depth were 4 to 48 ng/g at the Reclamation/USGS Saline Habitat Ponds (SHP),[2] 41 to 56 ng/g in the Alamo River, 15 to 41 ng/g in the Salton Sea near Alamo River, 60 to 98 ng/g at the Freshwater Marsh near Morton Bay, and 2 to 6 ng/g at the D-Pond on the Sonny Bono Salton Sea NWR (Miles et al. 2009). With the exception of the D-Pond, these concentrations are similar or higher than the levels measured at the Salton Sea SCH site.

Chlordane (organochlorine, <1.2 ng/g New River) and bifenthrin (pyrethroid, <0.5 ng/g New River) were also detected, but at lower levels than DDE. Other pesticides were infrequently detected (Wang et al. 2011).

3.3 Biological Characteristics

3.3.1 Vegetation Communities

The *Salton Sea Ecosystem Restoration Program Final Programmatic Environmental Impact Report* (Natural Resources Agency 2007) provides general information about vegetation around the Salton Sea. Additional data sources for the Project area included geographic information system (GIS) files from the Redlands Institute at the University of Redlands (1999), vegetation mapping completed for IID (2007), 6-inch resolution aerial photographs (Southern California Association of Governments and California Department of Transportation 2008), and site visits conducted on April 29 and November 16 through November 18, 2011. The biological resources section of the EIS/EIR (Section 3.4) describes the vegetation within all of the alternatives considered. The vegetation communities located within the SCH Project area include agriculture, common reed marsh, disturbed/developed, drainage ditch, mudflat, open water, tamarisk scrub, and tamarisk woodland. Additional observations of existing vegetation communities were recorded by Chambers Group (2012) during the wetlands delineation of the SCH Project area, including identification of iodine bush scrub and cismontane alkali marsh. The jurisdictional delineation was

[2] The SHP complex is a 100-acre project divided into four 25-acre ponds less than 2 feet deep. USGS and Reclamation developed the SHP complex at the Salton Sea's southern end in 2006; it was decommissioned in 2010.

finalized by the Corps and Dudek in November of 2012 and included a determination of the OHWM of the Salton Sea within the Project area.

3.3.1.1 Open Water and Exposed Playa/Seabed

The majority of the Project area consists of the Sea itself and associated unvegetated playa/seabed that occur adjacent to the shoreline where the Sea has recently receded. Areas below -231 feet msl generally support open water but may also include shallow areas that are intermittently exposed and inundated over an approximately 4-6 month period due to annual fluctuations in the Sea water surface elevation. For example, during the 2011 water year, the water surface elevation was -231.9 feet msl between October and December 2010 and then rose to -231.0 feet msl by August 2011 before declining again to -232.0 feet msl by September 2011. Wind action also shifts the geographic extent of inundation on a daily basis. This regime allows for playa areas to support invertebrates communities similar to mudflats; however, the lack of regular tidal influence, coupled with the receding condition of the Sea, means the periodically inundated area will not likely be sustained in a particular area for more than a few years, and, thus, these areas do not meet the Corps' definition of mudflat.

3.3.1.2 Common Reed Marsh

Common reed marshes are dominated by common reed (*Phragmites australis*). Herbs are less than 13 feet in height with a continuous canopy. This community is found in semi-permanently flooded and slightly brackish marshes, ditches, impoundments. Soils have high organic content and are poorly aerated (Sawyer and Keeler-Wolf 2009). Common reed marshes occurred much less frequently throughout the Project area. The community was well established in association with the New River in the Project area. Other areas of common reed marshes were observed at a lesser extent than the tamarisk scrub or iodine bush scrub throughout the Project area above the -231-foot below sea level elevation, primarily associated with the agricultural drainage portions of the Project area. Vegetation within the agricultural drainages is routinely maintained, and therefore the presence and abundance of this vegetation type is likely to fluctuate over time.

3.3.1.3 Agriculture/Disturbed

According to the Draft EIS/EIR, the primary agricultural crops present at the time of the November 2010 site visit included spinach, various types of grass hay, and alfalfa (Corps and Natural Resources Agency 2011). Many of the staging areas may be located in agricultural areas. In addition, there are approximately 5 acres of roads within the Project area.

3.3.1.4 Irrigation Ditches/Agricultural Drains

Irrigation ditches include both drains taking water away from the fields and water supply canals bringing water to the fields. Ditches may include both earthen and concrete-lined channels. The jurisdictional delineation identified 24 drainage channels, 7 of which were concrete-lined (Dudek and Chambers Group 2012). Vegetation associated with the ditches often changes over time based on use of an individual ditch, level of salinity, and frequency and timing of vegetation clearing by the landowner.

3.3.1.5 Tamarisk Scrub and Tamarisk Woodland

Tamarisk scrub is characterized as a weedy monoculture of any of several tamarisk species (*Tamarix* spp.), usually replacing native vegetation following major disturbance. This vegetation community can be found on sandy or gravelly braided washes or intermittent streams, often in areas where high evaporation increases the stream's salinity. Tamarisk is a prolific seeder and strong, long-rooted plant that absorbs water from the water table or the soil above it. These characteristics make this species an aggressive competitor in disturbed riparian corridors (Holland 1986). Tamarisk scrub was the predominant vegetation community observed throughout much of the wetland portion of the Project area. This vegetation community was observed within the exposed playa and upper extent of the shoreline of the Salton Sea, above the -231-foot below sea level elevation. Tamarisk scrub was also closely associated with the drainages within the Project area, and the riparian vegetation of the New River.

3.3.1.6 Iodine Bush Scrub

Iodine bush scrub is dominated by iodine bush (*Allenrolfea occidentalis*). Shrubs in this community are typically less than 7 feet in height with an open to continuous canopy. The herbaceous layer is variable and may include salt grass (*Distichlis spicata*) and alkali sacaton (*Sporobolus airoides*). This community can be found on dry seabed margins, hummocks, playas perched above current drainages, and seeps (Sawyer et al. 2009, cited in Chambers Group, Inc. 2012). Iodine bush scrub was also a common vegetation community throughout the Project area, but to a lesser extent than that of tamarisk scrub. Similar to what was reported in the Draft EIS/EIR, iodine bush scrub was observed in relatively open stands on the shores and exposed playa of the Salton Sea, and primarily above the -231-foot below sea level elevation (Corps and Natural Resources Agency 2011). This community was observed along some of the agricultural drainages, within former agricultural fields, and at the outlet/mouth of the New River.

3.3.1.7 New River

The New River is a perennial waterway with an approximately 30-foot-wide OHWM that was unvegetated and appears to have a mud bottom. The banks of the river contain associated riparian and wetland vegetation, and the bottom of the channel is dominated by southern cattail (*Typha domingensis*) and common reed. The river is separated from the Sea by a berm that was constructed for access purposes. The berm is approximately 5 to 7 feet in height, and an access road runs along the top of the berm. The river flows north through the Project area and discharges into the Salton Sea. Prior to discharging into the Sea, the New River crosses through mixed-use agricultural lands, and runoff from the agricultural lands contributes hydrology to the system. Direct precipitation and local stormwater runoff also contribute hydrology to the New River system. The New River is approximately 11,480 linear feet in length and encompasses approximately 11.0 acres within the Project area.

3.3.2 Threatened and Endangered Animals

Documented presence and suitable habitat for the following Federally listed species are within or near the Project footprint: desert pupfish, Yuma clapper rail, California least tern, least Bell's vireo, and southwestern willow flycatcher. Based on the above determinations, the Corps has initiated formal consultation under section 7 of the Endangered Species Act with the USFWS. Species presence was determined based on its recorded occurrence within the Salton Sea region (based on the California Natural Diversity Database). No focused surveys were completed for the proposed Project, but preconstruction surveys would be completed for nesting birds, Yuma clapper rail, and desert pupfish.

The Project area was determined to be absent of any Federally listed plant species (see Appendix H of the Draft EIS/EIR [Corps and Natural Resources Agency 2011]).

3.3.3 Fish, Crustaceans, Mollusks, and other Aquatic Organisms in the Food Web

Aquatic biota in the Salton Sea include invertebrates and fish. The initial aquatic biota (both invertebrates and fish) present in the Salton Sea were those that came in with the water from the Colorado River. Species from the rivers, creeks, and drains also entered the Sea. Subsequently, a variety of invertebrate and fish species were stocked in the Sea as salinity increased. Invertebrates also entered the Sea in the water with the stocked fish. Aquatic organisms that currently or in the recent past comprised the food web supporting fish in the Sea include phytoplankton, zooplankton, and benthic and water column macroinvertebrates. Macroinvertebrate species include diptera (flies), corixids (water boatmen), benthic polychaetes such as pileworms (*Neanthes succinea*) and a spionid worm (*Streblospio benedicti*), amphipods (*Gammarus mucronatus* and *Corophium louisianum*), ostracods (seed shrimp), and a barnacle (*Balanus amphitrite*) (Detwiler et al. 2002; Miles et al. 2009); zooplankton is dominated by copepods (Miles et al. 2009).

Between 1929 and 1956, more than 30 species of non-native fish were introduced into the Sea on more than 20 occasions, some of which were introduced repeatedly (Walker 1961). Between 1948 and 1956, the California Department of Fish and Game (now known as the Department of Fish and Wildlife, or DFW) introduced fish with the intention of creating a marine sport fishery (Walker 1961). Although a number of fish species were present in the Salton Sea while salinity was in the range of marine waters, those fish were introduced for recreational fishing and not as forage for birds. Tilapia that inhabit the Sea are hybrids between the Mozambique tilapia (*Oreochromis mossambicus*) and Wami River tilapia (*O. urolepis hornorum*) (Costa-Pierce 2001). These fish, called California Mozambique hybrids ("Mozambique hybrid tilapia"), are currently the most abundant fish in the Sea and have been used extensively as forage by birds due to their range in size classes and location within the water column that make them available for bird foraging.

The shoreline pools and shallow waters provide habitat for desert pupfish and sailfin molly (*Poecilia latipinna*), as well as other fish and invertebrates. These areas also provide important spawning and nursery habitat for tilapia. The smaller fish in shallow waters feed on invertebrates as well as algal material. Rocky shoreline habitats also provide valuable refugia for invertebrates during periods when hypoxic or anoxic conditions persist in the Salton Sea (Detwiler et al. 2002).

The open water supports fish and invertebrate production. Until recently, these areas also provided habitat for pelagic spawning fish such as orangemouth corvina (*Cynoscion xanthulus*). Orangemouth corvina, along with Gulf croaker (*Bairdiella icistia*) and sargo (*Anisotremus davidsonii*), have not been detected in the Sea since 2003 (DFG 2008) and are probably no longer present due to the Sea's increased salinity. The distribution of fish in the open water is concentrated along the nearshore areas. The Salton Sea's tilapia (Mozambique hybrid tilapia) population has risen considerably since 2003, contributing to elevated fish numbers in the Sea (DFG 2008). For example, the DFW (formerly DFG) recorded an increase in fish caught from 9.26 fish/net-hour in the summer of 2006 to 28.03 fish/net-hour in the summer of 2007 (DFG 2007).

The river mouths, particularly in the Sea's southern part, provide an area of reduced salinity and higher dissolved oxygen. Mozambique hybrid tilapia is the only fish species that has been recently collected near the river mouths, although common carp (*Cyprinus carpio*), threadfin shad (*Dorosoma petenense*), striped mullet (*Mugil cephalus*), striped bass (*Morone saxatilis*), and mosquitofish (*Gambusia affinis*) occasionally enter the Sea from the rivers (personal communication, S. Keeney 2011). In the past, orangemouth corvina has been reported to congregate (possibly for spawning) where freshwater flows into the Salton Sea, possibly due to higher dissolved oxygen or better water quality (Costa-Pierce 2001). No amphibians occur within the Salton Sea itself due to the high salinity.

Invertebrates in the Alamo River and agricultural drains include plankton, snails, midge larvae (chironomids), Asiatic clams (*Corbicula fluminea*), and crayfish (CRBRWQCB 2002a). Fish species present in the New River include blue tilapia (*Oreochromis aureus*), common carp, and channel catfish (*Ictalurus punctatus*) (personal communication, J. Crayon 2010; U.S. Department of Health and Human Services 2000). Other species reported in the Alamo and/or New rivers include orangemouth corvina, Mozambique tilapia, threadfin shad, channel catfish, flathead catfish (*Pylodictis olivaris*), red shiner (*Cyprinella lutrensis*), largemouth bass (*Micropterus salmoides*), and mosquitofish (CRBRWQCB 2002a; Costa-Pierce and Riedel 2000).

Fish in the agricultural drains include sailfin molly, red shiner, mosquitofish, longjaw mudsucker (*Gillichthys mirabilis*), common carp, desert pupfish, shortfin molly (*Poecilia mexicana*), porthole livebearer (*Poeciliopsis gracilis*), Mozambique tilapia hybrids, redbelly tilapia (*Tilapia zillii*), and possibly blue tilapia (Crayon and Keeney 2005; personal communication, J. Crayon 2010, S. Keeney 2011; CRBRWQCB 2005). Spiny softshell turtles (*Apalone spinifera*), bullfrogs (*Lithobates catesbeianus*), and Rio Grande leopard frogs (*Lithobates berlandieri*) are also present in the rivers and agricultural drains; the checkered garter snake (*Thamnophis marcianus*) occurs in agricultural drains/canals and marshes (personal communication, J. Crayon 2011).

3.3.4 Contaminant Effects in the Food Web

Selenium occurs in the Salton Sea's water and sediment and has the potential to bioaccumulate and adversely affect fish and wildlife (Natural Resources Agency 2007), as discussed in Appendix I, Selenium Management Strategies, of the Draft EIS/EIR (Corps and Natural Resources Agency 2011). Aquatic and benthic invertebrates are a major route of food-chain transfer in the Salton Sea food chain (Natural Resources Agency 2007). The suggested toxicity threshold for invertebrates as prey (to avoid bioaccumulation in birds) is 3 to 4 µg/g dw (Hamilton 2004). However, selenium concentrations observed at the Salton Sea vary widely among locations and taxa and frequently exceed this threshold. Mean invertebrate selenium concentrations ranged from 2.37 to 6.64 µg/g dw at Salton Sea, 2.16 to 8.50 µg/g dw at the SHP complex. The SHP complex was an experimental created habitat adjacent to the Alamo River, managed by the USGS, that used a blend of Salton Sea and Alamo River waters. The ponds were decommissioned at the end of the experiment in 2010. At the SHP complex, mean concentrations exceeded 4 µg/g dw in 67 to 80 percent of corixid samples and 0 to 30 percent of chironomid samples (Miles et al. 2009). In the IID agricultural drains, selenium concentrations in chironomids ranged considerably higher (mean 6.5 µg/g dw, maximum 50.6 µg/g dw) (Saiki et al. 2010).

Fish currently exposed to selenium include tilapia, sailfin molly, western mosquitofish, and desert pupfish. Lemly (2002) recommended a threshold of 4 µg/g dw to avoid toxic effects in sensitive fish species. Selenium levels in fish currently exceed this threshold. Mean whole-body fish selenium concentrations were 10.4 µg/g dw in the open Salton Sea, 9.67 µg/g dw in the New River Estuary, 11.5 µg/g dw in the Alamo River Estuary (Natural Resources Agency 2007, Appendix F), 6.81 to 6.89 µg/g dw in IID agricultural drains (Saiki et al. 2010), and 2.8 to 4.7 µg/g dw in New River wetlands upstream (Johnson et al. 2009). USGS studies noted that sailfin mollies and mosquitofish did not appear to be adversely affected at concentrations of 3.1 to 30.4

µg/g dw, and pupfish in laboratory experiments did not exhibit negative health effects from such levels of selenium exposure (Saiki et al. 2010).

Selenium's most substantial effects occur in bird embryos, such as increased risk of reduced hatching success and teratogenesis (embryo deformities) at higher concentrations. As such, selenium in the egg is the most sensitive measure for evaluating hazards for birds (Skorupa and Ohlendorf 1991, cited in Ohlendorf and Heinz 2011). The responses to selenium vary among bird species, ranging from "sensitive" (e.g., mallard [*Anas platyrhynchos*]) to "average" (e.g., black-necked stilt [*Himantopus mexicanus*]) and "tolerant" (e.g., avocet) (Skorupa 1998, cited in Ohlendorf and Heinz 2011). Cormorants and terns are likely to be fairly tolerant of selenium in keeping with greater tolerance of other saltwater-adapted species, such as avocets and snowy plover (*Charadrius alexandrinus*), compared to freshwater-adapted species, such as mallards (personal communication, H. Ohlendorf 2010). Risk of impaired reproduction can start to occur at egg concentrations of 6 to 12 µg/g dw. The risk of teratogenesis starts to occur above 12 µg/g dw for sensitive species and above 20 µg/g dw for moderately sensitive species (Ohlendorf and Heinz 2011).

Other contaminants of concern are pesticides, and organochlorine pesticides are the predominant type in sediments near the Alamo and New rivers (see Section 3.11.3.2, Surface Water Quality, and Appendix J, Summary of Special Studies, of the Draft EIS/EIR [Corps and Natural Resources Agency 2011]; Wang et al. 2011). The concentration of most pesticides was well below detectable levels, but DDT and its metabolites represented more than 80 percent of the total concentration of organochlorine pesticides detected in Salton Sea sediments, with DDE as the most abundant derivative. Because the use of DDT has been banned in the U.S. for decades, these are assumed to be legacy contaminants.

Of the current-use pesticides evaluated, bifenthrin was the most commonly detected pyrethroid and was found at concentrations up to 26 ng/g (Wang et al. 2011). Some of the air-exposed sediments contained bifenthrin at levels exceeding the 10-day median lethal concentration for *Hyalella azteca* (an aquatic isopod) of 4.5 ng/g dw. However, based on the relative sensitivity of *H. azteca* to pyrethroid exposure, the potential toxicity of these sediments to the invertebrate taxa that occur in the Salton Sea is likely overestimated (Ding et al. 2010).

Current DDE concentrations in surface sediments (0 to 5 cm deep) represent undisturbed existing conditions and the No Project Alternative. Mean DDE concentrations in these sediments were 1.14 to 6.52 ng/g near the New River (Table 6). Organochlorine pesticide concentrations showed a pattern of decreasing concentration with distance from the river mouth. Sediment DDE levels observed at the proposed SCH sites fall within the range of values observed in the region: 4 to 48 ng/g at the SHP complex and 2 to 98 ng/g for reference habitats in the southern Salton Sea area (Miles et al. 2009).

Table 6
Estimated Sediment DDE Concentrations (ng/g) for Existing Conditions/No Project and Proposed SCH Project (Alternative NR-3)

	Existing Conditions and No Project[1]		SCH Project[2]		Difference between Existing/No Project and Project	
Pond units	*Mean*	*Maximum*	*Mean*	*Maximum*	*Mean*	*Maximum*
New East	6.5	23.7	7.1	27.9	0.6	4.2
New Middle	2.8	8.0	3.5	14.7	0.7	6.7
New Far West	1.1	2.9	1.1	2.7	-0.6	- 0.2

[1.] DDE concentrations (mean and maximum values) in undisturbed surface sediments (0 to 5 cm deep) measured at each location (Amrhein and Smith 2011; Wang et al. 2011).
[2.] Expected (calculated) DDE concentrations for each SCH alternative, based on field measurements of surface sediments (0 to 5 cm) and subsurface sediments (5 to 15 and 15 to 30 cm deep) (Wang et al. 2011), and weighted according to proportion of pond area that would remain undisturbed but inundated (surface 0 to 5 cm concentrations) and area disturbed by construction (borrow ditches for berms, excavated swales and channels, borrow for habitat islands) (subsurface 5 to 30 cm concentrations). "Mean" is the area weighted average calculated using mean values for surface and subsurface sediments. Because DDE concentrations below 30 cm are unknown and construction could disturb deeper sediments, hypothetical "maximum" concentrations were also calculated using maximum observed values of surface and subsurface sediments, as a hypothetical upper bound of potential risk.

The scientific and regulatory literature was reviewed and evaluated to determine appropriate ecotoxicological screening criteria for DDE in sediment and biota. The first-tier screening criterion (31.3 ng/g DDE) is a PEC for general ecotoxicity based on sediment guidelines established by the CRBRWQCB (2010b, based on MacDonald et al. 2000) to prevent direct toxicity to the macroinvertebrate population, which serves as a food base for fish and insectivorous birds. The second-tier screening criteria address potential risk of DDE bioaccumulation in birds and their eggs. These sediment bioaccumulation screening level values are 0.55 ng/g for protection of adult fish-eating birds (herons) and 0.17 ng/g for protection against eggshell thinning in raptors (osprey) (Poulsen and Peterson 2006). A comparison of the screening level value criteria to the values in Table 6 shows that existing sediment concentrations of DDE are already at levels that pose a risk for bioaccumulation that could cause adult toxicity or eggshell thinning as a result of the long-term legacy of agricultural runoff.

Finally, DDE concentrations in black-necked stilt eggs at the Salton Sea have been measured (Miles et al. 2009). Reference sites were established at the Alamo River, Salton Sea, Freshwater Marsh, and the D-Pond or Hazard complexes (Sonny Bono NWR, USFWS). The Alamo River and Salton Sea (represented by Morton Bay) sites represented habitats that provided source waters to the shallow water SHP. The SHP was a 50-hectare experimental complex constructed by the USFWS in 2006. The SHP consisted of four interconnected ponds constructed at the southeastern shoreline of the Salton Sea that were flooded with blended waters from the Alamo River and Salton Sea. The Freshwater Marsh, located north of the SHP, represented an expansive vegetated open wetland sustained by flow-through agricultural drainwater. The NWR complexes (D-Pond and Hazard) are impounded wetlands sustained by water directly from the Colorado

River that represented an assumed lowest contaminant risk. The D-Pond initially was used as a reference site, but it was drained prior to the end of the study and was then substituted with the Hazard site (Miles et al. 2009).

These researchers cited 4.0 µg/g wet weight (ww) (Henny and Herron 1989, cited in Miles et al. 2009) as a threshold for observed eggshell thinning in aquatic birds, and 1.7 µg/g ww (Henny et al. 2008, cited in Miles et al. 2009) as a level at which eggshell thinning in stilt eggs was not observed at the SHP. The proportion of stilt eggs that exceeded the 1.7 µg/g p,p'-DDE value was 44 percent at the SHP, 29 percent at Freshwater Marsh/Morton Bay, and 21 percent at D-Pond/Hazard. By contrast, only 18 percent of the SHP eggs, 3 percent of the Freshwater Marsh/Morton Bay eggs, and 7 percent of the D-Pond/Hazard eggs exceeded 4.0 µg/g. Although stilt eggs are not necessarily reflective of the entire avian community, these observations give some indication that, in spite of elevated DDE levels in Salton Sea sediments, DDE concentrations in bird eggs do not pose a high potential for eggshell thinning.

Total DDT (includes dichlorodiphenyldichloroethane [DDD] and DDE) concentrations in fish tissue were measured around the Salton Sea by the SWRCB Toxic Substances Monitoring Program (1978 to 1995) for use in developing sedimentation/siltation total maximum daily load guidance for the New River (CRBRWQCB 2002b) and IID drains that empty directly into the Salton Sea (CRBRWQCB 2005). Mean total DDT fish tissue concentrations were 1,090 µg/kg in the New River (34 samples, representing 176 individual fish) (CRBRWQCB 2002b) and 97 µg/kg ww for Salton Sea fish (21 samples, representing 102 individual fish) (CRBRWQCB 2005). Poulsen and Peterson (2006) developed acceptable fish tissue levels of DDT, DDD, and DDE for protection of adult bird populations (150 µg/kg ww) and for protection against eggshell thinning in raptor populations (41 µg/kg ww). Therefore, fish tissue concentrations measured in the Salton Sea and the New River are already at levels that have the potential for avian toxicity and eggshell thinning.

3.3.5 Other Wildlife

The following are the principal references reviewed to obtain information regarding wildlife, including special-status wildlife, within the Project area and a buffer of 0.5 mile:

- The DFW California Natural Diversity Database (CNDDB) *Special Animals List*, reviewed in 2010;
- *Birds of the Salton Sea* (Patten et al. 2003) for descriptions of status and habitats on or adjacent to Project site;
- *Birds of North America Online* for range and habitat descriptions from various authors;
- Natural History Museum of Los Angeles County;
- Sonny Bono NWR (USFWS 2010a, b) occurrence data; and

- Studies on patterns of abundance, distribution, annual phenology, and habitat associations (Shuford et al. 2000).

In addition, observations of wildlife during focused surveys for Federally listed bird species (Dudek 2010) were recorded.

3.3.5.1 Common Bird Species

The Salton Sea ecosystem has become one of the most important habitats for birds in North America and supports some of the highest levels of avian biodiversity in the southwestern U.S. Recent studies have documented the great importance of the Salton Sea ecosystem in providing habitat for migrating and resident waterbirds, particularly those migrating within the Pacific Flyway. More than 400 resident, migratory, and special-status bird species have been recorded in the Salton Sea Basin; about 270 of those species, including 33 bird species that are threatened, endangered, or of special concern, use the Basin on a regular basis. In addition to the diversity of birds, studies have indicated that the large number of individual birds using the Salton Sea is even more ecologically relevant than the number of species due to its importance as a migratory stopover and wintering area for hundreds of thousands of birds (Natural Resources Agency 2007).

The Basin provides important habitat for 48 species of gulls (more than 40,000 individuals), terns, and shorebirds. It is one of only five areas in the interior of western North America used by tens of thousands of birds in spring (Shuford et al. 2000). Some common aquatic bird species for which the Salton Sea provides important habitat include American avocet (*Recurvirostra americana*), American coot (*Fulica americana*), American wigeon (*Anas americana*), American white pelican (*Pelecanus erythrorhynchos*) (30 percent of North American breeding population), black-necked stilt, California brown pelican (*Pelecanus occidentalis*), eared grebe (*Podiceps nigricollis*) (90 percent of North American population in some years), and ruddy duck (*Oxyura jamaicensis*) (50 percent of Pacific Flyway population) (USFWS 2010a; Shuford et al. 2000; Jehl 1994). Bird populations vary throughout the year as birds migrate to the Sea for breeding and as they stop over during migration to points north and south. The American avocet, American coot, American white pelican, and ruddy duck are all found at the Salton Sea throughout the year. In some years, the California brown pelican is present throughout the year. The American wigeon and eared grebe are absent for a few months in the summer (USFWS 2010a).

Point count surveys conducted within and near the Project area in 2009 (USFWS 2010a) show that the American avocet population is more abundant during August and September with numbers of individuals reaching into the thousands, while the American coot's population is greatest in March with numbers of individuals also reaching the thousands. The American wigeon is present in greater numbers in January and February with counts of over 5,000 individuals and is absent from the Salton Sea during the summer months (June through

September). American white pelican populations peak twice during the year, first from January through March and then again from July through September, with populations in the low thousands and then remaining in the hundreds during other months. California brown pelicans follow a similar pattern with a population increase in January and then again from June through September. The eared grebe population is greatest in January with a peak of over 5,000 individuals, which then declines in the summer and fall months. The ruddy duck population is highest in the winter to early spring (November through April) with the greatest numbers occurring in February (over 13,000 individuals), which then also declines in the summer months.

Numerous other bird species occur within the Project region as residents, visitors, and migrants. A total of 107 species of waterbirds were recorded for the Salton Sea in 1999 (Shuford et al. 2002) and include western and Clark's grebes (*Aechmophorus occidentalis* and *A. clarkii*, respectively); wading birds such as herons, egrets, and night-herons; and a number of waterfowl species such as snow (*Chen caerulescens*) or Ross's (*Chen rossii*) geese, northern shoveler (*Anas clypeata*), northern pintail (*Anas acuta*), and green-winged teal (*Anas crecca*). A number of raptor species have been recorded at the Salton Sea, most of which are discussed below. Shorebird species and numbers tend to peak during migration with large numbers of black-bellied plover (*Pluvialis squatarola*), black-necked stilt (also occurs in large numbers as a breeding species), willet (*Tringa semipalmata*), marbled godwit (*Limosa fedoa*), western sandpiper (*Calidris mauri*), least sandpiper (*Calidris minutilla*), dowitchers (*Limnodromus* spp.), and Wilson's phalarope (*Phalaropus tricolor*).

The Caspian tern (*Hydroprogne caspia*) is a common breeding bird that occurs within the Salton Sea region from mid-April through October. It is most abundant at the Sea from late summer through fall. Most Caspian terns depart from the region by the end of October, but some remain through the winter (Patten et al. 2003). Caspian terns forage primarily or exclusively for fish but may occasionally take crayfish and insects (Cuthbert and Wires 1999). Approximately 25 percent of the North American population of the Caspian tern breeds at the Salton Sea (Cuthbert and Wires 1999; personal communication, K. Molina 2010a). In 2009, the population size within the Project area was in the hundreds for the winter months and in the thousands for the breeding season (USFWS 2010a). In the past, Caspian terns nested on Mullet Island (Molina 2004). In 2010, nesting numbers of Caspian terns were up to 2,500 breeding pairs, on the D pond islands (personal communication, K. Molina 2010b).

In 2009, the California gull (*Larus californicus*) was found at the Salton Sea, primarily in December (USFWS 2010a). A few occurrence records are present for January, May, and June, although the numbers are much lower than the counts from December. This species was observed during summer 2010 surveys (Dudek 2010), and Molina (2004) states that the California gull colonized the Sea in 1996 and has nested annually since then in small numbers. It also winters at the Sea (Winkler 1996) and can be found throughout the year (USFWS 2008).

The double-crested cormorant (*Phalacrocorax auritus*) is a year-round resident of the Salton Sea with the highest counts occurring in November, December, and February; however, populations remain steadily in the thousands throughout the year. They nest regularly at the Sea. The largest nesting colony was on Mullet Island off the southeastern shore (Massey and Zembel 2002), but they also nest along the Alamo River (Molina and Sturm 2004) as discussed below for rookeries.

The laughing gull (*Leucophaeus atricilla*) was only observed at the Salton Sea in August during 2009 bird counts (USFWS 2010a), but was observed during summer 2010 surveys (Dudek 2010), and it is a fairly common summer and fall visitor. The Sea is the only area where the laughing gull occurs regularly in the western U.S. It has been observed nesting at Sonny Bono NWR after several decades of no breeding activity (Shuford et al. 2000; Molina 2004; Patten et al. 2003).

The long-billed curlew (*Numenius americanus*) is present throughout the year at the Salton Sea, but thousands occur in the Imperial Valley in the winter (20 percent of world population) (Audubon California 2011). Those staying year-round are likely first-year birds, and they concentrate around Red Hill, Obsidian Butte, and Bruchard Bay (Patten et al. 2003). In 2009 (USFWS 2010a), the long-billed curlew population was greatest in July and November. This species was observed during summer 2010 surveys (Dudek 2010). Curlews may occur along the mudflats and shoreline but occur in highest numbers in agricultural lands.

Least terns (*Sternula antillarum*) at the Salton Sea may be either from coastal California or more likely from Mexico. It has not been recorded breeding at the Sea (Patten et al. 2003), but may breed due to observations of pairs. This species was not observed in the 2009 aquatic surveys (USFWS 2010a) or by Dudek in 2010. The least tern probably occurs at the Sea on an annual basis and has been observed at Sonny Bono NWR's Unit 1, Red Hill, IWA Wister Unit, and at other locations farther away from the Project area. It occurs most often on mudflats and at the deltas of the New and Alamo rivers where it forages in fresh water in rivers or ponds (Patten et al. 2003).

The Salton Sea is an important migratory stopover for thousands of black terns (*Chlidonias niger*), but the species does not breed at the Sea (Patten et al. 2003; Shuford et al. 2000). In 2009, it was most abundant in May and then occurred in smaller numbers from June through December (no records for November) (USFWS 2010a). It was also observed during summer 2010 surveys (Dudek 2010) and could utilize open water and marshes around the Project area.

The northern harrier (*Circus cyaneus*) is a common winter visitor and is a nonbreeding summer visitor (Patten et al. 2003); it was also observed on several occasions during the summer 2010 surveys (Dudek 2010). Suitable foraging habitat within the Project area includes agricultural fields, marshes, and open scrub habitats.

The white-faced ibis (*Plegadis chihi*) occurs in large numbers at the Salton Sea as a winter visitor (up to 50 percent of California population) (National Audubon Society 2011) and migrant (30 percent of world population) (Audubon California 2011). It also is a nonbreeding summer visitor with numbers often exceeding 15,000 year-round (Patten et al. 2003; Shuford et al. 2000). It has attempted to nest periodically, and a relatively small colony is located at Finney Lake outside of the Project area. In 2010, the species was observed flying overhead in flocks of several hundreds of individuals (Dudek 2010). It nests in marsh habitat and forages in muddy ground and marshes; in shallow ponds, lakes, and rivers; and in flooded fields and estuaries. CNDDB has records from 1980 near the New River mouth.

The American white pelican (*Pelecanus erythrorhynchos*) formerly bred at the Salton Sea up to the 1950s but occurs now primarily as a migrant and winter resident. The Sea is an important wintering site for approximately 30 percent of the North American breeding population of American white pelicans and at times supports a substantial proportion of the species' world population (Patten et al. 2003; Shuford et al. 2000). As recently as 1999, nearly 23,000 individuals were observed in aerial surveys at the Sea (Shuford et al. 2000). Wintering birds congregate at the river mouths, loaf on sandbars and mudflats, and forage in shallow water. In 2009, the American white pelicans were most abundant in August with almost 3,000 individuals recorded near and within the Project area; numbers declined in the fall but the species remained a consistent visitor throughout the year (USFWS 2010a). This species was observed during Summer 2010 surveys near the mouths of the New and Alamo rivers and along the shoreline foraging within the Sea in rafts of several hundred (Dudek 2010); suitable loafing habitat includes sandbars and mudflats within the Project area.

3.3.5.2 Riparian Bird Species

A total of 115 species of birds was recorded within or adjacent to the riparian habitat along the New and Alamo rivers during the focused riparian surveys in 2010 (Dudek 2010). Bird species associated with riparian habitat that were commonly observed included song sparrow (*Melospiza melodia*), Abert's towhee (*Melozone aberti*), verdin (*Auriparus flaviceps*), house finch (*Carpodacus mexicanus*), black phoebe (*Sayornis nigricans*), common yellowthroat (*Geothlypis trichas*), red-winged blackbird (*Agelaius phoeniceus*), and marsh wren (*Cistothorus palustris*) (Dudek 2010).

3.3.5.3 Rookeries

A number of bird species occur at the Salton Sea as colonial nesting species specifically using rookeries, including double-crested cormorant; great blue heron (*Ardea herodias*); and great (*Ardea alba*), snowy (*Egretta thula*), and cattle (*Bubulcus ibis*) egrets. During the 2010 focused surveys, rookeries of the double-crested cormorant and great blue heron were observed at the mouth of the Alamo and New rivers. The double-crested cormorant also breeds on Mullet Island in one of the largest North American colonies (Shuford et al. 2002). Great blue herons also have been recorded within rookeries along the shoreline around IWA's Wister Unit and the New River delta (Shuford et al. 2000; Patten et al. 2003). The great blue heron does not form dense nesting colonies, but the species uses snags of partly submerged dead trees at the Salton Sea. Great egret nesting tends to be more colonial with sites concentrated along the shoreline at IWA's Wister Unit and Morton Bay around the delta of the New River (Molina and Sturm 2004; Patten et al. 2003). Similar to the great blue heron, the great egret nests in partially submerged snags. The snowy egret is similar to the great egret in nesting behavior and locations (Molina and Sturm 2004; Patten et al. 2003). At the Salton Sea, the cattle egret establishes massive rookeries (Molina and Sturm 2004; Patten et al. 2003), and during the 2010 surveys, hundreds to thousands of individuals were observed flying up and down the New and Alamo rivers (Dudek 2010). The rookeries for the cattle egret were only located along the Alamo River (Shuford et al. 2002; Dudek 2010).

3.3.5.4 Other Terrestrial Wildlife Species

A number of common terrestrial wildlife species occur in the Project area. Common terrestrial reptiles include side-blotched lizard (*Uta stansburiana*), desert spiny lizard (*Sceloporus magister*), western diamond-backed rattlesnake (*Crotalus atrox*), and gopher snake (*Pituophis catenifer*). They are found in upland habitats within the Project area, especially in habitat associated with agricultural development that provides subsidies of water and forage species. Common mammals of riparian, upland, and agricultural habitats of the Project area include coyote (*Canis latrans*), raccoon (*Procyon lotor*), muskrat (*Ondatra zibethicus*), Virginia opossum (*Didelphis virginiana*), striped skunk (*Mephitis mephitis*), desert cottontail (*Sylvilagus audubonii*), round-tailed ground squirrel (*Spermophilus tereticaudus*), and western pocket gopher (*Thomomys bottae*).

3.3.6 Special Aquatic Sites

Special aquatic sites within the Project area include the Sonny Bono Salton Sea NWR and wetlands. Portions of the Project area are within the Sonny Bono Salton Sea NWR, which is managed by the USFWS. Section 3.4.5 provides more detail about the Sonny Bono NWR.

The Project area was determined to support 1,132 acres of non-vegetated wetland and 493 acres of vegetated wetlands for a total wetland area of 1,625 acres. In addition, the majority of the land below the -231-foot elevation is considered lacustrine non-wetland waters and comprises 2,373 acres of the Project area. Portions of this area may be exposed depending on water level fluctuations within the Sea. Exposed areas bear some resemblance to mudflats; however, no tidally influenced mudflats are present.

3.4 Human Use Characteristics

3.4.1 Municipal and Private Water Supplies

Designated beneficial uses for surface waters in the SCH Project area include industrial service supply. The New River and Salton Sea are potential use sites for industrial service supply within the SCH Project area. Industrial service supply refers to uses of water for industrial activities that do not depend primarily on water quality including, but not limited to, mining, cooling water supply, hydraulic conveyance, gravel washing, fire protection, and oil well repressurization.

3.4.2 Recreational and Commercial Fisheries

The predominant recreational activities at the Salton Sea include bird-watching, wildlife observation, camping, hiking, picnicking, and hunting. Historically, the Salton Sea provided a variety of recreational opportunities, including swimming, water skiing, sport fishing, and boating. In recent years, however, recreational use at the Salton Sea has decreased noticeably, most likely due to a perception of deteriorating water quality and odors, the decline of the sport fishery, and the declining surface water elevation. Starting in 2000, all sport fish populations underwent a dramatic reduction. Marine sport fish species have been undetectable in DFW gill net sampling since mid-May 2003. In addition, none has been detected in fish kills or presented by anglers since mid-May 2003. In response to the loss of the marine sport fish, angling and recreational boating have virtually ceased at the Salton Sea (Natural Resources Agency 2007). Of eight boat-launching facilities that were active in the 1980s, today only two are active (Varner Harbor at the Salton Sea State Recreation Area Headquarters and the Obsidian Butte boat launch). On most days, no boats or other watercraft are present on the Salton Sea. The few boats that are observed on the Salton Sea are primarily research vessels (personal communication, J. Crayon 2011).

There are no commercial fisheries within the SCH Project area and limited recreational fishing.

3.4.3 Water-Related Recreation

Water-related recreation can be either noncontact or contact. Noncontact recreation refers to the uses of water for recreational activities involving proximity to water, but not normally involving contact with water where ingestion of water is reasonably possible. These uses include, but are not limited to, picnicking, sunbathing, hiking, beachcombing, camping, boating, tidepool and marine life study, hunting, sightseeing, or aesthetic enjoyment in conjunction with the above activities. Noncontact recreation is a designated beneficial use of surface waters at the New River and the Salton Sea within the SCH Project area.

Water contact recreation refers to uses of water for recreational activities involving body contact with water, where ingestion of water is reasonably possible. These uses include, but are not limited to, swimming, wading, water-skiing, skin and scuba diving, surfing, white water activities, fishing, and use of natural hot springs. This is a designated beneficial use of surface waters at the New River; however, although some fishing occurs in the downstream reaches, the presently contaminated water in the river makes it unfit for any recreational use. An advisory has been issued by Imperial County Health Department warning against the consumption of any fish caught from the river and the river has been posted with advisories against any body contact with the water. Water-contact recreation is also a designated beneficial use for the surface waters at the Salton Sea within the SCH Project area.

Figure 5 shows the relationship of the proposed SCH pond site to the nearby NWR. The Sonny Bono Salton Sea NWR was established in 1930 as a refuge and breeding habitat for wildlife and is operated by the USFWS. See Section 3.4.5 for more information regarding the NWR.

Hunting also occurs on lands owned by IID. Although it is not IID’s policy to allow hunting on their lands, it does occur during the waterfowl hunting season, particularly at IID’s Managed Marsh Complex. If waterfowl hunting does occur on IID-owned lands, the hunters must follow the State of California hunting regulations (e.g., cannot shoot guns containing lead shot over surface water bodies) and hunt during state-mandated hunting seasons applicable to Southern California (personal communication, B. Wilcox 2011).

3.4.4 Aesthetics

3.4.4.1 Project Vicinity

Elements that influence the visual environment include topographic features such as landforms; the Salton Sea itself; vegetation patterns; human-made alterations to the landscape such as roads, public works projects, agricultural land uses, and structures; and wildlife. Section 3.1 of the EIS/EIR provides a comprehensive analysis of the alternatives in relation to the surrounding viewshed (Corps and Natural Resources Agency 2011).

The New River flows into the Salton Sea where the proposed SCH site is located, forming a river delta that is a significant visual element within the region. Riparian vegetation and exposed shore (playa) dominate the delta area. Vegetation is generally dense and distributed linearly along the river, obscuring water views of the river.

Intensive irrigated row crops and wildlife management areas are the primary land uses in the study area. Agricultural lands consist of expansive areas of uniform rows and plots, separated by berms and cement-lined canals. The vivid green crops contrast significantly with the earthen tones of the berms and other surrounding land features of the arid desert. The berms and canals create a uniform grid pattern over a majority of the land area.

Due to their large numbers and variety, birds are an important aesthetic/visual element at the Salton Sea. Many of the birds congregate at or near the Sonny Bono NWR, which contains areas of salt and freshwater marsh, open water, exposed playa, pasture, and managed agricultural fields. Public access to the shoreline is provided at observation towers, viewing blinds, observation trails, and an interpretive center. Two separate units comprise the Sonny Bono NWR, including Unit 1, which encompasses the New River mouth and the shoreline to the south and west of the outlet. Rock Hill and Red Hill are both considered scenic “mountain peaks” because they are the only topographic features for miles around the Project vicinity. Previous studies in the area have considered the incorporation of one or both of these features in the design of restored habitat to significantly enhance the scenic quality of the area (Salton Sea Authority Outdoor Recreation Advisory Committee 2004).

Geothermal plants are visible northeast of the Project area and are dominant visual features due to their height and bulk. Steam plumes from the plants may be visible depending on atmospheric conditions, especially during cooler weather.

3.4.4.2 Visibility

Despite the Project area’s generally flat topography, visual access to the southern portion of the Salton Sea is limited due to the Salton Sea’s distance from major highways (State Route [SR] 86 and SR-111) and other urban centers. Within the study area, visual access is further limited by areas of dense riparian vegetation associated with the rivers and canals, as well as by the berms separating agricultural fields. In addition to limited visual access, physical access to the shoreline of the Salton Sea is generally restricted throughout most of the study area because of private land ownership and trespassing restrictions in protected areas.

3.4.4.3 Viewer Sensitivity

Viewer sensitivity is a measure of public concern for scenic quality and is analyzed by considering the type of users, amount of use, public interest, and adjacent land uses. Users within the study area include recreational users, such as hunters, anglers, and birdwatchers; farmworkers and residents at nearby farms; employees at the geothermal plants; and commuters/travelers on SR-86 between the intersection of SR-78 and Vendel Road. Workers and commuters in the area would view the Salton Sea in the vicinity of the New River as a backdrop to their daily activities or as a brief view as they pass through the area. Worker and commuter views of the SCH ponds would generally be obstructed by industrial and farming uses, including geothermal plants; farm equipment; agricultural fields; and the expansive grid network of canals that covers most of the area. These users would likely be insensitive to changes in visual character because the Project area would not be the focus of their activities and because views of farming and industrial uses would dominate the foreground of their views.

Recreational users, such as hunters, photographers, and birdwatchers, participate in these activities at the Sonny Bono NWR, IWA, and other sites in the study area. Because the value of such recreational activities is enhanced by the scenic quality of the surrounding areas, these users would have a greater interest in the preservation or enhancement of the visual character of the proposed Project sites. Additionally, because many of these users partake in recreational activities within or directly adjacent to the Project site, views are more focused on the natural environment and less obstructed by man-made modifications that would lessen their sensitivity to change.

3.4.5 Parks, National and Historic Monuments, National Seashores, Wilderness Areas, Research Sites, and Similar Preserves

Figure 5 shows the relationship of the proposed SCH pond sites to the nearby NWR and IWA. The Sonny Bono Salton Sea NWR was established in 1930 as a refuge and breeding habitat for wildlife and is operated by the USFWS. Most of the refuge is inundated by the Salton Sea. Along the shoreline, the refuge includes upland forage and freshwater marsh areas. This portion of land adjacent to the Salton Sea is an important part of the Pacific Flyway and is considered one of the premier bird-watching locations in the nation. The refuge, which receives approximately 20,000 visitors a year (personal communication, C. Schoneman 2011), also includes nature trails and provides opportunities for photography, picnicking, and waterfowl hunting. Public access to the shoreline is provided at observation towers, viewing blinds, observation trails, and an interpretive center; the only other areas open to the public are portions of Union Tract and Hazard Unit (northwest of the SCH Project), which are available for hunting from November to January.

4.0 IMPACT ANALYSIS

4.1 Impacts on Waters of the U.S.

4.1.1 Construction Impacts

Figures 13a through 13c show the jurisdictional resources in the SCH Project boundary with the limit of disturbance for Alternatives NR-2 and NR-3. In addition, these figures show the jurisdiction of two other resources agencies, the CRBRWQCB and DFW, which generally overlap with Corps-jurisdictional waters of the U.S.

For purposes of analyzing impacts on jurisdictional waters, the footprints of the various proposed Project components are categorized as either resulting in permanent or temporary impacts. Permanent impacts are broken down into two categories–permanent impacts that would result in a loss of waters of the U.S. and permanent impacts that would not result in a permanent loss of waters of the U.S., but that would change the elevation and contours of the aquatic resource and may result in a habitat type conversion. Temporary impacts include areas that may be impacted during construction, but the elevation and contours would be restored to preconstruction conditions once construction is completed.

Some component of the Project such as pipelines and power lines may be constructed outside the SCH Project boundary as shown on Figures 13a-13c. These components would be constructed completely within uplands and mainly within existing roads.

Permanent Impacts – No Loss of Waters of the U.S. (Habitat Conversion)

Alternative NR-3

The ponds themselves and the pond shoreline would be considered jurisdictional waters, but construction would permanently alter existing conditions (e.g., change bottom elevation and contours), and therefore these areas are also considered permanently impacted. The pond shoreline, located between the berms and the water surface of the ponds, would vary in width from 6 to 25 feet wide. Construction of the SCH ponds and pond shoreline (totaling 3,285 acres) would result in permanent impacts, but also would convert jurisdictional waters from one type to another. Up to 2,402.1 acres of jurisdictional resources (2,012 acres of non-wetland waters and 390 acres of wetland waters) would be converted to saline wetland ponds under Alternative NR-3.

Alternative NR-2

Construction of the SCH ponds and pond shoreline under Alternative NR-2 (totaling 2,178 acres) would result in permanent impacts, but also would convert jurisdictional waters from one type to another. Up to 1,294.9 acres of jurisdictional resources (905 acres of non-wetland waters and 390 acres of wetland waters) would be converted to saline wetland ponds under Alternative NR-2.

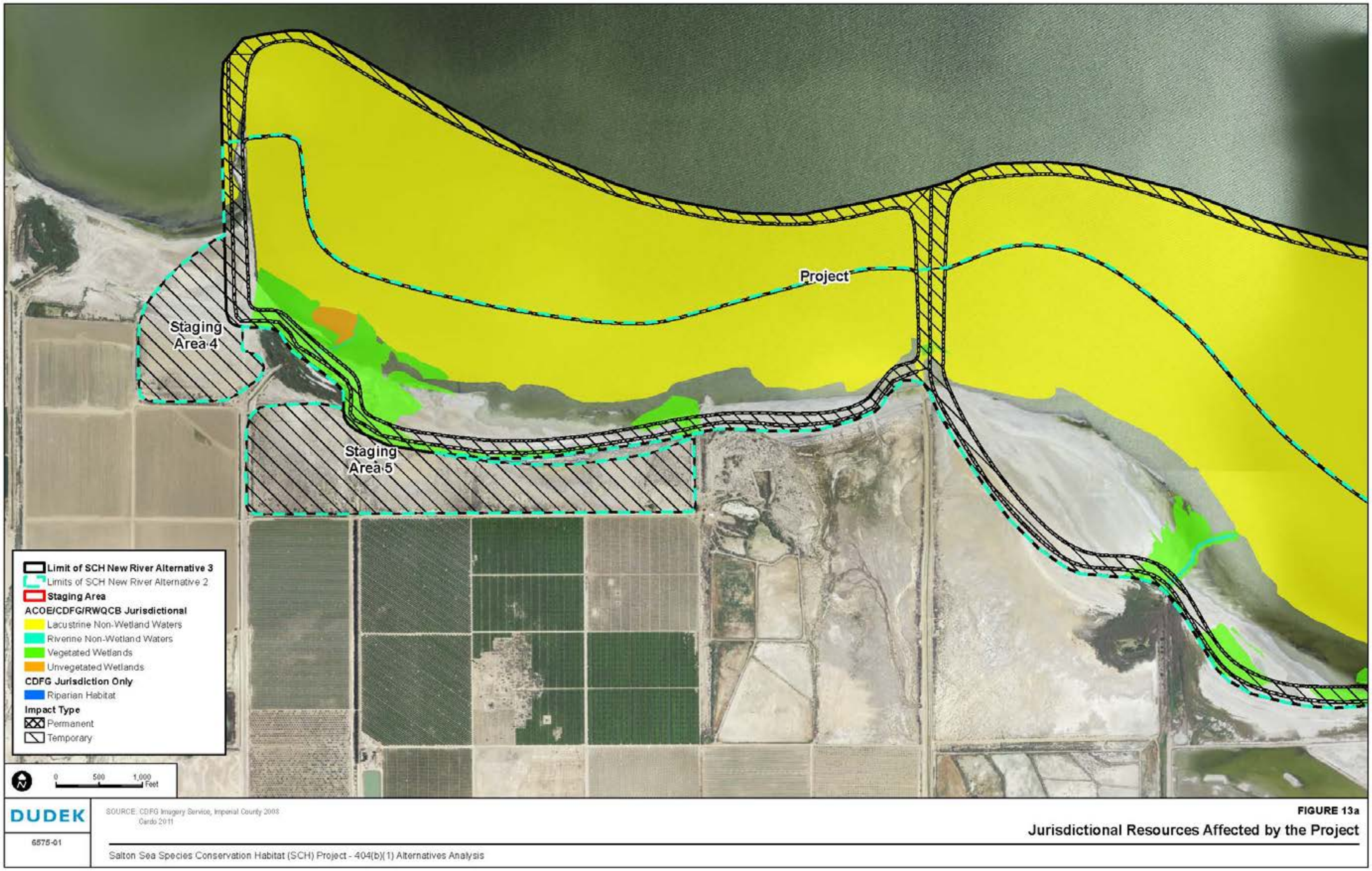


Figure 13a Jurisdictional Resources Affected by the Project

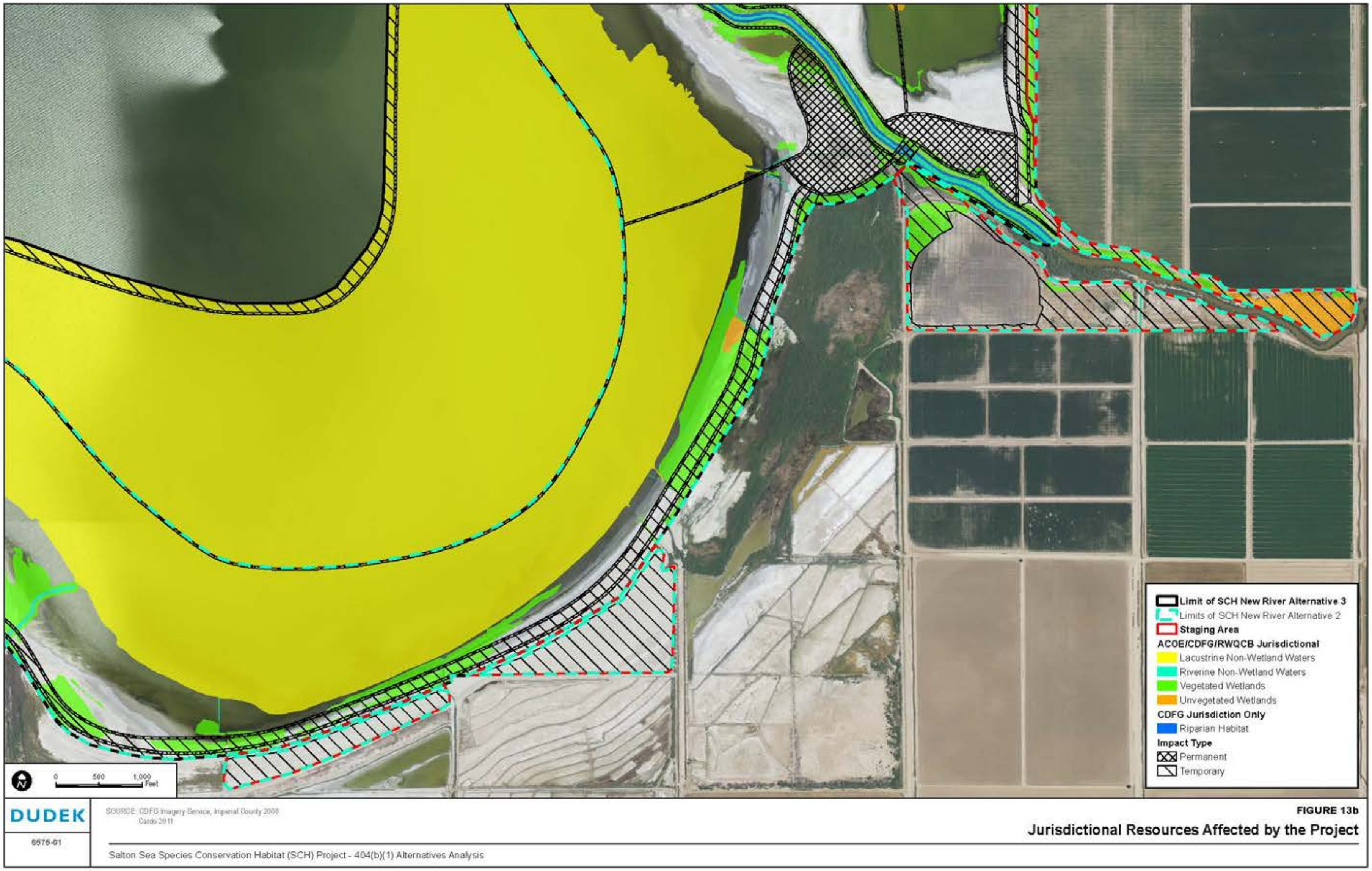


Figure 13b Jurisdictional Resources Affected by the Project

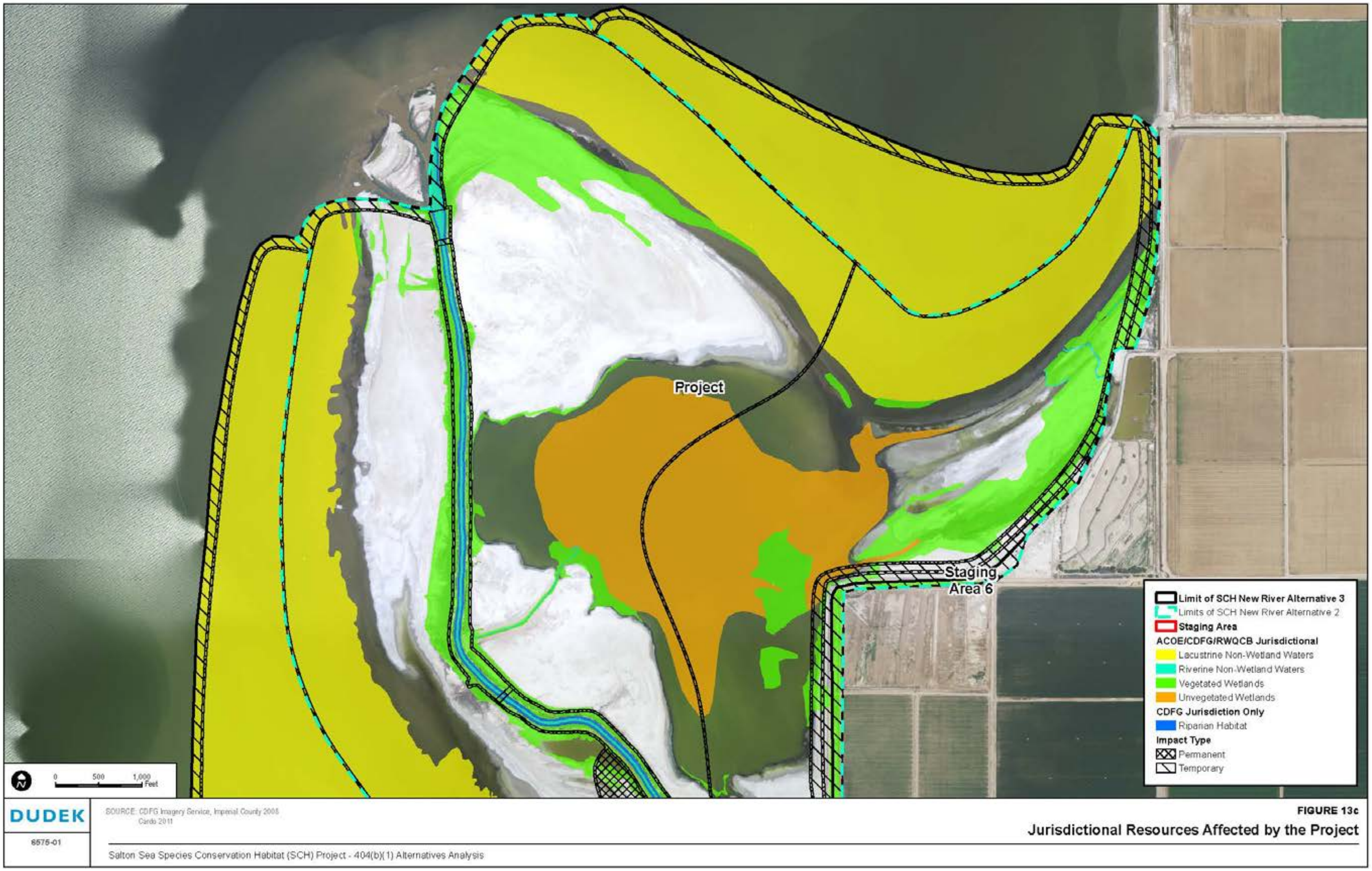


Figure 13c Jurisdictional Resources Affected by the Project

Permanent Impacts – Loss of Waters of the U.S.

Alternative NR-3

SCH Project components that are categorized as permanent impacts resulting in a loss of waters of the U.S. include berms, sedimentation basins, water diversion at the New River, and creation of an interception ditch. Construction of these Project components under Alternative NR-3 would result in the permanent loss of approximately 90.1 acres of jurisdictional resources (Table 7, Figure 13a through 13c).

Creation of the ponds requires construction of both perimeter and cascading interior berms within and adjacent to the Sea, which is responsible for the majority of the permanent impacts. The base of the berms would be 110 linear feet wide but would become partially submerged upon filling the ponds. The top of the berms would be approximately 26 feet wide, which includes an approximately 20-foot-wide driving surface and a short section of bank (3 feet either side) to support the road surface above the water in the ponds. Construction of the berms under Alternative NR-3 would result in permanent impacts on up to 71.9 acres of jurisdictional resources (Table 7).

In order to remove sediment from the water before pumping it into the ponds, two sedimentation basins would be created on either side of the New River. Each basin would be divided into two parts: the active basin and the maintenance basin. Since the water within the basins would fluctuate according to operational requirements, and accumulated sediments would be excavated to maintain the berms, these basins are categorized as a permanent impact and would result in a loss of 3.9 acres of jurisdictional resources (Table 6). The New River pump station would be placed within the analyzed impact footprint of one of the sedimentation basins and therefore does not constitute an additional permanent impact.

Permanent impacts on the New River would occur at the river diversion. The diversion would be located near the sedimentation basins. Creation of this diversion would permanently impact and result in a loss of approximately 0.9 acres of jurisdictional resources (Table 7).

A 30-foot-wide earthen interception ditch would be created along the southern perimeter of the ponds, in part, to capture agricultural runoff before it enters the ponds. Expected establishment of vegetation within the ditch would require routine dredging to ensure that water is able to flow from the agricultural areas to the Sea. This maintenance dredging is expected to occur every 1 to 2 years, and therefore this Project component was categorized as a permanent impact. Initial construction of the interception ditch would impact up to 13.5 acres of jurisdictional resources (Table 7).

Table7
Maximum Permanent from Loss of Section 404 Jurisdictional Waters of the U.S. within the SCH Study Area – Alternative NR-3

Jurisdictional Resource	Permanent Impacts (acres)				
	Berms	*Interception Ditch*	*New River Diversion*	*Sedimentation Basin*	*Total*
Lacustrine Non-Wetlands Waters	48.4	3.1	0.0	0.0	51.5
Riverine Non-Wetlands Waters	0.2	0.1	0.2	0.1	0.6
Lacustrine Vegetated Wetlands	20.3	10.2	0.7	3.7	34.9
Lacustrine Unvegetated Wetlands	3.0	0.1	0.0	0.0	3.1
Total	71.9	13.5	0.9	3.9	90.1

Alternative NR-2

Alternative NR-2 would include similar facilities as Alternative NR-3, including berms, an interception ditch, New River diversion, and sedimentation basin. These facilities would occupy the same locations as Alternative NR-3 and result in the same amount of impacts with the exception of the berms. Under Alternative NR-2, cascading ponds would not be constructed; therefore, permanent loss of jurisdictional waters due to the construction of berms would be smaller than under Alternative NR-3. A total of 68.8 acres of permanent loss of jurisdictional waters would occur under Alternative NR-2 (Table 8), including 51.9 acres of berms.

Table 8
Maximum Permanent from Loss of Section 404 Jurisdictional Waters of the U.S. within the SCH Study Area – Alternative NR-2

Jurisdictional Resource	Permanent Impacts (acres)				
	Berms	*Interception Ditch*	*New River Diversion*	*Sedimentation Basin*	*Total*
Lacustrine Non-Wetlands Waters	28.4	1.8	0.0	0.0	30.2
Riverine Non-Wetlands Waters	0.2	0.1	0.2	0.1	0.6
Lacustrine Vegetated Wetlands	20.3	10.2	0.7	3.7	34.9
Lacustrine Unvegetated Wetlands	3.0	0.1	0.0	0.0	3.1
Total	51.9	12.2	0.9	3.8	68.8

Temporary Impacts

Alternative NR-3

Temporary impacts under Alternative NR-3 include staging areas, two temporary river crossings, and interstitial areas (areas between the footprint of the berms and the Project boundary [i.e., construction work areas]). These three Project components would temporarily impact up to 209.7 acres of jurisdictional resources within the Project area (Table 9).

The final location of the staging areas has not been determined; however, this analysis assumes that all six staging areas, in their entirety, would be temporarily impacted. This conservative approach is being used because of the unknown nature of the staging activities in terms of the amount of land needed and the locations that might be used. The staging areas would be constructed in a manner that reduces the amount of impacts on vegetation and jurisdictional resources to the furthest extent possible. Of the 255.5 acre of staging areas identified; 28.3 acres support jurisdictional resources. (Table 9).

Two temporary river crossings, at the middle and the north end of the New River, would be used to transport dirt across the river during construction. The exact placement of the temporary crossings has not been identified, but one is planned at the north end of the New River, and the second is planned approximately halfway between the northern and southern borders of the Project area. The crossings are expected to impact a total of up to 0.3 acre of jurisdictional resources along the river and would be removed after the ponds have been constructed (Table 9).

Interstitial areas are those areas between the berms and Project boundary, the berms and the interception ditch, and the Project boundary and interception ditch. Although no specific disturbance is scheduled to occur in the interstitial areas, these areas would likely be temporarily disturbed as construction of the ponds and associated facilities occurs. Approximately 181.1 acres of jurisdictional resources occur within the interstitial areas (Table 9).

Table 9
Maximum Temporary Impacts on Section 404 Jurisdictional Waters of the U.S. within the SCH Study Area – Alternative NR-3

Jurisdictional Resource	Temporary Impacts (acres)			
	Staging Areas	*New River Crossing*	*Interstitial Areas*	*Total*
Lacustrine Non-Wetlands Waters	0.0	0.0	111.6	111.6
Riverine Non-Wetlands Waters	0.2	0.1	2.4	2.7
Lacustrine Vegetated Wetlands	18.6	0.2	65.9	84.7
Lacustrine Unvegetated Wetlands	9.5	0.0	1.1	10.7
Total	28.3	0.3	181.1	209.7

Alternative NR-2

Alternative NR-2 would include similar temporary work areas as Alternative NR-3, including the same staging areas and New River crossing location. The amount of interstitial work area would, however, be reduced due to the reduced pond area constructed under Alternative NR-2. Under Alternative NR-2, a total of 115.7 acres of temporary loss of jurisdictional waters would occur (Table 10).

Table 10
Maximum Temporary Impacts on Section 404 Jurisdictional Waters of the U.S. within the SCH Study Area – Alternative NR-2

Jurisdictional Resource	Temporary Impacts (acres)			
	Staging Areas	*New River Crossing*	*Interstitial Areas*	*Total*
Lacustrine Non-Wetlands Waters	0.0	0.0	17.5	17.5
Riverine Non-Wetlands Waters	0.2	0.1	2.4	2.7
Lacustrine Vegetated Wetlands	18.6	0.2	65.9	84.7
Lacustrine Unvegetated Wetlands	9.5	0.0	1.1	10.7
Total	28.3	0.3	87.0	115.7

Summary of Impacts on Jurisdictional Resources

Both Alternatives NR-2 and NR-3 would result in impacts on jurisdictional resources. The alternatives would result in the permanent conversion of jurisdictional waters (2,402.1 acres under Alternative NR-3 and 1,294.9 acres under Alternative NR-2). Both alternatives would also result in permanent loss of jurisdictional waters (90.1 acres under Alternative NR-3 and 68.8 acres under Alternative NR-2). Finally, both alternatives would result in a temporary loss of jurisdictional waters (209.7 acres under Alternative NR-3 and 115.7 acres under Alternative NR-2). However, these impacts are small in comparison with the pond area to be created under each alternative (3,285 acres under Alternative NR-3 and 2,178 acres under Alternative NR-2) and the enhanced conditions to jurisdictional resources expected to occur through implementation of the alternatives. Given the small amount of permanent loss relative to the amount of habitat to be created and preserved and the receding condition of the Sea under the No Project Alternative, these impacts are considered less than significant.

4.1.2 Operational Impacts

In addition, operation and maintenance of the ponds and associated facilities would cause temporary disturbances to waters of the U.S. at intervals during the Project's life under Alternative NR-2 or NR-3. The steep earthen sides of the sedimentation basins would grow a narrow band of emergent wetland vegetation and tamarisk that would likely be removed at least annually during basin maintenance. Berms would be maintained by using the dredged sediment materials from the sedimentation basins and from the ponds.

4.1.3 Indirect Effects

The proposed Project, under both Alternatives NR-2 and NR-3, has been designed in a manner that minimizes indirect effects on waters of the U.S. Water control structures and sedimentation basins would ensure that sedimentation, erosion, scour, and other potential adverse effects on the Sea and adjacent wetlands would be minimized. Furthermore, the interception ditch would be designed and operated in a manner that balances local surface and subsurface water movement so that the amount of water in adjacent marshes is not affected.

4.1.4 Direct and Indirect Impacts on Jurisdictional Conditions

The Project area was evaluated to quantitatively determine the conditions within jurisdictional areas using CRAM as described in Section 3.1.2.1. CRAM was used to evaluate agricultural drainages, the New River, and some vegetated areas along the southern shoreline of the Salton Sea. These areas would be subject to direct impacts due to Project construction and the resulting conversion of these areas to either ponds or pond-associated infrastructure such as berms, sedimentation basins, and interception ditches under either Alternative NR-2 or NR-3. For the majority of the Project area under both alternatives, the Project represents a conversion of existing waters of the U.S. and unvegetated exposed playa to aquatic habitat (waters of the U.S.) with no vegetation. CRAM is not currently designed to assess unvegetated, aquatic habitats such as would be created by the Salton Sea SCH Project. Therefore, the typical Corps practice of predicting CRAM scores for post-Project conditions within the unvegetated aquatic areas cannot be applied to the majority of the Salton Sea SCH Project. Instead, a qualitative evaluation has been compiled based on predicted functional conditions of the unvegetated aquatic areas within the Project area. Following the qualitative assessment of unvegetated aquatic areas, a quantitative analysis conducted for the vegetated portions of the Project is summarized.

Although these analyses were completed for Alternative NR-3, a similar forecast would be predicted for Alternative NR-2 because of the largely similar features of both alternatives. The larger extent of ponds under Alternative NR-3 would result in slightly higher scoring in some categories (e.g., biotic function), due to the greater extent of saline wetland pond created under Alternative NR-3; however, it would also result in slightly lower scoring in other categories (e.g., hydrology), due to the increase in hydrologic modifications (e.g., construction berms) under Alternative NR-3 compared with Alternative NR-2.

4.1.4.1 Post-Project Unvegetated Aquatic Area Assessment

The buffer and landscape context condition is expected to remain relatively unchanged under either alternative. Project features, such as berms, sedimentation basins, and associated access roads, may have a negative effect on the buffer condition but would not constitute a break in buffers because these features could be used by wildlife.

The hydrology of the Project area would be highly altered by the Project under either alternative. The purpose of the Project is to develop hydrologic conditions that can support aquatic habitat, particularly for fish as a food source for avian species because these conditions are currently under threat. As with current conditions, hydrology would be largely dependent on artificial conditions and would have limited lateral movement of floodwaters due to constructed berms and water control structures. These predicted future conditions represent low ecological functions (as measured by CRAM and other assessment tools derived from natural systems), but are similar to existing conditions.

The physical structure of the Project area would be altered through Project construction activities (dredging and filling) required to create ponds and berms as well as bird habitat islands under either alternative. The Project is designed to provide stable, relatively uniform slopes along the edges; however, below the pond surface would be deeper escape channels for fish and within the ponds would be bird habitat islands. Thus, the typical functional measures for topographic complexity are expected to be greater than existing conditions.

Biotic structure, under CRAM, is focused on vegetative cover. The Salton Sea SCH Project, under either Alternative NR-2 or NR-3, is not intended to provide vegetated habitat areas, although some habitat areas would be developed to offset for permanent and temporary impacts on vegetated areas. The majority of the Project is instead intended to be developed as aquatic habitat with relatively minimal vegetative cover. Thus, biotic structure is expected to be low.

Additional biotic functions beyond those associated with vegetated features are expected to increase with implementation of either alternative. In addition to the aquatic habitat provided by the ponds themselves, new shallow shoreline would be created inside the berms on the fringes of the ponds that would provide foraging opportunities for shorebirds since an invertebrate population would be supported by the lower salinity conditions. Breeding functions for nesting birds, such as snowy plover, gull-billed tern (*Gelochelidon nilotica*), and Caspian tern would be supported along the shoreline of the SCH ponds, and predator-free nesting areas on islands within the ponds would be provided. Loafing opportunities for species such as white pelican would continue to be available along the shoreline within the berms as well as outside of the berms and on the berms themselves. Under the pond water surface, deeper meandering channels would be created to allow escape cover and safe passage for fish throughout the Project area.

4.1.4.2 Post- Project Vegetated Area Assessment

A post-Project analysis of functional condition was prepared to evaluate the anticipated ecological functions that could be expected within the vegetated areas of the SCH Project (Dudek 2012). With the exception of the locations of the four assessment areas on the New River, which remain unchanged, all assessment area locations had to be relocated and reconfigured due to Project construction, which would significantly alter the landscape. The future assessment areas were placed in areas thought to be appropriate based on the anticipated Project design and include both riverine and lacustrine areas (Figure 14) (Tables 11 and 12).

Table 11
Comparison of Average CRAM Attribute Scores between the Existing Conditions AAs and the Forecasted Post-Project Riverine AAs for Alternative NR-3

CRAM Attributes	Existing Condition AAs	Forecasted Post-Project AAs
Buffer and Landscape Context	82.5	84.3
Hydrology	66.7	71.4
Physical Structure	32.8	33.3
Biotic Structure	40.3	39.6
Overall Score	56.0	57.2

Table 12
Comparison of Average CRAM Attribute Scores between the Existing Conditions AAs and the Forecasted Post-Project Lacustrine AAs for Alternative NR-3

CRAM Attributes	Existing Conditions AAs	Forecasted Post-Project AAs
Buffer and Landscape Context	84.3	82.3
Hydrology	68.8	66.7
Physical Structure	31.3	25.0
Biotic Structure	50.8	44.5
Overall Score	60.0	55.0

Based on this analysis, the post-Project functional condition of the vegetated areas is expected to remain approximately the same relative to the pre-Project condition. For riverine wetland types, including the New River and the created interception ditch, functional conditions are expected to remain the same (from an average of 56.0 pre-Project to 57.2 post-Project, under Alternative NR-3), with only very slight increases in buffer and landscape context, hydrology, and physical structure attribute scores. For lacustrine wetland types, including the pond shorelines, functional conditions are expected to also remain the same (from an average of 60.0 pre-Project to 55.0 post-Project under Alternative NR-3) with only very slight decreases attribute scores. Both slight increases and declines forecasted are negligible and within the error precision tolerance for CRAM (e.g., 10 percent for overall index scores and 5 percent for individual attribute scores).

Figure 14 Assessment Areas Post-Project Forecast Overview Map

Buffer and landscape context conditions are expected to remain mostly the same because buffers would be present with little to no buffer interruptions (e.g., paved roads, developments). Within all of the assessment areas, buffer and landscape connectivity is expected to be suitable for wildlife movement. Similar to the pre-Project condition, each of the assessment areas is expected to contain a large assemblage of non-native vegetation, primarily salt cedar, which results in a low to moderate Buffer Condition score.

The agricultural drainages and interception ditches, when compared to the New River, are distinct from each other in their hydrologic characteristics. The functions and services of the wetland habitats associated with the New River would remain essentially unchanged. However, the interception ditch would be a new feature that functionally replaces the agricultural drainages that currently cross the exposed playa/seabed. The interception ditch would convey agricultural runoff around the ponds and into the Sea. It is anticipated that the hydrologic characteristics of the interception ditch would be similar to the agricultural drainages, with fluctuating, perennial flow that varies depending on the agricultural uses of the season.

The physical structure of the assessment areas is based on physical features (e.g., structural patch types) and the topographic complexity (e.g., variety of elevational gradients) within the waterways and Sea shore. Within all of the assessment areas, the physical structure is predicted to consist of mostly uniform slopes with little micro topography resulting in low scores for topographic complexity. Likewise, the drainages are predicted to exhibit minimal structural patch richness. Overall, the Physical Structure attribute receives the lowest scores of any of the CRAM attributes, as is the case with the existing conditions, which is indicative of the extensive management of the New River, as well as unnatural conditions of the agricultural drainages and interception ditches.

Similar to the baseline conditions, the vegetation communities are predicted to have little biotic structural diversity, both in types and distribution of vegetation communities and in overlap of tall, medium, and short plant layers. Also, the majority of the assessment areas are expected to either be dominated or co-dominated by non-native vegetation. These features are representative of a highly disturbed ecosystem, which is reflected in the low Biotic Structure attribute scores predicted for both the New River and the agricultural drainages.

Summary

As discussed above, the condition of the jurisdictional resources would be similar to existing conditions under either alternative, but would be higher than the predicted future conditions. Due to the receding condition of the Sea, jurisdictional resources would decline, as would their functions and services they provide. Although Alternatives NR-3 and NR-2 would result in similar short-term jurisdictional conditions, Alternative NR-3 would result in higher jurisdictional conditions long-term due to the additional jurisdictional resources that would be preserved.

4.1.5 Physical Substrate Impacts

Portions of the ground surface within the SCH ponds would be excavated (with a balance between cut and fill) to acquire material to build the berms and habitat islands resulting in disturbance of the physical substrate. Best management practices (BMPs) to be implemented include an Erosion and Sediment Control Plan (ESCP) and a Stormwater Pollution and Prevention Plan (SWPPP). Typical measures include preservation of existing vegetation to the extent feasible, installation of silt fences, use of wind erosion control (e.g., geotextile or plastic covers on stockpiled soil), and stabilization of site ingress/egress locations to minimize erosion. Additionally, the Project would comply with the Imperial County Air Pollution Control District's Regulation VIII rules for dust control (general requirements, construction and earthmoving activities, bulk materials, open areas, and conservation management practices), which are required for all projects.

Water would be used to perform hydrostatic tests of the saltwater and brackish water pipelines before they were put into service. The test water from the pipelines would be released into either one of the sedimentation basins or one of the SCH ponds. The water would be released in a controlled manner to minimize the potential for erosion, and any erosion that did occur would be contained within the basin or the pond, reducing potential impacts on physical substrate.

Exposed playa that was recently submerged would be used to construct the berms. It is highly saline and not considered topsoil. Topsoil along the existing New River berm would be removed during construction of the pipeline leading from the river to the ponds; however, this pipeline segment is very short (approximately 100 feet). Thus, any loss of topsoil would be minimal.

In general, the soils on the seabed are weak (in terms of expected stability in the context of constructed berms, etc.) and may be subject to erosion, piping, settlement, and spreading during the life of the Project. These factors would be considered during the geotechnical design and accommodated by allowing for settlement in the design and placement of soil, adding features such as a cutoff wall to avoid seepage, and using flatter side slopes on the berms to reduce seepage and add stability. The preliminary geotechnical investigation (Appendix C of the Draft EIS/EIR [Corps and Natural Resources Agency 2011]) showed that the Sea sediments at the pond sites are predominantly fine-grained soils with low strength. These types of soils would readily erode when exposed to even light wave action and are dispersive in fresh water and brackish water. Compressibility, seepage, and expansion potential are also issues that would need to be addressed through appropriate design. If seepage developed through or underneath a berm, the dispersive nature of the soils could lead to the loss of the embankment. Additional geotechnical analysis would be performed prior to construction, however, and the berms would be constructed following appropriate site-specific soil construction techniques, including the use of specialized equipment and flat to moderate slopes. The Project would not cause instability in the surrounding area, and should berm failure occurring during the life of the Project, this would be addressed by repairing the failed section, relocating a section of berm, or changing the berm cross section. Therefore, due to the ESCP and SWPPP that would be developed and approved prior to construction and the BMPs that would be implemented both during and immediately after construction and maintenance activities, the direct and indirect impacts to substrate would be less than significant.

Although there is less grading under Alternative NR-2, the nature of the impact would be similar under either alternative.

4.1.6 Water Circulation, Fluctuation, and Salinity Impacts

The Project is designed to manipulate water circulation, fluctuation, and salinity levels within the proposed SCH ponds. Based on a proof-of-concept model, each pond or set of ponds would be operated under different conditions to test the success of the habitat with different pond characteristics. The final operations would be decided at the end of the proof-of-concept period, expected to occur in 2025. Appendix D of the Draft EIS/EIR provides examples of the range of operations for the SCH Project (Corps and Natural Resources Agency 2011).

The main parameters subject to change include salinity, residence time,[3] and depth. They can be controlled by changing the amount and salinity of water delivered to the SCH ponds, the outflow to the Salton Sea, and the total storage in the ponds. The potential range of these parameters includes:

- Salinity: Typical range of 20 to 40 ppt, occasionally up to 50 ppt;
- Residence time: 2 to 32 weeks; and
- Depth: 4 to 6 feet at the exterior berm.

The biotic community (e.g., algae, invertebrates, fish, and birds) would respond in varying ways to these operations and other environmental conditions. These operations, ecological responses to the operations, and other key indicators or events at the ponds (e.g., water temperature, bird die-offs), would be monitored, and any necessary adjustments to operations would be made through a monitoring and adaptive management program (Appendix E of the Draft EIS/EIR).

Water Surface Elevation: The SCH ponds would lose about 72 inches of stored water to evaporation each year, similar to the adjacent Salton Sea. The total volume of water lost to evaporation would be equivalent to the evaporation rate multiplied by the surface area of the

[3]Residence time is the amount of time water entering the SCH ponds from the New River and Salton Sea would reside in the ponds before being released to the Sea.

SCH ponds. For a maximum surface area of 3,770 acres, about 22,460 af of water would be lost from the ponds per year. In the absence of the Project, this volume of water would otherwise flow to the Sea, where it would be subjected to a similar evaporation rate (slightly smaller because of the lake effect and the hypersaline conditions). As the Sea recedes, the surface area exposed to evaporation will decline, while the surface area of the ponds would remain constant. Thus, evaporation from the SCH ponds would remain constant while evaporation from the Sea will decrease over time.

From the initial Project operation in 2014 through the end of the proof-of-concept period in 2025, a maximum of approximately 269,460 af of water could be lost to evaporation from the SCH ponds. This loss would be partially offset by the decrease in evaporation from the Sea because the storage (and therefore the surface area of the Sea) would be less due to the SCH diversion and other reductions in inflow. By 2025, the volume of water stored in the Sea would be reduced by up to 156,700 af under Alternative NR-3 compared to the No Action Alternative, and the Sea's surface elevation would be about 0.9 feet or less lower.

By 2077, the Sea's depth (water surface elevation minus the bottom elevation of the Sea) would be reduced by up to 5.1 percent, and its water surface elevation would be about 1.0 foot or less lower as a result of the SCH diversions under Alternative NR-3.

The SCH ponds would cover playa that would otherwise be exposed under the No Action Alternative, and by 2077, the net effect would be to inundate an additional 1,150 acres of playa under Alternative NR-3 compared to the No Action Alternative, even though the Project captures water that would otherwise flow to the Sea, resulting in a smaller remnant Sea.

The Project would also result in a change to the Salton Sea's water surface elevation when compared to existing conditions. Most of the change, however, would be a consequence of the changes in inflow to the Sea, and not related to the Project. Table 13 shows the changes from existing conditions that occur under the No Action Alternative and the small increment associated with the Project. For example, by 2077 the water surface elevation of the Sea is expected to decline by 27.2 feet relative to existing conditions. While this is a substantial change in elevation, 1.0 foot of the change would result from Alternative NR-3 (0.7 foot from Alternative NR-2). That is, the Sea will get smaller, shallower, and saltier regardless of whether or not the SCH Project is implemented. 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 (process by which a water body acquires a high concentration of nutrients [e.g., nitrates and phosphates]), and related anoxia (decrease in oxygen) and algal productivity, threaten the Salton Sea ecosystem with the most immediate threat being the loss of fishery resources that support piscivorous birds. The Project would offset a portion of this lost habitat by providing new habitat that is usable by birds, fish, and other organisms. It would not, in itself, result in changes that would have an adverse effect on or preclude the beneficial uses of the Salton Sea identified in the Basin Plan (CRBRWQCB 2006).

Table 13
Salton Sea Surface Elevation and Area – No Action[1] and SCH Project Alternatives

	Elevation			Storage			Area		
	2014 (ft)	*2025 (ft)*	*2077 (ft)*	*2014 (af)*	*2025 (af)*	*2077 (af)*	*2014 (acres)*	*2025 (acres)*	*2077 (acres)*
Existing[2]	-231.0	—	—	6,744,357	—	—	227,299	—	—
No Action	-234.7	-248.4	-258.2	5,867,592	3,183,010	1,648,221	219,785	169,467	141,723
NR-3[3]	-234.8	-249.3	-259.2	5,845,137	3,026,286	1,504,769	219,493	166,413	139,097
Difference	-0.1	-0.9	-1.0	-22,455	-156,725	-143,451	-292	-3,054	-2,626
NR-2	-234.8	-249.0	-258.9	5,851,729	3,072,288	1,545,332	219,577	167,308	139,847
Difference	-0.1	-0.6	-0.7	-15,863	-110,723	-102,889	-208	-2,159	-1,875

Notes:
1. No Action modeled in Programmatic EIR, Appendix H-2, Attachment 2, Table H2-2-3 (Natural Resources Agency 2007).
2. Existing Conditions are represented by 2010 conditions.
3. Maximum change if all ponds are constructed.

Therefore, when comparing what is expected to occur in the near future with the proposed Project impacts, Project construction would have less than significant direct impacts on the Salton Sea water surface elevation. These impacts would be similar under both Alternatives NR-2 and NR-3. Alternative NR-2, due to a smaller pond area, would have slightly less hydrologic effect on the Sea.

Hydrologic effects on the New River, due to the diversion of water for the SCH ponds, is estimated based on simulations of possible Project operations to determine reductions in the average annual flow and the peak monthly flow immediately downstream of the diversion. The reduction would be present only in the portion of the river between the diversion and the Sea. The water would be returned to the Sea, less the evaporation loss that occurred while the water was in the SCH ponds. For the average annual condition under Alternative NR-3, the diversion would range from 7 to 51 percent of the New River flow, depending on the pond salinity and residence time. For the peak evaporation month (June), the reduction downstream of the diversion would range from 10 to 56 percent for the New River. The reductions in flow would be offset by the flow returned to the Sea from the ponds. Therefore, the hydrologic effects on the New River under Alternative NR-3 are expected to be less than significant. The effects would be slightly reduced under Alternative NR-2.

Flooding: The SCH ponds would be located on areas that are recently exposed (dry) playa or are currently submerged. Rainfall on the dry playa would infiltrate and/or drain to the Sea. Rainfall on the SCH ponds temporarily would be retained in the ponds and would not cause an increase in flooding. The drainage pattern of some IID drains would be altered by the SCH Project because some of them would be intersected by the interception ditch. The interception ditch would be designed to convey the historic flow in the drains and maintain a channel elevation that is lower than the elevation of the drains to avoid backing water into the drains. The IID drains would remain in a free-flowing condition, and connectivity between the drains and the Sea would be maintained. The interception ditch would also collect shallow groundwater that seeps from the SCH ponds. Therefore, the Project would alter the drainage pattern of the IID drains, but not substantially or in a manner that could result in substantial erosion, siltation, or flooding.

Water from the New River would supply the SCH ponds, but the course of the river would not be changed. The structures that would be used to divert water would be set into the river bank and stabilized with riprap, thus preventing erosion. Less water would be carried in the river after the water was diverted, thus lessening the potential for siltation, erosion, and flooding.

The proposed SCH site would be located adjacent to Flood Zone A defined by FEMA. The pumped diversion is designed to be recessed into the bank of the river in order to maintain the channel cross section and avoid collecting debris on the diversion works. In addition, the diversion would remove water from the river, thereby decreasing the flow and lowering the water surface elevation in the river at the diversion and downstream, which would reduce the risk of flooding.

Other structures constructed under this Project include berms, which are not habitable structures as defined by FEMA. Moreover, if the berms failed, the impounded water would be released directly to the Salton Sea or onto exposed playa where it would then flow to the Sea, and their failure would not expose people to risk of injury or death. The bottom of the sedimentation basin would be from 15 to 20 feet below the ground surface and, therefore, would not pose a flood hazard.

This Project would include a trailer or similar facility that would serve as office space for the permanent employees. It would be constructed on adjacent ground above the -228-foot elevation. This facility would be in Zone A delineated by FEMA and would be constructed in conformance with the Imperial County floodplain regulations for elevation, flood proofing, and tie-downs (for a trailer). These design features would reduce the flood potential and, therefore, by design avoid a flooding-related impact.

The proposed Project has been designed to reduce the potential of flooding both upstream of the Project site and downstream. The construction of the interception ditch is to allow the connectivity of the drains and the Sea in order to prevent flooding issues in the surrounding areas. In addition, any structures created would abide by County floodplain regulations to reduce the potential of impacts from flooding. Therefore, the construction of the proposed Project would have less than significant impacts on flooding. Because Alternative NR-2 includes facilities in the same locations as Alternative NR-3, it would have similar potential flooding impacts.

Salinity. The salinity of the Salton Sea already exceeds the Basin Plan objective (it currently is approximately 51 ppt, whereas the objective is 35 ppt). Because the diverted water under the proposed Project would pass through the SCH ponds, losing water only to evaporation, both water and salt would be returned to the Sea. The SCH ponds would temporarily store a volume of salt, a portion of which would be continuously released back to the Sea and a portion of which would be temporarily in storage. The amount in storage is related to the SCH salinity and the volume of the ponds, and the rate that is returned to the Sea depends on the residence time (2 to 32 weeks). The salt only would be stored temporarily; thus, the SCH ponds would not be a salt sink.

Although the total salt load of the Sea would not change as a result of the Project, the volume of water in the Sea would be reduced due to the decreased rate of inflow from the New River as a result of the SCH diversion. The following salinity levels are estimated for the onset of operations (2014), the end of the proof-of-concept period (2025), and the end of the Project's lifetime (2077). Under the No Action Alternative, salinity is expected to reach 59.0 ppt in 2014, 114.0 ppt in 2025, and 272.0 ppt in 2077. These levels can be compared with the levels predicted under full build-out of the proposed Project: 59.2 ppt in 2014, 119.9 ppt in 2025, and 297.9 in 2027 for Alternative NR-3. For Alternative NR-2, these levels would be slightly reduced in later years of the Project: 59.2 ppt in 2014, 118.1 ppt in 2025, and 290.1 in 2027.

Under either alternative, the Project would also result in a change to the Salton Sea's salinity when compared to existing conditions, but the salinity of the Sea would continue to increase regardless of whether the SCH Project were implemented. The Project would not, in itself, result in changes that would have an adverse effect on or preclude the beneficial uses of the Salton Sea identified in the Basin Plan. The construction of the proposed Project would have direct impacts to the Salton Sea by increasing the salinity about 9.5 percent by 2077 under Alternative NR-3 and 6.7 percent under Alternative NR-2; however, when compared to the future predicted conditions, the proposed Project only would create a slight increase, and the impact would be less than significant.

4.1.7 Suspended Particulate/Turbidity Impacts

The proposed Project may result in adverse effects related to suspended particulates and turbidity from diversion of New River flows and/or modification of the Salton Sea playa. Each of these potential circumstances is evaluated below.

Under the proposed Project, a portion of the New River's flow would be diverted through the sedimentation basins to allow sediment to settle out prior to conveyance and delivery of water to the SCH habitat ponds. Routine operations would include the removal and disposal of the sediments collected in the sedimentation basins. The resulting discharge from the SCH ponds to the Salton Sea would have a reduced sediment load, and thus, the Project would contribute to meeting the sedimentation/siltation total maximum daily load standard and would reduce turbidity (CRBRWQCB 2002b).

The SCH ponds, under either alternative, would have both interior and exterior berms. A berm failure could occur as a result of a seismic event, seiche, flood event, or other similar factor. The volume of sediment released would be about the size of the eroded portion of the berm. If an interior berm failed, sediment would enter the SCH ponds and would not affect other water bodies. If an exterior berm failed, nearby canals or drains would not be affected because the SCH ponds would be downgradient, and any water and sediment released from the ponds would flow away from them, toward the Salton Sea. However, water flowing over the exposed playa could pick up sediment from the berm failure and transport it to the Sea. If this were to occur, impacts on the Salton Sea would be short term, lasting only for several days. If a large-scale berm failure occurred, water would be released through the breach and either would enter the Sea directly (in the near term) or would be released onto the exposed playa (in the future). If a smaller breach occurred, the ponds would be drained both through the breach and through the release of water through the control valve. This release would also occur over several days. Sediment released into the Sea would settle and would not have a substantial effect on water quality. Impacts on the New River would occur only if a berm failed in the immediate vicinity of the river. This type of failure is unlikely because the elevation of the existing ground is above -228 feet, but should this occur, the sediment would temporarily degrade water quality of a short segment of the river, and the sediment would flow to the Sea. If failure were to occur, the berms would be repaired promptly and BMPs would be employed immediately to prevent additional sediment from eroding away from the site.

Both Alternatives NR-2 and NR-3 may have direct adverse short-term impacts on suspended particulates and turbidity for several days following berm failures. Both would, however, have a long-term benefit to the Salton Sea by trapping most of the sediment loads from the New River in the sedimentation basin and ponds and reducing the amount of sediment and turbidity within the Salton Sea at the outlet of the SCH ponds. Thus, impacts of suspended particulates and turbidity are considered to be less than significant.

4.1.8 Contaminant Impacts

Selenium. Existing (2004 to 2009) mean selenium concentrations in the New River are 3.2 μg/L (C. Holdren, Reclamation, unpublished data). These concentrations have varied little over recent years and are expected to be similar over the next few years. Under future conditions, selenium concentrations will increase by 2075 but will not exceed 10 μg/L (Natural Resources Agency 2007).

Under both Alternatives NR-2 and NR-3, a portion of the New River's selenium-laden flow would be diverted through the ponds before discharging to the Sea. The SCH ponds would be operated using blended inflow water with a selenium concentration between the New River (mean < 3.5 µg/L) and Salton Sea (< 2 µg/L). For 20 ppt salinity (this would be the worst-case scenario for selenium under existing conditions and near-term conditions), the inflow selenium concentration would be 2.6 µg/L (Sickman et al. 2011). Shortly after the ponds were constructed and first filled with water, selenium concentrations in the ponded water would be expected to increase due to solubilization of oxidized selenium from the rewetted playa sediments (Amrhein et al. 2011, summarized in Corps and Natural Resources Agency 2011, Appendix I). Selenium concentrations in overlying water (approximately 1 meter deep) could increase by approximately 0.9 µg/L (Amrhein et al. 2011). The total load of selenium solubilized and released to the Salton Sea would depend on the amount of playa sediments exposed and oxidized (this increases each year as the Sea recedes), available iron oxides in sediments (these bind selenium and reduce the amount solubilized in water) (Amrhein et al. 2011), and the size of the ponds that would be constructed and inundated. However, this "flush" would be temporary and would likely decline over the first 1 to 2 years. This is supported by findings from the Reclamation/USGS SHP, where the water selenium concentration and frequency of elevated egg selenium concentrations declined after the first year (Miles et al. 2009). Sickman et al. (2011) suggested that saline wetlands at the Salton Sea appear to develop selenium removal pathways (i.e., volatilization or sequestration) within the first 1 to 2 years after construction. Reducing water retention time and increasing flow-through of the ponds for several weeks or months following initial filling could be used to flush soluble selenium from the ponds (Amrhein et al. 2011).

If a minimal amount of selenium were removed within the ponds, the selenium concentration of the discharge would be 2.6 µg/L under existing conditions, and potentially elevated by approximately 0.9 µg/L during the initial wetting period. These levels would still be below the water quality objective of 5 µg/L. In the future, however, the discharge may exceed this standard, depending on the water blending ratios needed to achieve suitable salinities (Sea salinity is increasing, so the ponds would use less Sea water in the future) and the future selenium concentrations in the river (up to 10 µg/L possible). Nevertheless, this concentration would be lower than the concentration of New River water directly flowing to the Salton Sea.

In conclusion, there would likely be an increase in total selenium load reaching the Sea compared to the existing conditions and No Action Alternative. This increase, however, would be temporary (lasting 1-2 years), and the relative magnitude of selenium load compared to the amount present in river-source water would be less than significant. The selenium discharged to the Sea would be diluted and assimilated, given the Sea's much greater volume and its assimilative capacity in its anoxic sediments; therefore, the proposed Project would not affect the Sea's selenium loading or waterborne concentrations.

Dissolved Oxygen. Operation of the SCH ponds would use nutrient-rich New River water blended with Salton Sea water. Water quality modeling (B. Barry and M. Anderson, University of California Riverside, unpublished data) indicates that the ponds would sustain high primary productivity, with phytoplankton blooms in March through May and in October. This high primary productivity would result in periods of anoxia both daily (near dawn due to respiration of all organisms present) and seasonally (especially in spring and fall). SCH pond water discharged to the Salton Sea during these anoxic periods would have lower levels of dissolved oxygen, potentially lower than the CRBRWQCB (2006) water quality objective of 5 mg/L, but this would be offset by aeration that would occur as it cascades from the outfall structure. Furthermore, this lowering of dissolved oxygen would have only a localized effect that would be quickly dissipated in the larger Sea, assisted by wave action. The proposed Project is expected to have a direct short-term, localized impact on dissolved oxygen entering the Sea, but this impact would be less than significant. The impact is expected to be similar regardless of which alternative is implemented.

Nutrients. Operation of the SCH ponds would include the blending of New River water and Salton Sea water. Total phosphorus concentration in the SCH pond water would be greater than in the Salton Sea (> 122 µg/L), but less than in the New River (< 1,031 µg/L). The concentration of total phosphorus in SCH pond water discharged into the Salton Sea would exceed the draft numeric target of 35 µg/L (0.035 mg/L), but this exceedance already occurs for river water discharging directly to the Sea. Therefore, Alternatives NR-2 and NR-3 would not contribute additional concentrations of total phosphorous into the Sea. Release of phosphorus would temporarily stimulate local algae production and reduce water quality conditions. Any potential effect would be localized and temporary because the pond discharge would be rapidly dissipated in the considerably larger volume of the Sea; therefore, proposed Project impacts on nutrients would be less than significant. The impact is expected to be similar regardless of which alternative was implemented.

Pesticides and other Contaminants: Project construction would last approximately 2 years, during which time sediment and associated pesticides inputs to the Salton Sea and New River might be increased. Construction activities would temporarily increase suspended sediment in waters of the Sea. Re-suspended bottom sediments would allow release of previously deposited water-soluble contaminants. With regard to pesticides, disturbance of bottom sediments in those areas where berm construction and excavation of swales would occur would redistribute buried DDT residues and pyrethroid pesticides into the water column, particularly at East New River. Pyrethroid pesticides (Fojut and Young 2011), as well as DDT and residues, are highly hydrophobic, however, and would likely remain bound to disturbed sediments that would remain in the ponds and berms. In addition, potential inadvertent releases of hazardous materials into nearby waters during construction would temporarily degrade water quality at the Salton Sea. Generally, these potential impacts would be short term and limited to the duration of construction.

Both Alternatives NR-2 and NR-3 would include an ESCP and SWPPP for construction and maintenance activities. These plans would address the potential for erosion and incorporate appropriate protections into the design. Although DDT residues could remain in the surface sediments beyond the 2-year construction period, concentrations would likely be similar to elevated concentrations already present in several other nearby habitats. Resuspension and redistribution of almost exclusively sediment-bound pyrethroids would be unlikely to increase pyrethroid toxicity over existing levels, based on ongoing input of pyrethroids from agricultural drainage and pesticide concentrations currently measured in waters entering the Salton Sea. Therefore, direct and indirect impacts from pesticides and other contaminants would be short-term, lasting only during the construction period (2 years), and would be less than significant. The impact is expected to be similar regardless of which alternative is implemented.

4.2 Biological Impacts

4.2.1 Vegetation Communities

Project construction activities would result in removal of vegetation communities, particularly stands of tamarisk adjacent to the New River, depending on the amount of excavation for material to construct the ponds and berms. For areas to be inundated by the ponds or where structures would be placed (e.g., access roadways along the river berms, river water intake), the loss would be permanent. Vegetation communities would also be temporarily disturbed or removed for construction of the water delivery pipelines, construction work areas, and designated staging areas. However, Project features outside the ponds would be sited to minimize or avoid impacts on vegetated wetland communities to the maximum extent feasible.

As discussed in Section 4.1.5, the SCH ponds are expected to provide high-functioning aquatic habitat that is not directly comparable to existing functions of vegetated wetlands. Overall, existing functional scores are relatively low and not expected to be substantially negatively affected by implementation of the proposed Project. Based on these factors, the conversion of vegetation communities to aquatic habitat within the SCH ponds is not considered a substantial adverse impact.

Conversion of existing vegetation communities to SCH pond infrastructure, such as berms, sedimentation basins, etc., does represent a potentially substantial adverse loss of wetland functions that would require mitigation measures to reduce the impacts.

Tables 14 and 15 list the estimated maximum permanent and temporary impacts on vegetation communities that would occur based on existing conceptual layout of facilities and existing vegetation conditions under Alternatives NR-3 and NR-2. The impacts under both alternatives are the same because the additional ponds proposed under Alternative NR-3 would be located in areas that are unvegetated (i.e., open water). Quantification of direct permanent and temporary impacts would be refined at the time of construction and documented in the Final Habitat Mitigation and Monitoring Plan (HMMP) to be prepared for the proposed Project.

Table 14
Maximum Permanent Impacts on Mature Vegetated Resources*

Impact Type	Habitat Type	Jurisdictional Vegetation Impacts (Acres)[1]	Non-Jurisdictional Vegetation Impacts (Acres)
Pond	Cattail Marsh	16.8	--
	Tamarisk Scrub	30.5	7.3
	Tamarisk Woodland	6.3	0.1
	Subtotal	53.6	7.4
Berms	Cattail Marsh	0.9	--
	Common Reed Marsh	0.1	--
	Tamarisk Scrub	4.5	1.0
	Tamarisk Woodland	7.2	0.2
	Subtotal	12.7	1.2
Sedimentation Basins	Tamarisk Scrub	1.0	0.1
	Tamarisk Woodland	1.7	0.5
	Subtotal	2.7	0.6
Interception Ditch	Cattail Marsh	1.0	--
	Tamarisk Scrub	2.3	--
	Iodine Bush Scrub	0.9	--
	Subtotal	4.2	--
New River Crossings	Common Reed	0.2	--
	Tamarisk Scrub	0.2	0.1
	Tamarisk Woodland	0.4	--
	Subtotal	0.9	0.1
	Grand Total	74.1	9.4

*Note that the impact acreages listed in this table are the maximum possible under the proposed Project design and assume that the entire Project would be built. Impact acreages would likely be less than this because the entire Project area would likely not be utilized for the Project.
[1] Numbers may not total due to rounding.

Table 15
Temporary Impacts on Vegetated Resources*

Impact Type	Habitat Type	Jurisdictional Vegetation Impacts (Acres)	Non-Jurisdictional Vegetation Impacts (Acres)
Staging Areas	Common Reed Marsh	0.5	--
	Iodine Bush Scrub		65.0
	Quailbush Scrub	0.5	11.4
	Tamarisk Scrub	8.4	7.0
	Tamarisk Woodland	1.6	0.8
	Subtotal	11.0	84.2
New River Crossings	Common Reed	0.1	--
	Tamarisk Scrub	0.1	--
	Tamarisk Woodland	0.2	--
	Subtotal	0.4	0.0
Interstitial Areas (between perimeter berms and outer edge of Project)	Cattail Marsh	5.7	--
	Common Reed Marsh	0.1	--
	Iodine Bush Scrub	4.1	--
	Tamarisk Scrub	12.9	0.8
	Tamarisk Woodland	3.1	0.5
	Subtotal	25.9	1.3
	Grand Total	37.3	85.6

*Note that the impact acreages listed in this table are the maximum possible under the proposed Project design and assume that the entire Project would be built. Impact acreages would likely be less than this because the entire Project area would likely not be used for the Project.

Mitigation Measures

The EIS/EIR for the Project includes Mitigation Measure (MM) BIO-5, which would offset permanent impacts resulting from the footprint of SCH pond infrastructure facilities, as well as temporary impacts from construction activities, including staging. MM BIO-5 requires preparation of a Habitat Protection, Mitigation, and Restoration Program. The program would detail measures to avoid impacts/disturbance of habitat, specifically during the bird breeding season; quantify the maximum area of each plant community that may be temporarily or permanently removed during construction; and provide methods for restoration of those plant communities including on- or off-site restoration locations, use of native seed sources, details for planting, irrigation, maintenance, and monitoring, with ultimate success determined through defined performance criteria.

As discussed above, the applicant and the EIS/EIR propose numerous measures to be implemented along with either alternative chosen that would mitigate the direct and indirect impacts to biological resources.

4.2.2 Threatened and Endangered Animals

The Project, under either alternative, has the potential to adversely affect the following Federally listed species: desert pupfish, California least tern, least Bell's vireo, southwestern willow flycatcher, and Yuma clapper rail. Potential impacts on each species are discussed below.

4.2.2.1 Desert Pupfish

It has been determined that the Project, under either alternative, would likely adversely affect desert pupfish. Desert pupfish are present in agricultural drains and in shallow water along the Sea's shoreline, and construction activities for the ponds and diversion of the drain outflows around the Project area would result in habitat loss, alteration of adjacent habitat through turbidity, and mortality of some individuals. As a consequence, it is foreseeable that construction and maintenance of these features has the potential to result in permanent and temporary direct impacts on the desert pupfish. However, the SCH Project would provide up to approximately 1,693 acres of suitable desert pupfish habitat within the 3,770 acres of SCH ponds under Alternative NR-3 or approximately 1,089 acres of suitable desert pupfish habitat within the 2,670 acres of SCH ponds under Alternative NR-2. Thus, while some impact to pupfish and their habitat would occur, there would be an increase in suitable habitat for pupfish.

Loss or Harm to Individuals

If construction activities occurred during the desert pupfish breeding season (approximately April through October), reproductive success for those mature pupfish in the Project footprint would be greatly reduced. Since the species generally does not live more than 2 years, loss of reproduction for 1 year could have substantial effects on the population size at a specific location. However, if a location remains connected or is reconnected to desert pupfish habitat, immigration and a subsequent population rebound can be expected. Construction of the pump stations and pipeline for bringing saline water from the Salton Sea to mix with the river water for salinity control in the ponds would be from a barge and the adjacent berm and would temporarily affect a small area of the Sea, primarily through underwater sound and turbidity. Few, if any, desert pupfish would be affected by this construction activity. As the Sea recedes, the outer pump station would need to be moved, or another one built, and the pipeline extension placed on or within the exposed playa/seabed. By that time, salinity in the Sea would exceed the tolerance of desert pupfish, and construction would not affect them. Desert pupfish have been shown experimentally to survive in 90 ppt salinity, but they succumb in situ when salinity approaches 70 ppt.

Operation of the pump stations to bring saline water to the ponds has the potential to entrain desert pupfish until the Sea becomes too saline for their survival. The intake would be screened until that time, and maintenance activities to clean or to replace the screen could affect pupfish in the intake's immediate vicinity. Maintenance of the pump stations could result in release of lubricants or other chemicals potentially toxic to pupfish. Due to the proposed location of the pump stations (adjacent to the outer berm and offshore from the ponds), few desert pupfish are likely to be affected by maintenance activities.

When the Sea's salinity or water quality exceeds their tolerance, any desert pupfish entering the overflow would be killed. Water from existing agricultural drains that discharge to the Sea where the ponds would be built would be diverted around the ponds by new interception ditches to the east and west. Habitat used by pupfish in those drains would remain, but the individual drain connections to the Sea would be combined into as many as three connections, thereby resulting in a greater distance for desert pupfish to traverse in the Sea between the new (combined) drain outlets. Construction of the new drain interception ditches would disturb existing pupfish habitat at the mouth of the drains and could disrupt spawning, depending on time of year, or result in injury or mortality of individuals. The new drain interception ditches, once completed, would provide habitat for desert pupfish, but maintenance of these channels would cause periodic disturbance within that habitat and could result in disturbance to spawning or mortality of some individuals.

Maintenance activities for the ponds also could affect desert pupfish that are present in the ponds. Turbidity effects, disturbance of feeding and spawning areas, and direct mortality could occur. The inclusion of other fish species in the ponds would likely result in competition and possibly predation. Dropping the water level of one or more ponds for maintenance could strand desert pupfish resulting in mortality from desiccation or predation by birds. Under an emergency situation, draining one or more of the ponds for maintenance could occur and would strand desert pupfish resulting in the same types of mortality.

Loss of Suitable Habitat

The Project would result in a permanent isolation of existing shallow shoreline habitat (up to approximately 8.1 miles) where the ponds are constructed compared to current conditions. The acreage of open water that would be altered is as much as 2,221 acres, and an additional maximum of 13 acres of drainage ditches and irrigation canals would be altered. Pupfish, however, would still be able to move around (outside) the ponds via the Sea until salinity exceeds their tolerance in about 2020. The ponds would overflow directly into the Sea, and pupfish could enter that overflow. When the Sea's salinity or water quality exceeds their tolerance, any desert pupfish entering the overflow would be killed.

Habitat Gain

Although the SCH ponds are not specifically designed to provide pupfish habitat, the shallow water within them would be suitable habitat, and some pupfish are likely to be trapped in the ponds during construction if the downslope (offshore) berms are installed "in the wet" rather than on the exposed playa. The DFW would also inoculate the ponds with pupfish. These pupfish would likely persist due to the proposed water quality for the ponds but would be isolated (physically and genetically) from those in the Salton Sea and its connected waters. Isolation of populations in the drains and tributaries would also occur in approximately 2020; therefore, the proposed Project would have the same effect as what would naturally occur in future conditions (No Action Alternative). The DFW would manage the genetic health of the population in the SCH ponds by infusion of fish from outside populations as necessary.

The EIS/EIR for the Project includes mitigation that requires the preparation and implementation of a desert pupfish protection and relocation plan. The plan is intended to address pupfish protection and relocation during construction as well as during future maintenance activities within the Project. Included in the plan are protocols for preconstruction or premaintenance surveys, pupfish capture and release, optimal timing to minimize impacts on pupfish spawning, and maintenance of screens to control movement when salinity of the Salton Sea exceeds thresholds that allow pupfish to live.

Adaptive management procedures that include assessment of mitigation measure effectiveness, development of revised measures to improve effectiveness, and similar assessment of revised measures to verify effectiveness. In summary, SCH Project activities have the potential to directly and indirectly impact desert pupfish and alter their habitat even with the implementation of the mitigation measures. However, a gain of suitable habitat would also occur, fully offsetting the habitat loss. In consideration of the aforementioned analysis, mitigation measures identified above and any additional requirements specified in the Biological Opinion from the USFWS for the Project would minimize and/or mitigate for impacts to desert pupfish populations and their habitat.

Impacts under Alternative NR-2 would be less than under Alternative NR-3; however, less suitable habitat would be constructed due to the smaller acreage of SCH ponds developed under Alternative NR-2.

4.2.2.2 California Least Tern

It has been determined that the Project would have no effect on California least tern. Least terns have not been recorded breeding at the Sea (Patten et al. 2003). This species was not observed in the 2009 aquatic surveys (USFWS 2010b) or by Dudek in 2010.

4.2.2.3 *Least Bell's Vireo*

It has been determined that the Project, under either alternative, may affect, but is not likely to adversely affect least Bell's vireo. Within the SCH Project area, suitable least Bell's vireo habitat exists in tamarisk riparian habitat, which occurs primarily along the New River. The tamarisk habitat occurs in association with the two main rivers that empty into the Salton Sea: New River and Alamo River. The habitat occurs along the edges of the rivers often as a very narrow band of vegetation. In some areas, the tamarisk scrub widens out and forms more of a patch of habitat versus a linear strip of vegetation. Based on past surveys, it is unlikely that the species occurs in this region; however, some habitat suitable for both breeding and migratory stopover is present.

Loss of or Harm to Individuals

During migration, construction activities could disturb least Bell's vireos but are unlikely to result in significant impacts on these birds. If least Bell's vireos breed onsite in the future, maintenance activities could result in nesting failure and possible mortality of a few individuals, primarily nestlings during the breeding season. The low lift pump diversion at the SCH ponds would be located adjacent to the New River. This potential impact is anticipated to be minimal and could be avoided by timing maintenance activities at those locations for outside the breeding season. If least Bell's vireo were to nest within the Project area in the future within stands of tamarisk that remain within the Project, maintenance activity disturbance could cause failure of nesting and possible mortality of some individuals. Mitigation measures incorporated into the environmental analysis of the Project include measures to conduct surveys if activities are planned during the breeding season and to avoid maintenance activities that would disturb breeding behavior/success (e.g., delaying maintenance activities or implementing noise attenuation).

Loss of Suitable Habitat

Suitable habitat for the least Bell's vireo occurs within 99.1 acres of tamarisk riparian habitat along the New River within the SCH pond area. Construction activities for the river diversion as well as the berm improvement and road construction along both sides of the river between the ponds could result in riparian habitat loss if they occur during migration. While loss of habitat is anticipated to be minimal, noise and human activity immediately adjacent to the riparian corridor could adversely affect breeding for any individuals present in that area if construction activities occur during the riparian bird breeding season (April through September) and would thus result in making the habitat unsuitable for them. Mitigation measures as identified above including preconstruction surveys, biological buffers, and noise attenuation measures to reduce impacts.

In summary, construction activities, maintenance taking place in vireo habitat, and permanent and temporary losses of riparian habitat associated with the SCH Project would have direct and indirect impacts on least Bell's vireo and their suitable habitat. Mitigation measures identified above and any additional requirements specified in the Biological Opinion from the USFWS for the Project would minimize and/or mitigate for impacts to least Bell's vireo and their habitat.

Impacts under Alternative NR-2 are largely similar to Alternative NR-3 because most of the tamarisk habitat is near the shoreline and along the New River where to the alternatives have nearly identical development features.

4.2.2.4 Southwestern Willow Flycatcher

It has been determined that the Project, under either alternative, may affect, but is not likely to adversely affect southwestern willow flycatcher. Development activities have the potential to temporarily displace southwestern willow flycatchers from some habitat areas and to reduce their ability to successfully form pairs, establish territories, build nests, forage, and defend their territories and young. Within the SCH Project area, suitable southwestern willow flycatcher habitat exists in tamarisk riparian habitat, which occurs primarily along the New River. The habitat occurs along the edges of the river often as a very narrow band of vegetation. In some areas, the tamarisk scrub widens out and forms more of a patch of habitat versus a linear strip of vegetation. Willow flycatchers were observed along the New River within the survey area as well as in a patch of habitat located south of the New River, also known as Bruchard Bay. While the identification of the birds detected in 2010 was not confirmed, there is some potential for the observed individuals to be the southwestern willow flycatcher (Patten et al. 2003). Migratory stopover areas, for either the migrant willow flycatcher subspecies (most likely the little willow flycatcher [*E. t. brewsteri*]) or the southwestern willow flycatcher subspecies, may provide critically important resources affecting local and regional flycatcher productivity and survival (Sogge et al. 1997). Thus, this species should be considered to potentially breed on site or to use the site for migratory stopover purposes.

Loss of or Harm to Individuals

Because the southwestern willow flycatcher is highly mobile and has not been observed nesting within the SCH Project area, there is little potential for Project-related construction to result in harm to, or mortality of, willow flycatchers. However, should this species nest within the SCH Project area in the future, implementation of the proposed Project could result in mortality of southwestern willow flycatchers due to destruction of nests and loss of young if construction activities occurred during the nesting season.

It is foreseeable that short-term, construction-related impacts could potentially affect the southwestern willow flycatcher in areas adjacent to construction zones. These secondary impacts include construction-related noise and ground vibration, fugitive dust, nighttime illumination, and contact with polluted runoff, and could potentially harm individual birds, young, and/or eggs. In particular, construction-related noise, vibration, and nighttime illumination could adversely affect nesting and breeding behavior, resulting in a decrease in nesting success. Mitigation measures incorporated into the environmental analysis of the Project include measures to conduct surveys if activities are planned during the breeding season and to avoid maintenance activities that would disturb breeding behavior/success (e.g., delaying maintenance activities or implementing noise attenuation).

Maintenance activities could result in a minor amount of riparian habitat loss or disturbance at the diversion location and where the river and Sea water pipelines enter the ponds. During migration, these activities could disturb southwestern willow flycatcher but are unlikely to result in significant impacts on these birds. If southwestern willow flycatchers breed on site in the future, maintenance activities could result in nesting failure and possible mortality of a few individuals, primarily nestlings during the breeding season. The low lift pump diversion at the SCH ponds would be located adjacent to the New River and operations of the pump may disrupt breeding of this species. Maintenance of and driving along the river berms during the nesting season could have similar impacts. This potential impact is anticipated to be minimal and could be avoided by timing maintenance activities at those locations for outside the breeding season. In addition, noise measures as discussed above would also be implemented for maintenance and operation activities that have been identified within the proximity of nesting southwestern willow flycatcher.

Loss of Suitable Habitat

Suitable habitat for the southwestern willow flycatcher occurs within 99.1 acres of tamarisk riparian habitat along the New River within the SCH pond area. Construction activities for the river diversion, as well as the berm improvement and road construction along both sides of the river between the ponds, could result in riparian habitat loss. If southwestern willow flycatcher were to nest within the SCH Project area in the future within stands of tamarisk that remain within the Project, riparian habitat loss from maintenance activities or due to disturbance could cause failure of nesting and possible mortality of some individuals. While loss of habitat is anticipated to be minimal, noise and human activity immediately adjacent to the riparian corridor could adversely affect breeding for any individuals present in that area if construction activities occur during the riparian bird breeding season (April through September) and would thus result in making the habitat unsuitable for them.

In summary, the southwestern willow flycatcher is highly mobile, has not been documented to nest in the SCH Project area, and is only expected to use on-site riparian habitat during migration periods, although there is potential for breeding on site. Thus, there is little potential for Project-related construction or operations, or for potential long-term secondary impacts, to result in direct impacts to willow flycatchers; however, implementation of the proposed Project could result in mortality of southwestern willow flycatchers due to destruction of nests and loss of young if such construction/grading activities occurred during the nesting season and nesting occurred on site. If southwestern willow flycatchers were to nest in the Project area in the future, maintenance activities could affect reproductive success of pairs nesting near such activities. Mitigation measures identified above and any additional requirements specified in the Biological

Opinion from the USFWS for the Project would minimize and/or mitigate for impacts to southwestern willow flycatchers and their habitat.

Impacts under Alternative NR-2 are largely similar to Alternative NR-3 because most of the tamarisk habitat is near the shoreline and along the New River where the alternatives have nearly identical development features.

4.2.2.5 Yuma Clapper Rail

It has been determined that the Project, under either alternative, may affect, but is not likely to adversely affect Yuma clapper rail. Development activities have the potential to temporarily displace Yuma clapper rails from occupied habitat and to reduce their ability to successfully form pairs, establish territories, build nests, forage, and defend their territories and young. Suitable Yuma clapper rail habitat exists in several freshwater marsh areas that occur near the Project area. Human activity and noise may potentially interfere with establishing territories and nesting.

Loss of or Harm to Individuals

Yuma clapper rails are present within freshwater marsh habitat along the drains or within freshwater marsh habitat immediately adjacent to the Project footprint. There would be no direct impacts on occupied freshwater marsh habitat because all suitable habitat is located outside of the Project footprint. Construction noise and activity near areas occupied by Yuma clapper rail, such as within Bruchard Bay or other marshes in Unit 1, could result in nesting failure if such activities occur during the breeding season (March through August). Due to the low population size of this species, any loss of individuals or their annual reproduction could adversely affect the population size. Mitigation measures incorporated into the environmental analysis of the Project include measures to conduct surveys if activities are planned during the breeding season and to avoid maintenance activities that would disturb breeding behavior/success (e.g., delaying maintenance activities or implementing noise attenuation). Furthermore, the design of interception ditches would be such that the amount of water in existing adjacent marshes (including those occupied by Yuma clapper rail) would not be affected.

Loss of Suitable Habitat

Operation of the interception ditches, particularly in NWR Unit 1 (southwest of the New River), could reduce the amount of water in adjacent marshes such as Bruchard Bay through interception of subsurface flow. Loss or alteration of marsh habitat could affect Yuma clapper rail breeding because it would reduce potential breeding habitat. Maintenance or construction within the drain interception ditches would have the potential to affect breeding habitat of this species if marsh vegetation develops in the channels, is colonized by the species, and is cleared during the nesting season. In summary, Yuma clapper rails are known to occur within suitable habitat adjacent to the Project area. Thus, there is a potential for Project-related construction or operations to result in indirect impacts on the Yuma clapper rail. Mitigation measures identified above and any additional requirements specified in the Biological Opinion from the USFWS for the Project would minimize and/or mitigate for impacts on Yuma clapper rails and their habitat.

Impacts under Alternative NR-2 are largely similar to Alternative NR-3 because both alternatives include ponds adjacent to Yuma clapper rail occupied habitat areas.

4.2.3 Fish, Crustaceans, Mollusks, and other Aquatic Organisms in the Food Web

Some aquatic organisms would be entrained with the water diverted from the New River and end up in the sedimentation basins and ultimately in the SCH ponds. Since they are freshwater species, many would survive in the sedimentation basin, but none is expected to survive in the ponds, which would typically be managed at salinities above 20 ppt. River flow downstream of the diversion would be reduced by less than 50 percent, which would also reduce the amount (volume) of aquatic habitat and its structure (e.g., depth). However, these potentially adverse conditions would only affect individuals of or habitat for non-native aquatic species that reside in the New River.

Although the Project generally would benefit aquatic species, some water quality instabilities are likely to occur, at least in some of the ponds, which could affect aquatic organisms. The nutrient load in the New River would sustain high primary productivity (primarily phytoplankton) to support invertebrates and fish. As a result, dissolved oxygen in the ponds could become very low at times, such as near dawn, due to respiration of all organisms present. Water temperatures are also expected to fluctuate in these shallow ponds on a daily and seasonal basis with thermal stratification occurring at times. The lower thermal and dissolved oxygen tolerances for fish may be exceeded under certain environmental conditions, but not necessarily at the same time, resulting in fish kills that reduce the population size in the ponds where this phenomenon occurs. The lower dissolved oxygen tolerance for some benthic invertebrate species that provide food for fish may also be exceeded at times in some locations, primarily in the deeper portions of some ponds. The duration of such events is expected to be short with rapid recovery of the fish and invertebrate populations. Impacts on aquatic species would be less than significant, but loss of adequate fish for forage could affect piscivorous birds that rely on the ponds for forage. The level of effect would depend on how extensive the fish die-off was (i.e., what proportion of fish present were killed in a pond and how many ponds were affected). The Project is designed to test various pond designs with monitoring to determine what works best to meet the Project goals and objectives and would be outlined in the adaptive management plan that would be developed for the Project.

The Project would result in a temporary disturbance or loss of shallow shoreline habitat (up to approximately 8.1 miles under either Alternative NR-2 or NR-3) where the ponds would be constructed compared to current conditions. Individuals of shoreline and shallow water foraging species would still be able to move around (outside) the ponds and forage along the Sea's other shoreline areas. Although the SCH ponds are not specifically designed for species that forage on invertebrates, the shallow water within them would provide the same amount or more suitable foraging habitat. The part of the existing shoreline not altered by the shoreline low berm, associated road, and slope protection would again be available for nesting and foraging upon completion of construction, and shorelines along the pond berms could provide additional habitat, although it may be rocky rather than sedimentary due to slope protection.

Therefore, the Project's overall effects on aquatic organisms are considered less than significant under either Alternative NR-2 or NR-3.

4.2.4 Contaminants in the Food Web

Contaminants in the water and sediment, such as selenium and pesticides, could impact biota using the SCH ponds. Breeding species that could be exposed to selenium by feeding at the SCH ponds include gull-billed tern, California brown pelican, double-crested cormorant, Caspian tern, black skimmer (*Rynchops niger*), black-necked stilt, American avocet, and western snowy plover (*Charadrius alexandrinus nivosus*). Ecorisk modeling was used to estimate potential selenium concentrations in water and biota for different Project alternatives and operations (model scenarios of river water blended with Salton Sea water to achieve 20 or 35 ppt salinity in ponds) (Sickman et al. 2011; see Appendix I of the Draft EIS/EIR). For the proposed Project, estimated fish tissue selenium concentrations would be 4.3 to 5.5 µg/g dw in ponds operated at salinities of 20 to 35 ppt, which exceeds a protective standard of 4.0 µg/g dw (Lemly 2002) but is similar to or less than existing levels at the Salton Sea and rivers (Natural Resources Agency 2007; Johnson et al. 2009; Saiki et al. 2010). Bird egg selenium concentrations would be 6.0 to 8.3 µg/g dw in ponds operated at salinities of 20 to 35 ppt, and less than 6 µg/g dw for ponds operated at 40 ppt or greater. This egg selenium concentration exceeds the conservative toxicity threshold (> 6.0 µg/g dw), which would increase the probability of reduced hatching success in some species, but would not reach levels associated with teratogenesis (>12 µg/g dw) (Ohlendorf and Heinz 2011).

The actual magnitude of selenium impacts for the SCH Project would be lower than estimated by Sickman et al. (2011). First, the ecorisk model assumed all diet comes from the SCH ponds. The actual concentrations would likely be lower than modeled because the birds' foraging range would include other habitats beyond the SCH ponds. For example, the actual concentration could be less for gull-billed terns because they forage extensively in agricultural fields and drains as well as over the Salton Sea. Second, when the model was run using parameters estimated from the SHP complex, the modeled egg selenium concentrations were greater than the actual measured egg concentrations (Miles et al. 2009), indicating that this ecorisk model is a very conservative estimator of risk. Third, selenium concentrations decreased over time at other constructed habitats in the region, both in sediment of freshwater treatment wetlands (Johnson et al. 2009) and eggs from saline ponds (Miles et al. 2009), which suggests that selenium removal pathways could develop within the first 1 to 2 years after construction (Sickman et al. 2011). Impacts of the Project on common bird reproductive success would be less than significant for bird species that forage on invertebrates due to the availability of other freshwater marsh foraging habitat in the area. For species of piscivorous birds that nest at the Sea, such as the Caspian tern, a reduction in breeding success would be unlikely, at least until fish are no longer present in the Sea, because foraging would not be limited to the SCH ponds and pond management to minimize the selenium risk would occur. To minimize selenium bioaccumulation through detritus, the SCH ponds and sedimentation basins would be designed and operated to discourage the growth of emergent vegetation, such as cattails and bulrushes, which contribute high amounts of organic matter.

Concerning pesticides, the predominant pesticide residue measured in Salton Sea sediments was DDE. The area-weighted DDE concentration (SCH Project column) of inundated pond sediment (undisturbed playa surface, borrow ditches, habitat swales, and submerged edges of berms and islands) was compared to existing conditions (i.e., DDE concentration of undisturbed surface sediment) to determine whether exposure to DDE would change due to pond construction and inundation.

For the proposed Project, the estimated DDE concentration of pond sediments would be very similar to existing conditions, with an increase of 0.7 ng/g for estimates based on mean existing DDE concentrations and an increase of 4.3 to 6.7 ng/g for estimates using only the highest observed DDE concentration (Table 6). The Project did not exceed the PEC concentration of 31.3 ng/g for any estimation. Therefore, direct and indirect impacts of contaminants caused by the proposed Project would be less than significant. These effects would be similar under either Alternative NR-2 or NR-3.

4.2.5 Diseases

Bird and fish die-offs have occurred since the Sea's creation in 1905, but their frequency and intensity have increased in the past 2 decades (Friend 2002; Moreau et al. 2007). Avian botulism, avian cholera, and Newcastle disease were determined to be the major causes of most monitored bird die-offs in the 1990s (Natural Resources Agency 2007; Moreau et al. 2007). Botulism spores occur in the sediment and are ingested by fish such as tilapia. Fish die-offs occur periodically at the Salton Sea, and fish-eating birds, especially pelicans, can die from botulism toxins ingested from dying fish. In general, outbreaks of avian cholera, a bacterial disease, occur among dense concentrations of waterfowl, usually during the winter. Most recently, outbreaks of botulism have occurred in 2006 and 2008. In the past 2 years, one episode of avian cholera began in December 2010 and ended before February 2011 (personal communication, K. Riesz 2011).

The proposed SCH ponds would have a low potential to expose birds to disease. If extensive fish die-offs occurred in the ponds due to conditions such as anoxia or temperature extremes, the dead fish could poison fish-eating birds. The conditions that result in fish die-offs in the Salton Sea are usually due to large turnover events where deep anoxic waters come to the surface. In contrast, the SCH ponds would be much shallower and experience more mixing, which is expected to result in lower biological oxygen demand and less severe conditions of anoxia. Also, pond operations could be adjusted to reduce conditions that would be stressful to fish (e.g., periodically increase flow-through rates or reduce salinities). Therefore, the relative risk of fish die-offs in the SCH ponds would be lower compared to the Salton Sea under current conditions. The risk of avian cholera in the SCH ponds would likely be similar to or lower than the risk in existing wildlife ponds at Sonny Bono NWR or IWA’s Wister Unit, where densities of waterfowl are higher than expected at the SCH ponds. To reduce the risk of disease transmission and spread, the SCH ponds are designed to allow boat access for monitoring and removal of bird carcasses, if necessary. Therefore, direct and indirect impacts to disease caused by the proposed Project (under either Alternative NR-2 or NR-3) would be less than significant.

4.2.6 Beneficial Impacts

The SCH Project would benefit fish and aquatic invertebrates by restoring habitat that is more stable than the Sea’s and with salinity near that of seawater. The SCH ponds would be specifically designed for piscivorous birds such as the American white pelican, Caspian tern, and double-crested cormorant, and habitat within the Project ponds would include the shallow water they require for foraging, a food source, and constructed islands that provide predator protection for resting and nesting. The amount of fish available for these birds would increase as the fish populations in the ponds develop and stabilize, and fish density should be higher than prior to Project construction. Providing forage fish as conditions in the Sea exceed the tolerance of fish currently present and the addition of islands protected from predators are beneficial impacts of the Project.

The Project would not result in a loss of shoreline greater than what would occur under the No Action Alternative, but it may result in changes to the invertebrate food base for species that rely on invertebrate food. If that occurs, the Project would be a beneficial impact for the species compared to the No Action Alternative by providing foraging opportunities that may not exist under future conditions. The Project would replace that impacted shoreline with equal or greater shoreline and provide a food source that may not exist under the No Action Alternative. For piscivorous birds, the Project would provide a food source as the source in the Salton Sea declines to a very low level with essentially no tilapia except in small areas at the drain and river outflows. The amount of fish provided, however, would be considerably less than that currently in the Sea and would support a smaller number of piscivorous birds. Consequently, after the Sea's salinity exceeds the tolerance of the fish species used by the birds, the Project would be the primary source of forage fish at the Sea, and the piscivorous bird populations would likely decline to match the more limited availability of food sources.

Overall, the Project could have beneficial impacts for piscivorous bird foraging and bird nesting on islands when compared to the existing environmental setting and the No Action Alternative. The benefits of the Project are greater under Alternative NR-3 due to the large area of ponds (3,770 acres) that would be constructed, compared with Alternative NR-2 (2,670 acres).

4.2.7 Other Wildlife

4.2.7.1 Construction Impacts

Bird Species

Construction activities could affect special-status and common bird species that are present within the Project footprint through direct habitat disturbance, noise, and human presence. Individuals immediately adjacent to Project activities also could be affected by noise. Noise has been documented to adversely affect avian reproduction, and thus, construction noise and activity, if adjacent to areas occupied by nesting birds, could result in nesting failure if such activities occur during the breeding season. These effects are expected to be similar under either Alternative NR-2 or NR-3.

Burrowing Owl. Because the burrowing owl (*Athene cunicularia*) is or could be present along the drains and berms, construction of the interception ditches and the gravity diversion pipeline and sedimentation basin could result in burrow loss and mortality of some individuals. If construction activities occurred during the burrowing owl breeding season (February through August), burrowing owl adults, eggs, or young could be trapped or killed by grading or excavation activities. Construction noise and activity, if adjacent to areas occupied by nesting burrowing owls, could result in nesting failure. If construction activities occurred during the burrowing owl wintering season and burrowing owls occupied a burrow within the construction area, the adults may be trapped, injured, or killed. Once construction was completed, burrowing owls could reestablish use of the area disturbed. No permanent loss of habitat would occur.

Maintenance of Project roads, pond berms, and sedimentation basins could temporarily affect burrowing owl nesting or wintering as described for construction (DFG 2012). Mitigation incorporated into the EIS/EIR to minimize adverse effects on burrowing owl includes provisions for avoidance of impacts to nesting or wintering burrowing owls within the Project impact area through preconstruction (or premaintenance) surveys, establishment of buffers around the active burrow, and passive relocation methods.

California Black Rail. The California black rail (*Laterallus jamaicensis coturniculus*) occupies habitat areas similar to those used by the Yuma clapper rail, and the potential for adverse effects would be the same as described in Section 4.2.2. In addition, similar mitigation measures as described in Section 4.2.2 for the Yuma clapper rail would be implemented to reduce impacts to California black rail.

Other Nesting Marsh Bird Species. Redhead (*Aythya americana*), least bittern (*Ixobrychus exilis*), and yellow-headed blackbird (*Xanthocephalus xanthocephalus*) are or could be present in freshwater marsh habitat as breeding birds within the Project area if freshwater marsh habitat is present within the drains that would be affected. Construction noise and activity could result in habitat disturbance or loss as well as nesting failure during the breeding season (April through August).

Operation of the interception ditches could affect adjacent marsh nesting habitat as described for the Yuma clapper rail. Maintenance of the drain interception ditches would have the potential to affect breeding of these species if marsh vegetation develops in the channels, is colonized by these species, and is cleared during the nesting season.

Western Snowy Plover. Because western snowy plovers are or could be present nesting and wintering along the shoreline and foraging in shallow water along the Sea’s shoreline, construction activities for the ponds and drain interception ditches around the Project area could result in habitat loss and mortality of some individuals. Pond construction (primarily berm on the landward side of the ponds) would cause a small loss of foraging habitat for the western snowy plover, but other foraging habitat would remain outside the Project footprint. If construction activities were to occur during their breeding season (March through August), reproductive success for those snowy plovers in the Project footprint could be greatly reduced through the destruction of nests and nest abandonment by adults due to noise and human activity. Due to the relatively small population in the region, loss of reproduction for a portion of the breeding population at the Salton Sea for up to 2 years could have substantial effects on the population size.

The Project would result in a permanent disturbance or loss of shallow shoreline habitat (up to approximately 8.1 miles) where the ponds are constructed compared to current conditions. The loss could also include flooding of currently exposed shorelines along the bay on the eastern side of the New River. Western snowy plovers would still be able to move around (outside) the ponds and nest and forage along the Sea’s other shoreline areas. Although the SCH ponds would not be specifically built for western snowy plovers, the shallow water and shoreline within them could provide suitable foraging habitat upon completion of construction. Suitable nesting habitat and foraging opportunities may also be present where not covered by shoreline protection (e.g., riprap). However, the low berm (approximately 2 feet high) with its associated road along the landward side of the ponds could eliminate or alter shoreline habitat used by western snowy plovers for resting and nesting.

Maintenance activities along the shoreline of the ponds may result in impacts on western snowy plover nesting, if maintenance takes place during the breeding season and if the species nests within the Project area.

Riparian Bird Species. Because white-tailed kite (*Elanus leucurus*), little willow flycatcher, yellow-breasted chat (*Icteria virens*), gila woodpecker (*Melanerpes uropygialis*), and crissal thrasher (*Toxostoma crissale*) are or could be present in riparian habitat along the New River within the SCH pond area, construction activities for the river diversion as well as the berm improvement and road construction along both sides of the river between the ponds could result in riparian habitat loss or disturbance that could cause failure of nesting and possible mortality of some individuals. While loss of habitat is anticipated to be minimal, noise and human activity immediately adjacent to the riparian corridor could adversely affect breeding for any individuals present in that area if construction activities occur during the riparian bird breeding season (April through September).

Maintenance activities could result in a minor amount of riparian habitat loss or disturbance at the diversion location and where the river and Sea water pipelines enter the ponds. During the breeding season, maintenance activities could result in nesting failure and possible mortality of a few individuals, primarily nestlings. Maintenance of and driving along the river berms during the nesting season could have similar impacts. This impact is anticipated to be minimal and could be avoided by timing maintenance activities at those locations for outside the breeding season.

Gull-Billed Tern and Black Skimmer. The gull-billed tern and black skimmer both occur at the Salton Sea for breeding and foraging, and both prefer to nest on islands for protection from predators because they are ground-nesting species. No island nesting sites are currently present within the Project area; however, both species have occasionally nested along the Sea's shoreline, although with limited success. Although it is unlikely that construction would result in direct impacts on the gull-billed tern and black skimmer, nesting failure due to construction activities or noise adjacent to nesting areas could occur if construction activities, including drain interception ditch construction, took place during the species' breeding season (April through September). Since relatively few individuals are present in the region, loss of reproduction for even a portion of the local breeding population for 1 year could have substantial effects on the population size. Construction of the river diversion and sedimentation basins would not affect any breeding habitat.

Project construction would result in a temporary disturbance or alteration of shallow shoreline habitat (up to approximately 6.3 miles) where the ponds would be constructed compared to current conditions. Although gull-billed terns and black skimmers might forage along the shoreline, few would be expected in this area because nesting is limited due to lack of predator protection along the shoreline. Construction noise and activity, if adjacent to areas occupied by gull-billed tern or black skimmer, would have a low potential to result in nesting failure if such activities occur during the breeding season (April through September).

Maintenance activities within the ponds would have the potential to affect nesting birds through noise and human presence, if such activities occurred during the breeding season and near nesting sites.

Loggerhead Shrike. Because loggerhead shrikes (*Lanius ludovicianus*) are or could be present in shrub and scrub habitat along the Salton Sea shoreline, Project construction activities for the drain interception ditches and the landward pond berm could result in temporary disturbance of suitable habitat. If these construction activities would result in habitat disturbance or loss during the breeding season (April through September), breeding efforts of any pairs present may fail. Construction noise and activity, if adjacent to areas occupied by nesting loggerhead shrikes, could result in nesting failure. Compared to the No Action Alternative and current existing conditions, the Project could result in impacts on nesting loggerhead shrike if nesting habitat is present within or immediately adjacent to the construction area. Maintenance of the drain interception ditches could affect breeding loggerhead shrikes immediately adjacent to the channels if maintenance occurred during the breeding season.

Common Bird Species. The Salton Sea and surrounding region provide nesting, wintering, and migration stopover habitat for hundreds of bird species and thousands of individuals. The Project area provides habitat for a subset of the species and individuals that occur within the greater Salton Sea area. A number of common bird species could be affected by the Project.

Because common species are or could be present nesting and/or foraging for breeding, within or immediately adjacent to the Project footprint, construction activities for the ponds, drain interception ditches around the Project area, and diversion facilities, if they were to occur during the bird breeding season (March through September), could result in destruction of nests and nest abandonment by adults due to direct disturbance or noise and human activity.

Construction activities also could result in the direct removal of snags used by colonial nesting birds, which include double-crested cormorant, great blue heron, cattle egret, great egret, and snowy egret. However, most snags could be avoided and left in place for use by birds until they deteriorated and collapsed due to natural processes. A few trees located adjacent to the New River that may be used by colonial nesters also could be removed, depending on placement of the diversion structure and conveyance pipeline crossing of the New River to reach the western ponds as well as improvement of the river berms. However, the Project structures would be placed to minimize or avoid impacts on the maximum extent feasible.

Mitigation Measures

The EIS/EIR includes mitigation measures to offset significant impacts on birds including MM BIO-2: Prepare and implement a preconstruction/maintenance survey plan for bird species, MM BIO-3: Conduct noise calculations/measurements and implement noise attenuation measures, if needed, and MM BIO-4: Design interception ditches to avoid alteration of water levels in adjacent marshes. The implementation of these measures would reduce impacts to nesting birds within and adjacent to the Project site to a level which is less than significant.

4.2.7.2 Operational and Maintenance Impacts

Birds

During operations, noise from the pump that brings saline water to the ponds is unlikely to affect breeding because it would be located at the edge of the outer berm and offshore (approximately 3,000 feet or more from the existing shoreline), or on the exposed playa/seabed when the Sea recedes that far.

Burrowing Owl. Pump stations and pipelines bringing saline water from the Salton Sea to mix with the water for salinity control in the ponds are unlikely to affect burrowing owls unless they had nesting or wintering burrows within the small area where the pipeline would cross the river bank. As the Salton Sea recedes, the outer pump station may require relocation or reconstruction and a pipeline extension placed on or within the exposed playa/seabed. These activities would not affect burrowing owls because none is expected to be present in the recently exposed playa/seabed due to lack of suitable habitat.

California Black Rail. Operation and maintenance of the pump stations to bring saline water to the ponds would not affect breeding of the California black rail because no suitable habitat for these species is present at or near those locations. Maintenance of the ponds would not affect these species because salinity of the habitat pond water and design of the sedimentation basins (steep slopes, water depth greater than emergent vegetation can grow in) would prevent development of marsh habitat used by this species. Noise from maintenance activities within the ponds would not be high enough to affect rails in nearby habitats due to attenuation with distance. The sedimentation basins are designed to minimize growth of emergent vegetation with maintenance at least annually so that no habitat suitable for California black rail would develop.

Other Nesting Marsh Bird Species. Operation and maintenance of the pump stations to bring saline water to the ponds would not disrupt breeding of the redhead, least bittern, or yellow-headed blackbird because no suitable habitat for these species is present at or near those locations. As described for the rail species, the Project ponds and sedimentation basins would not provide suitable habitat for marsh bird nesting.

Western Snowy Plover. Operation of the pump stations to bring saline water to the ponds would not disrupt breeding of the western snowy plover because no suitable nesting habitat for the species is present at the location of the pump stations.

Loggerhead Shrike. Operation and maintenance activities for the ponds and pump stations are not expected to affect loggerhead shrike breeding because these activities would not occur in or adjacent to nesting habitat.

Riparian Bird Species. Operation of the pump stations to bring saline water to the ponds would not disrupt breeding of the riparian bird species because no suitable nesting habitat for these species is present at the pump stations' locations.

Common Bird Species. Maintenance activities have the potential to disturb bird nesting on the islands and along the berms if such activities occurred during the breeding season. Such disturbances could cause nest abandonment or nest destruction if physical activities occurred on the islands or along the berms. During operations, both pump stations would provide an isolated structure that could be used by some species of birds for resting, roosting, or even nesting. These structures may include deterrents to bird use. If such deterrents are not used or are not effective, maintenance of the pump stations would intermittently disturb any birds using the structures. Disturbance during the nesting season could result in nest failure for the pairs using the structures.

Operation of the pump stations to bring saline water to the ponds would not disrupt breeding of common birds that nest within the Project area because the pump stations would be located adjacent to the seaward side of the outer berm and in the Sea away from any nesting habitat, including the islands within the ponds. Maintenance activities have the potential to disturb bird foraging throughout the Project. Effects on foraging, however, would be less than significant because maintenance would occur in only a portion of the ponds at a time leaving other foraging areas available nearby within the Project area.

The sedimentation basins adjacent to the river diversion would likely attract birds, such as ducks and gulls, that rest on the water surface. Due to the basin's steep sides and annual maintenance, foraging and nesting habitat for these species would not develop. The basin, therefore, would not increase the population size of these birds. Ducks and geese are present at the Salton Sea primarily during the winter when the duck clubs operate, and the amount of surface water provided by the basin (approximately 40 acres) would be small compared to that of the duck clubs. Piscivorous birds may use the basin to forage if populations of fish develop from individuals entrained with the diverted water.

In summary, operations and maintenance impacts to birds are considered less than significant under either Alternative NR-2 or NR-3.

4.2.7.3 Beneficial Impacts

The SCH ponds would provide additional habitat for desert pupfish after the Salton Sea exceeds their water quality tolerances. Isolated populations would remain where the drains and tributaries (rivers and several streams) enter the Sea, but the ponds would provide approximately 2,178 acres of habitat with suitable water quality under Alternative NR-2 and 3,285 acres under Alternative NR-3. In addition, the interception ditch would maintain connectivity among pupfish populations in drains adjacent to the Project (allow fish movement along the shoreline between drains).

The SCH ponds are specifically designed to attract gull-billed tern and black skimmer, among several other special-status bird species, and the habitat provided would include the shallow water they require for foraging, a food source, and constructed islands that would provide predator protection for nesting upon completion of construction, which would increase the amount of habitat for these species. The addition of islands protected from predators and a food source for piscivorous birds is a beneficial impact of the Project.

Increasing salinity in the Sea may result in changes to the invertebrate food base for species during the Project. If, under the No Action Alternative conditions, the increased salinity changes the prey base and the food source is unsuitable for the western snowy plover, the Project would have a beneficial impact on this species by providing foraging opportunities that may not exist under the No Action Alternative.

4.2.8 Special Aquatic Sites

Special aquatic sites identified within the Project area include wetlands and the Sonny Bono NWR. Impacts on wetlands are addressed in Section 4.2.1. Impacts on the Sonny Bono NWR are addressed in Section 4.3.5.

Table 16 provides a summary of impacts on wetlands and the amount of new pond wetlands to be created as a result of each alternative. Under both alternatives, approximately 883 acres of disturbed upland areas would be converted to wetland waters of the U.S. The remaining acreage of wetlands created is the conversion of existing non-wetland waters to wetlands. Due to the size of Alternative NR-3, more non-wetland waters would be converted to wetlands.

Table 16
Wetlands Impacts and Pond Creation

Impact/Creation Type	Alternative NR-2 (acres)	Alternative NR-3 (acres)
Current Jurisdictional Wetlands within Project Area	544.7	544.7
Permanent Loss of Wetlands	38.0	38.0
Permanent Conversion of Wetlands to Ponds	389.8	389.8
Additional Wetlands Created Through Constructed Ponds[a]	1,788.4	2,895.7

[a] This includes both the conversion of non-wetland waters to wetlands and converting disturbed uplands to wetland waters.

4.3 Impacts on Human Use Characteristics

4.3.1 Municipal and Private Water Supplies

The local groundwater conditions reflect a shallow perched water table that receives inflows from the IID drains and applied water that is not captured in on-farm drains. The Project would store water on otherwise dry playa and, therefore, would provide seepage (additional water) to the shallow groundwater system. The interception ditch would intercept a portion of this seepage, and the remainder would flow toward the Salton Sea. This Project would not interfere with or cause a deficit in groundwater resources and, therefore, would not cause an adverse impact on groundwater. If future studies suggest that shallow groundwater is a potential water supply for the Project, additional environmental review would be needed before that supply can be used. The proposed Project, under either Alternative NR-2 or NR-3, would not have impacts on municipal and private water supplies.

4.3.2 Recreational and Commercial Fisheries

As discussed in Section 3.4.2, the Project area does not support recreational or commercial fisheries. Fish would not be intentionally stocked for the purpose of providing angling opportunities. Nevertheless, such opportunities may be provided at the SCH ponds, in particular for tilapia. Fish populations would be monitored as a metric of the SCH Project's success. If populations became well established and appeared to provide fish in excess of what birds were consuming, angling could be allowed. The proposed Project, under either Alternative NR-2 or NR-3, may have beneficial effects on recreational fisheries.

4.3.3 Water-Related Recreation

The SCH Project is not specifically designed to accommodate recreation because the provision of recreational opportunities is not a Project goal. Nevertheless, some recreational activities would be available to the extent that they are compatible with management of the SCH ponds as habitat for piscivorous birds dependent on the Salton Sea.

Public access could be allowed to facilitate day use, hiking, bird-watching, and nonmotorized watercraft use. However, management plans may require that certain areas be seasonally closed to human activities to avoid disturbance of sensitive birds. When bird nesting was observed by SCH managers, human approach would be limited by posted signs. Hours of public access could be restricted to early morning during hot weather when nesting birds are present.

Waterfowl hunting would be allowed consistent with the protection of other avian resources.

The water diversion would be located in the bank of the New River adjacent to the ponds while the sedimentation basins would be located within the pond footprint and would not affect recreational opportunities.

Overall, Project impacts on recreational resources would be beneficial under either Alternative NR-2 or NR-3.

4.3.4 Aesthetics

Construction of the SCH ponds and associated components would involve extensive excavation and the formation of berms and islands. Trucks and light vehicles would traverse nearby roads each day in order to transport workers and haul construction materials, but these would not cause a substantial visual change since trucks and heavy equipment are typically used in agricultural settings.

Views by visitors to the Sonny Bono NWR during Project construction would be dominated by heavy machinery engaged in ground-disturbing construction activities and dust emissions. Individuals viewing the Project from this area would likely be sensitive to changes in the visual environment; however, access is limited in this area and construction would only occur temporarily.

Construction would likely disrupt normal wildlife patterns in the immediate vicinity, but this change would be temporary, and wildlife-viewing opportunities would be available at the nearby Sonny Bono NWR and IWA.

Once operational, views of the Project site would likely be of the berms and dikes that contain the SCH ponds due to the angle of view from which travelers along SR-86 and nearby agricultural areas view the site. Because of the distance (over 2 miles from the nearest pond site), the Project site would likely be undistinguishable from the surrounding area. There would be little contrast between the Project and the adjacent agricultural areas and remaining open water of the Salton Sea. No impacts on the visual environment would occur when the Project was viewed from this distance.

The SCH ponds would be constructed in areas that are currently or were recently submerged. Upon completion of construction, the area viewed from points within the Sonny Bono NWR would consist primarily of SCH ponds surrounded by berms. The ponds and nesting islands are considered a more aesthetically pleasing setting than the exposed playa that would be present when construction begins. The SCH ponds are intended to provide habitat for birds, which would also contribute to the area's scenic qualities. The scenic quality and character of the site would be improved compared to the No Action Alternative.

Views from the Sonny Bono NWR may include a trailer that would be present at the site for use by permanent employees. The trailer would be compatible with existing agricultural uses that predominate. The sedimentation basins that would be located adjacent to the New River within the pond footprint would also be compatible with agricultural uses. The diversion structure would require the removal of a small amount of vegetation on the New River bank, but the disturbed area would be minor and would not be visible from sensitive viewpoints at the Sonny Bono NWR. The seawater pump stations would be located on platforms at the outer berm and in the Sea and may have to be relocated as the Sea recedes. A pipeline would be required to bring seawater to the ponds. Such small-scale facilities would be visually compatible with surrounding agricultural uses.

It is possible that some activities, such as dredging, may occur 24 hours a day and require night lighting. This impact would be temporary, and the site is located in a remote rural area, well-removed from populations who could be affected by the increased night lighting. Therefore, the proposed Project, under either Alternative NR-2 or NR-3, would have minimal impacts to aesthetics.

4.3.5 Parks, National and Historic Monuments, National Seashores, Wilderness Areas, Research Sites, and Similar Preserves

As discussed in Section 3.4.5, the Project area includes lands within the Sonny Bono NWR. IID owns the land where the SCH ponds would be located and the Natural Resources Agency would lease the land from IID for the Project's duration. IID already leases much of the land where the ponds would be located to the USFWS for management of the Sonny Bono Salton Sea NWR. The USFWS is also planning to develop a restoration project at Bruchard Bay. This area is adjacent to, but outside of, the area proposed for the SCH Project. The Unit 1 A/B Ponds Reclamation Project is planned for a separate portion of the NWR at the southern tip of the Salton Sea. This area is within the current footprint of the proposed SCH Project at the New River. The SCH agencies would coordinate with the USFWS to maximize the constructability of both projects; however, the USFWS considers the SCH Project a priority in this area and if reclamation of part or all of the old Unit 1 A/B Ponds is not possible as a result of the SCH Project, the USFWS prefers to seek reclamation alternatives elsewhere (personal communication, C. Schoneman 2011).

An agreement between DFW and USFWS would be established prior to construction of the SCH Project, under either Alternative NR-2 or NR-3, in order to ensure compatibility between NWR uses and the SCH Project. Therefore, preserves are expected to be minimally impacted by the proposed Project.

4.4 Determination of Cumulative Effects on Waters of the U.S.

Cumulative effects associated with the Project are described in detail in Section 4.0 of the Draft EIS/EIR. The Draft EIS/EIR had determined there would be no cumulative impacts on Agricultural Resources and Land Use and Recreation, and a less than significant impact for Aesthetics, Energy Consumption, Geology and Soils, Greenhouse Gas Emissions, Hydrology and Water Quality, and Noise. The Draft EIS/EIR found that with implementation of mitigation measures for the proposed Project, as well as general required measures for other projects, cumulative impacts would be reduced to less than significant for Biological Resources, Cultural Resources, Hazards and Hazardous Materials, and Paleontological Resources. The Draft EIS/EIR also found that cumulative impacts were significant and unavoidable after implementing mitigation measures for Environmental Justice and Air Quality.

The geographic scope for the environmental resources cumulative impact analysis consists of the Salton Sea Hydrologic Unit Code (HUC) 8 watershed within Imperial County. This geographic area was chosen because the entire Salton Sea HUC 8 watershed would be too large of an area to provide a meaningful cumulative analysis. Therefore, only the portion of the watershed within the boundaries of Imperial County that could influence the southern portion of the Salton Sea (where the proposed Project is located) was analyzed. As discussed above, a small amount of permanent loss of jurisdictional resources would be caused by either alternative, which would immediately be offset by the additional jurisdictional resources created. In addition, both Alternative NR-2 and NR-3 would preserve more jurisdictional resources compared to the No Action Alternative, although Alternative NR-3 would preserve more jurisdictional resources than Alternative NR-2 due to its larger size. A 404 permit would be required for the SCH Project, under either alternative, containing permit conditions that would ensure that impacts of this Project on waters of the U.S. were minimized, as well, and any cumulative impacts from the issuance of such permits also would be minimized. Construction, operation, and maintenance of the other past, present, or reasonable foreseeable projects could result in significant cumulative impacts on biological resources associated with the loss of habitat and individuals of special-status species, disturbance or loss of riparian or other sensitive habitats, and adverse effects on Federal waters of the U.S., including wetlands. Although the SCH Project alternatives would have overall beneficial impacts on biological resources, construction, maintenance, and operations would result in significant impacts, and their contribution would be cumulatively considerable. Feasible mitigation measures would reduce potential impacts of other projects, and implementation of MM BIO-1, a desert pupfish relocation plan; MM BIO-2, preconstruction and maintenance surveys; MM BIO-3, noise measurements and as-needed noise attenuation features; and MM BIO-4, a habitat mitigation and restoration plan, would reduce the SCH Project's contribution to cumulative impacts on biological resources to less than significant.

4.5 Determination of Least Environmentally Damaging Practicable Alternative (LEDPA)

As presented in Section 4, Alternatives NR-2 and NR-3 have similar impacts. The footprints of the two alternatives are identical, expect Alternative NR-3 includes additional cascading ponds towards the center of the Salton Sea. These additional ponds would result in additional impacts on jurisdictional resources (mainly open water) in this location, but effects on listed species, water quality, hydrology, other wildlife species, and human use would not increase as a result of construction of these additional ponds. These additional ponds provide a benefit of establishing 1,107 acres of additional habitat area compared to Alternative NR-2. Alternative NR-3 would result in approximately 20 more acres of permanent loss than Alternative NR-2 due to the additional berms; however, this would be immediately offset by the creation of 883 acres of wetland waters of the U.S. Although both alternatives would create the same amount of additional wetland waters (883 acres), this increased acreage would only be short-term due to the recession of the Sea. Therefore, only the total acreage of ponds created by the Project would continue to support jurisdictional resources and provide functions and services attributed to aquatic resources, while surrounding areas are eventually expected to convert to non-jurisdictional uplands. Alternative NR-3 would preserve more area as jurisdictional resources (3,285 acres) than would Alternative NR-2 (2,178 acres). Therefore, although the immediate short-term impacts would be slightly higher under Alternative NR-3, the long-term environmental benefits would also be higher for Alternative NR-3.

The Corps finds that the long-term potential benefits of creating the additional constructed pond area outweighs the increased short-term impacts of Alternative NR-3, especially given the long-term fate of these areas if no project was constructed. Alternative NR-3 is therefore determined to be the LEDPA.

5.0 MITIGATION PROPOSED BY THE APPLICANT

The proposed Project purpose is to restore aquatic habitat along the Salton Sea; therefore, the majority of impacts on waters of the U.S., while permanent (because the proposed Project would alter the elevation and contours), would not result in a loss of waters of the U.S. The pond sites would be converted from one aquatic resource habitat type to another. In addition, the small amount (90.1 acres) of permanent impacts that would result in a loss of waters of the U.S. under Alternative NR-3 (the LEDPA) would be from the creation of berms, diversion structures, and sedimentation basins, which are essential components of the proposed Project and are required to create the restored areas. The LEDPA (Alternative NR-3), when completed, would restore a total of 883.4 acres of waters of the U.S. that currently are non-jurisdictional upland playa, resulting in an overall net gain of 793.3 acres (restored waters of the U.S. minus loss of waters due to Project implementation). Therefore, in accordance with the EIS/EIR for the SCH Project, no Project-specific compensatory mitigation for impacts on jurisdictional wetlands and waters of the U.S. is required. Due to the beneficial nature of the Project for water quality, wildlife habitat, and special-status wildlife species, the Project is considered to be self-mitigating. However, the Corps would review and approve the adaptive habitat management plan that would be developed with this Project and require monitoring reports to be available for Corps review upon request to ensure that habitat restoration is successful and functioning as intended.

Temporary impacts also would occur during construction from the use of temporary components such as staging areas and crossings, and the Corps requires full restoration of all temporarily impacted areas. If such areas are not fully restored, then impacts are considered permanent and may require additional mitigation. The applicant has prepared a Draft HMMP, which quantifies and describes the mitigation measures and Corps requirements. The HMMP is focused primarily on providing guidance for replacement of wildlife habitat that would be impacted by non-pond features of the SCH Project, in accordance with MM BIO-5 from the EIS/EIR.

The Corps' restoration requirements would be applied to both temporary and permanent impacts. Temporary impacts would be restored at a minimum of 1:1 ratio at impact sites for both native and non-native plant communities, in accordance with the Corps' definition of temporary impacts. The focus of the restoration effort would be to restore habitat for wildlife in accordance with MM BIO-5. The HMMP provides an implementation plan to ensure the successful restoration of wetlands, including restoration of all areas of temporary impact. The HMMP identifies roles and responsibilities of various entities involved in the restoration, describes restoration goals and objectives, and identifies suitable restoration sites. It also includes a restoration work plan with recommended methodologies for site preparation, seeding/planting, irrigation, etc.; a maintenance plan; specific monitoring and reporting requirements, including site performance standards; and a description of long-term management of the restoration sites.

The Project also includes provision for an Operations Plan and an Adaptive Management and Monitoring Plan. The Draft EIS/EIR includes initial framework drafts of these documents in

Appendix D (Project Operations) and Appendix E (Monitoring and Adaptive Management Framework). These documents would govern operations of the Project and the collection of monitoring data to assess the effectiveness towards the various goals and objectives of the program.

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