ALTERNATIVES

This section describes the alternatives development process, the alternatives that were carried forward for detailed analysis, and those that were eliminated from further consideration. Additional detail regarding the alternatives development process is included in Appendix B.

2.1 Regulatory Requirements

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

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

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

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

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

2.2 Alternatives Development

Alternatives development for the SCH Project involved refining Project goals and objectives; identifying potential site locations, configurations, and Project components; and applying exclusionary and evaluative criteria. A detailed discussion of the alternatives development process is included in Appendix B. The California Department of Fish and Game (DFG) and California Department of Water Resources (DWR) initially identified three generalized locations for the SCH ponds, based on the potential availability of contiguous acreage (the initial target was 2,400 acres of saline habitat based on preliminary cost estimates and available funding) 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 2-1).

Initial review identified only about 900 acres of land that potentially were available at the Salton Sea's northern end near the Whitewater River, while larger areas were identified at the Sea's southern end near the New and Alamo rivers. Therefore, several acreage combinations were developed using one or more of the rivers, resulting in habitats that would be contiguous or dispersed. The range of initial concept SCH configurations and approximate acreages included:

- Contiguous SCH ponds at the Whitewater River (900 acres)
- Contiguous SCH ponds at the New River (2,400 acres)
- Contiguous SCH ponds at the Alamo River (2,400 acres)
- Dispersed SCH ponds at the New and Alamo rivers (4,800 acres)
- Dispersed SCH ponds at the Whitewater and New rivers (3,300 acres)
- Dispersed SCH ponds at the Whitewater and Alamo rivers (3,300 acres)
- Dispersed SCH ponds at the Whitewater, New, and Alamo rivers (5,700 acres)

Criteria were developed to rank and screen sites and Project components where appropriate. This process was done through a combination of exclusionary criteria and evaluative criteria.

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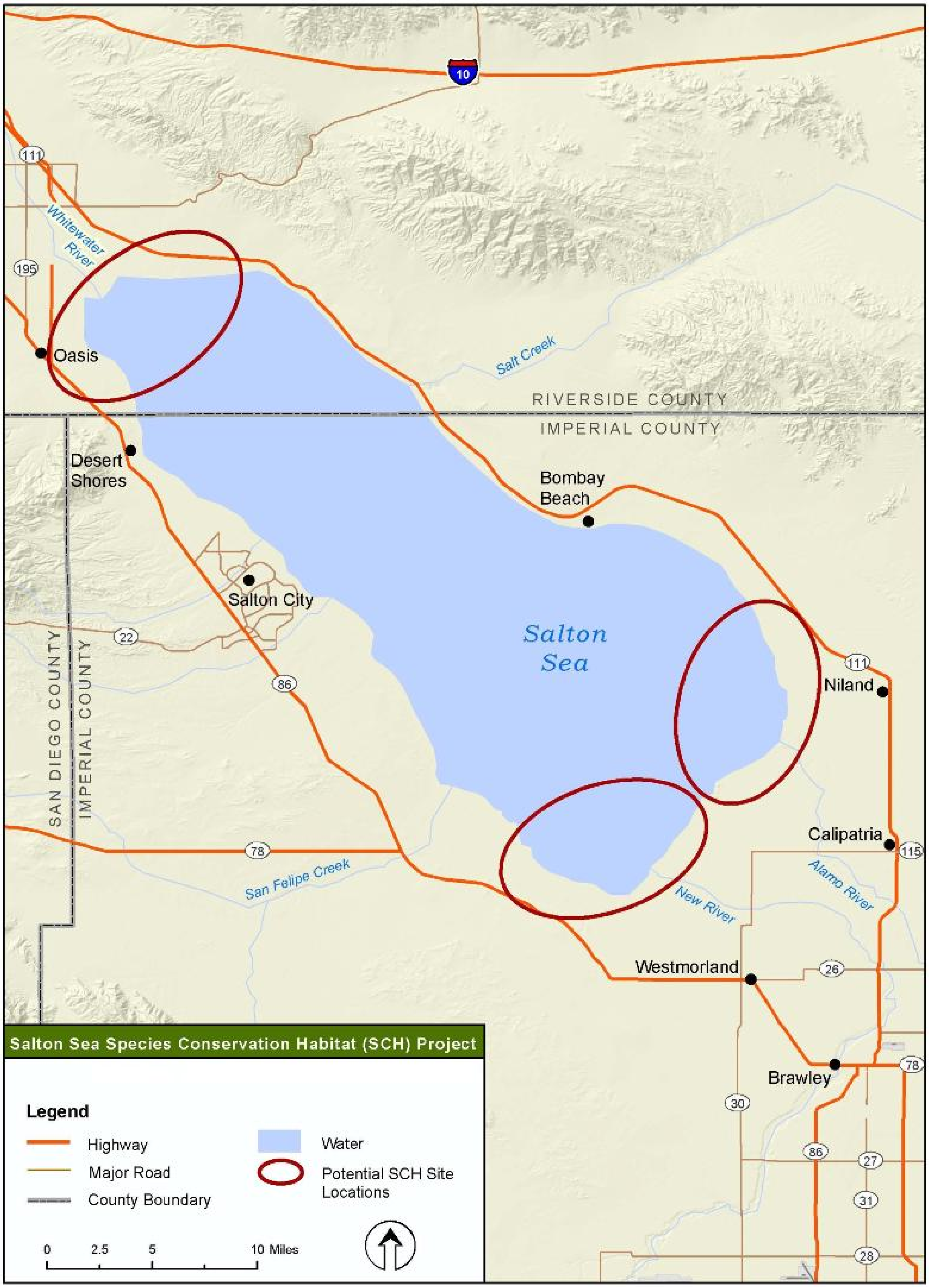

2 **Figure 2-1 Initial Conceptual Locations for SCH Ponds**

2.2.1 Exclusionary Criteria

Exclusionary criteria relate to those factors essential to successful Project completion: (1) available water rights; (2) available land (ownership and accessibility); and (3) adequate water supply (quantity, quality, and seasonal availability). Those potential sites and Project components that either did not meet the goals and objectives/purpose and need or were not feasible or practicable due to cost, technical, or environmental considerations were eliminated from further consideration. The screening analysis is summarized below:

Exclusionary criteria relate to those factors essential to successful Project completion: (1) available water rights; (2) available land (ownership and accessibility); and (3) adequate water supply (quantity, quality, and seasonal availability). Those potential sites and Project components that either did not meet the goals and objectives or were not viable due to cost, technical, or environmental considerations were eliminated from further consideration. The screening analysis is summarized below:

1. **Available water rights**. The Whitewater River is designated by the State Water Resources Control Board as a fully appropriated stream from the Salton Sea to the headwaters; thus, no water would be available for the SCH Project. The New and Alamo rivers are not designated as fully appropriated. Metropolitan Water District of Southern California has applications pending for appropriative rights for essentially all the available water in both New and Alamo rivers, but has not prepared the required environmental document for these water rights applications, and so the State Water Resources Control Board has not acted upon these applications.
2. **Available land**. Adequate land appears to be available at the New and Alamo rivers, owned primarily by Imperial Irrigation District (IID), although the land in the Wister Beach area is owned by multiple private parties. At the Whitewater River, land owned by the Torres Martinez Desert Cahuilla Indian Tribe (Torres Martinez Tribe) would be required to convey water to ponds, and available land for the SCH Project is limited.
3. **Adequate water supply**. Assuming 6 feet of evaporation annually, the amount of water necessary to supply the SCH ponds each year ranges from 5,400 acre-feet for 900 acres of SCH ponds to 34,200 acre-feet 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). Adequate water is available in the New and Alamo rivers, but not the Whitewater River due to existing and projected demands by the Coachella Valley Water District (CVWD) and the Torres Martinez Tribe.

   Water from agricultural drains has poorer water quality than that in the New and Alamo rivers; it is an unreliable supply that varies seasonally and may diminish over time as conservation increases. The drains also are habitat for desert pupfish (*Cyprinodon macularius*), a protected species. Available information indicates that adequate groundwater may not be available to supply the Project; thus, the Salton Sea's use as a source of saline water is considerably more preferable.

Based on this evaluation, sites at the Whitewater River were eliminated due to lack of water supply and available land. Drainwater and groundwater also were eliminated as potential water supplies.

2.2.2 Evaluative Criteria

A list of potential Project components was developed, representing different ways that the SCH Project could be implemented. These components are not alternatives; rather, they are elements that could potentially be included in an alternative. Components considered included:

- Diversion Mechanisms
  - Inline weir in river (brackish water)
  - Lateral weir in river (brackish water)
  - Pump water from the river (brackish water)
  - Pump saline water from the Salton Sea
- River Water Conveyance
  - Open canal
  - Brackish water pipeline
  - Combination
- Saline Water Conveyance
  - Pipeline
  - Backwater channel
- Suspended Sediment Management
  - Sedimentation basin near diversion
  - Sedimentation basin near SCH ponds
  - No sediment management
- Power Supply
  - Three-phase power
  - Diesel generator
  - Solar power

Evaluative criteria were applied next to determine which types of components would be included in the alternatives carried forward for evaluation. The criteria included (1) engineering feasibility and constructability; (2) relative cost-effectiveness (including capital cost and operations and maintenance) measured as cost per acre; (3) potential for physical environmental impacts; (4) compatibility with existing and planned land uses; and (5) ability to meet SCH Project schedule. Components were eliminated or refined based on these criteria. This process is described in detail in Appendix B.

Based on this analysis, six initial conceptual alternatives were developed that included two different locations and two methods of diverting and conveying the water to the SCH ponds. These alternatives would comply with NEPA and CEQA requirements to evaluate a reasonable range of alternative ways of implementing a project and CEQA's requirement to identify alternatives that would avoid or substantially lessen one or more of a project's significant environmental impacts.

For example, those alternatives requiring gravity diversion would result in a significant impact on lands under Williamson Act contracts[1] (refer to Section 3.2, Agricultural Resources), whereas this impact would not occur under the alternatives requiring a pumped diversion. The latter generally would result in greater demand for power, however, as discussed in Section 3.6, Energy Consumption.

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

Refinements included modifying the configuration of the New River alternatives involving pumped diversion of river water. The configuration originally included a narrow, roughly 2-mile-long pond on the far western side that was eliminated due to the relatively high cost of berm construction required in order to obtain a comparatively small amount of habitat. Additionally, eliminating this area avoided channels carrying natural drainage. The alternatives that included both New and Alamo river sites were eliminated because the costs to construct habitat in both areas would have greatly exceeded available funds; therefore, they were considered infeasible. Additionally, the portion of the alternatives that included Red Hill Bay was eliminated because the United States Fish and Wildlife Service (USFWS) has plans to develop shallow water habitat in this area as part of the Sonny Bono Salton Sea National Wildlife Refuge (NWR). (The USFWS also has a planned restoration project at the New River, and DWR and DFG are working in close coordination with NWR staff to avoid any conflicts between the two projects.) The refined alternatives being considered in the EIS/EIR are as follows:

- **Alternative 1 – New River, Gravity Diversion + Cascading Ponds[2]:** 3,130 acres of ponds constructed on either side of the New River (East New and West New), upstream gravity diversion of river water, and independent and cascading pond units.
- **Alternative 2 – New River, Pumped Diversion:** 2,670 acres of ponds constructed on either side of the New River (East New, West New, and Far West New), pumped river diversion at the SCH ponds, and independent ponds.
- **Alternative 3 – New River, Pumped Diversion + Cascading Ponds:** 3,770 acres of ponds constructed on either side of the New River (East New, West New, and Far West New), pumped diversion of river water, and independent ponds extended to include Far West New and cascading pond units.
- **Alternative 4 – Alamo River, Gravity Diversion + Cascading Pond:** 2,290 acres of ponds constructed on the north side of the Alamo River (Morton Bay), gravity river diversion upstream of the SCH ponds, with independent ponds and a cascading pond unit.

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

[2] All of the alternatives include independent ponds; thus, the name of the alternative reflects those ponds that also include cascading ponds.

- **Alternative 5 – Alamo River, Pumped Diversion:** 2,080 acres of ponds constructed on the north side of the Alamo River (Morton Bay and Wister Beach), pumped river diversion at the SCH ponds, and independent pond units.
- **Alternative 6 – Alamo River, Pumped Diversion + Cascading Ponds:** 2,940 acres of ponds constructed on the north side of the Alamo River (Morton Bay, Wister Beach), pumped river diversion at the SCH ponds with independent and cascading pond units.

The pond locations for each alternative, along with the general area where the upstream gravity diversion and conveyance facilities could be located, are shown on Figure 2-2.

The No Action Alternative also is considered in this analysis, as required by NEPA and CEQA. The No Action Alternative is described below, followed by a discussion of features that are common to each of the six Project alternatives and additional detail regarding each of these alternatives.

2.3 No Action Alternative

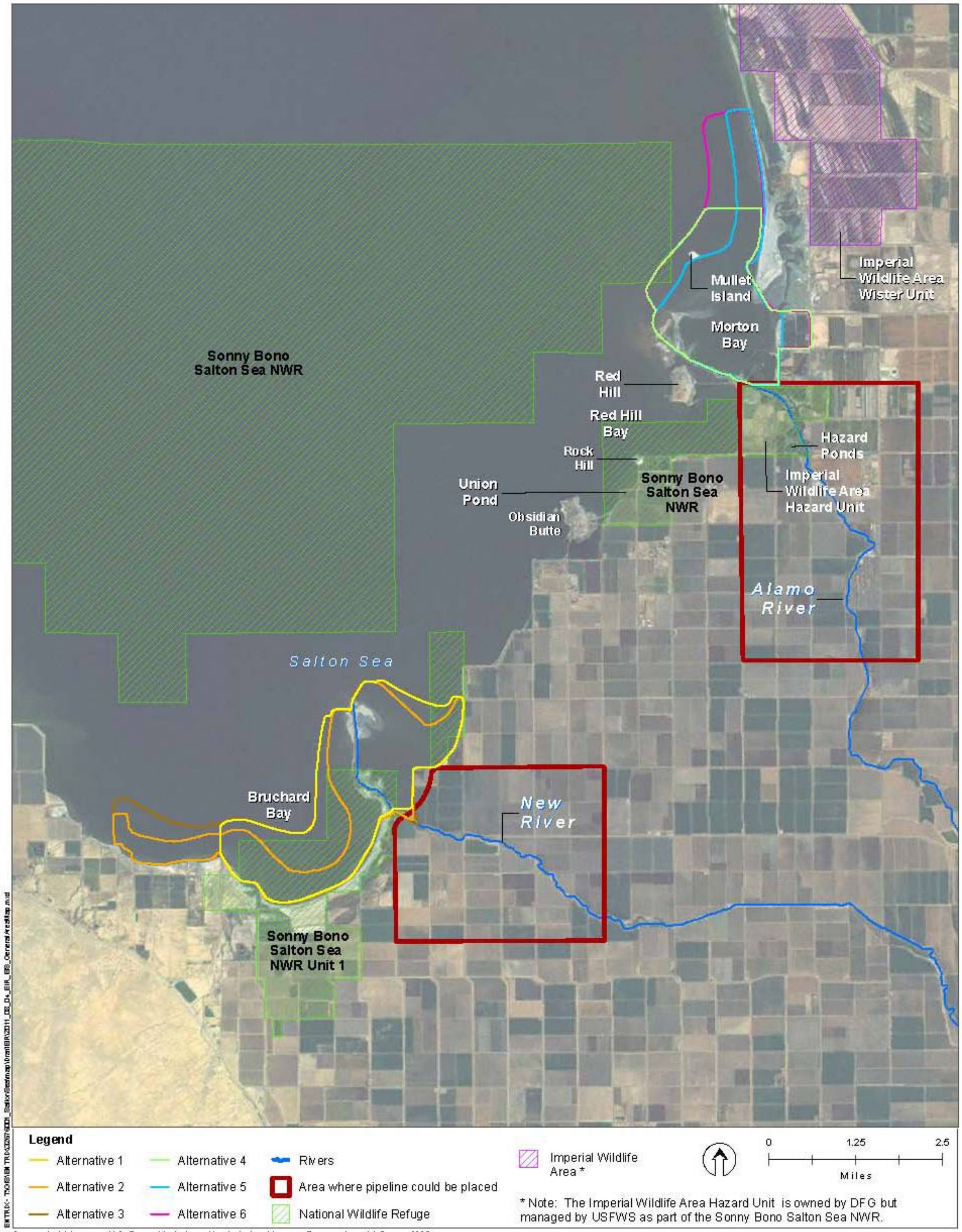
Under the No Action Alternative, the Corps would not issue a permit for the SCH Project, and no components of the SCH Project would be constructed. Other activities are expected to occur that would affect the Salton Sea ecosystem, however, as discussed below. The description of the No Action Alternative is based on the *Salton Sea Ecosystem Restoration Program Final Programmatic Environmental Impact Report* (DWR and DFG 2007). The No Action Alternative is intended to reflect existing conditions (those present at the time the Notice of Preparation was issued) plus changes that are reasonably expected to occur in the foreseeable future if none of the alternatives are implemented, based on current plans and consistent with available infrastructure and community services.

2.3.1 Actions that Could Affect Inflows to the Salton Sea

Under the No Action Alternative, actions that could affect inflows to the Salton Sea include:

- IID Water Conservation and Transfer Project (and associated required mitigation measures);
- Colorado River Basin Salinity Control Program;
- Mexicali wastewater improvements;
- Mexicali power production;
- Total Maximum Daily Loads implementation;
- Coachella Valley Water Management Plan; and
- Other Quantification Settlement Agreement (QSA) related projects (refer to Section 1 for a discussion of the QSA).

Estimates of future inflows to the Salton Sea were developed in the Programmatic Environmental Impact Report (DWR and DFG 2007) and account for potential reductions in Colorado River water deliveries that would reduce agricultural return flows into the New and Alamo rivers, wastewater system improvements to the Mexicali II service area that would divert effluent to the Gulf of California, and recently constructed power plants that would use a portion of the New River flows for cooling water. The projected inflows from the Imperial Valley were also based upon historical patterns adjusted for QSA implementation and the IID Water Conservation and Transfer Project.



Source: Aerial Imagery: U.S. Dept. of Agriculture, Nat. Agricultural Imagery Program, Imperial County, 2005.

Figure 2-2 SCH Project Alternative Locations

Under the IID Water Conservation and Transfer Project, the amount of water to be conserved and transferred would increase over the first 24 years until 2026 when the transferred amount would be 303,000 acre-feet per year (afy). Mitigation water that is being put into the Sea by IID will minimize the effect of other actions on inflows through 2017. Historical inflows from the Coachella Valley also were adjusted for implementation of the QSA-related projects and the Coachella Valley Water Management Plan. Under the QSA, IID would conserve water and transfer the water to CVWD. This amount would increase to 103,000 afy by 2026. This amount of water would continue until 2047. After 2047, IID would provide 50,000 afy to CVWD, and the Metropolitan Water District of Southern California would provide 50,000 afy to CVWD.

Inflows to the Salton Sea would decline slowly until 2018 and decline more rapidly through the mid-2030s. Inflows would be relatively stable from the mid-2030s to 2078. These actions would result in an average inflow of over 900,000 afy until 2078. Changes in the inflows would result in changes in the Sea's surface water elevation, reducing it from approximately -231.87 feet mean sea level (msl) currently to -258.2 feet msl by 2077. Salinity would increase from 50,994 milligrams per liter (mg/L) currently to 278,000 mg/L by 2077. Air quality management facilities, described below, would not be implemented until the surface water elevation is below -235 feet msl and the soils are dry. Pupfish channels would not be constructed until the Sea's salinity exceeds 90,000 mg/L.

2.3.2 Facilities Included in No Action Alternative

QSA implementation and the related The IID Water Conservation and Transfer Project would require several actions affecting the Salton Sea, including air quality management on the playa that would be exposed due to QSA implementation, protection of desert pupfish at the Salton Sea to mitigate QSA impacts, and modification of recreational facilities at the Salton Sea to mitigate QSA impacts.

2.3.2.1 Air Quality Management

The IID Water Conservation and Transfer Project would result in the additional exposure of playa between -235 and -248 feet msl. To mitigate the potential air quality impacts from this area, the IID Water Conservation and Transfer Project Mitigation Monitoring and Reporting Plan included the following four-step air quality mitigation and monitoring plan:

- Restrict access to exposed playa;
- Conduct a research and monitoring program;
- Create or purchase offsetting emission reduction credits; and
- Direct emission reductions at the Salton Sea by implementing feasible dust mitigation measures or supplying water to the Sea to maintain moisture on the playa exposed by QSA actions.

Mitigation will only occur on the playa between -235 and -248 feet msl.

2.3.2.2 Air Quality Management by Other Landowners

As described above, the air quality management measures under the No Action Alternative would only be located between -235 and -248 feet msl. In accordance with the requirements of the local air quality management districts, landowners would be responsible for the remaining exposed playa between the existing shoreline and -235 feet msl. Although it is possible that air quality management for these areas also would require a water supply, no water has been allocated for lands above -235 feet msl. If water-based methods are used to control dusts on these lands, further reductions in the Salton Sea's surface elevations and more exposed playa below -248 feet msl would occur. Owners of these areas also would be responsible for air quality management. The primary owners of lands in the seabed are the Federal government, IID, and the Torres Martinez Tribe.

2.3.2.3 Pupfish Connectivity

The IID Water Conservation and Transfer Project required that IID extend the drains in the Imperial and Coachella valleys into the Salton Sea as the water surface level recedes to increase available habitat for desert pupfish in the drains. This would occur after 2017 when IID is no longer required to provide mitigation water to the Salton Sea, as discussed in Section 1, Introduction. When conditions in the Sea become unsuitable for desert pupfish and preclude their movement among drains, pupfish channels would be constructed to interconnect the drains and eliminate the connection to the hypersaline Sea. The Sea is projected to become unsuitable for desert pupfish when salinity reaches about 90,000 mg/L. The pupfish channels would not be connected to the extended river or creek channels. Therefore, five separate desert pupfish areas would be developed. Along the Sea's southern shoreline, separate pupfish channels would be located north of the New River, between the New and Alamo rivers, and north of the Alamo River. Along the northern shoreline, separate pupfish channels would be constructed to the east and west of the Whitewater River.

2.3.2.4 Extension of Recreational Facilities

The IID Water Conservation and Transfer Project also required that IID extend boat ramps located around the shoreline and trails at Salton Sea State Recreation Area. These facilities are to be extended as the Sea recedes.

2.4 Features Common to the Project Alternatives Carried Forward for Detailed Analysis

All alternatives considered for the SCH Project would restore shallow water habitat lost due to the Salton Sea's ever-increasing hypersalinity and reduced area as the Sea recedes. The SCH ponds would use available land at elevations less than -228 feet msl (the former Sea level in June 2005). The SCH Project would consist of one or more large ponded units that each contains three to five smaller ponds (Figure 2-3). The newly created habitat would be contained within low berms. The water supply for the SCH ponds would be a combination of brackish river water and saline water from the Sea, blended to maintain an appropriate salinity range. 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. The proof-of-concept period would last for approximately 10 years after completion of construction (until 2025). By that time, 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 QSA (2078) or until funding were no longer available. The SCH ponds would be constructed and operated by DFG, on behalf of the California Natural Resources Agency.

2.4.1 Project Components

2.4.1.1 Basic Design Considerations

The SCH ponds would be constructed primarily on recently exposed playa following the existing topography (ground surface contours) where possible. 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. The ponds would use a range of design specifications. 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.

2.4.1.2 Pond Unit Type

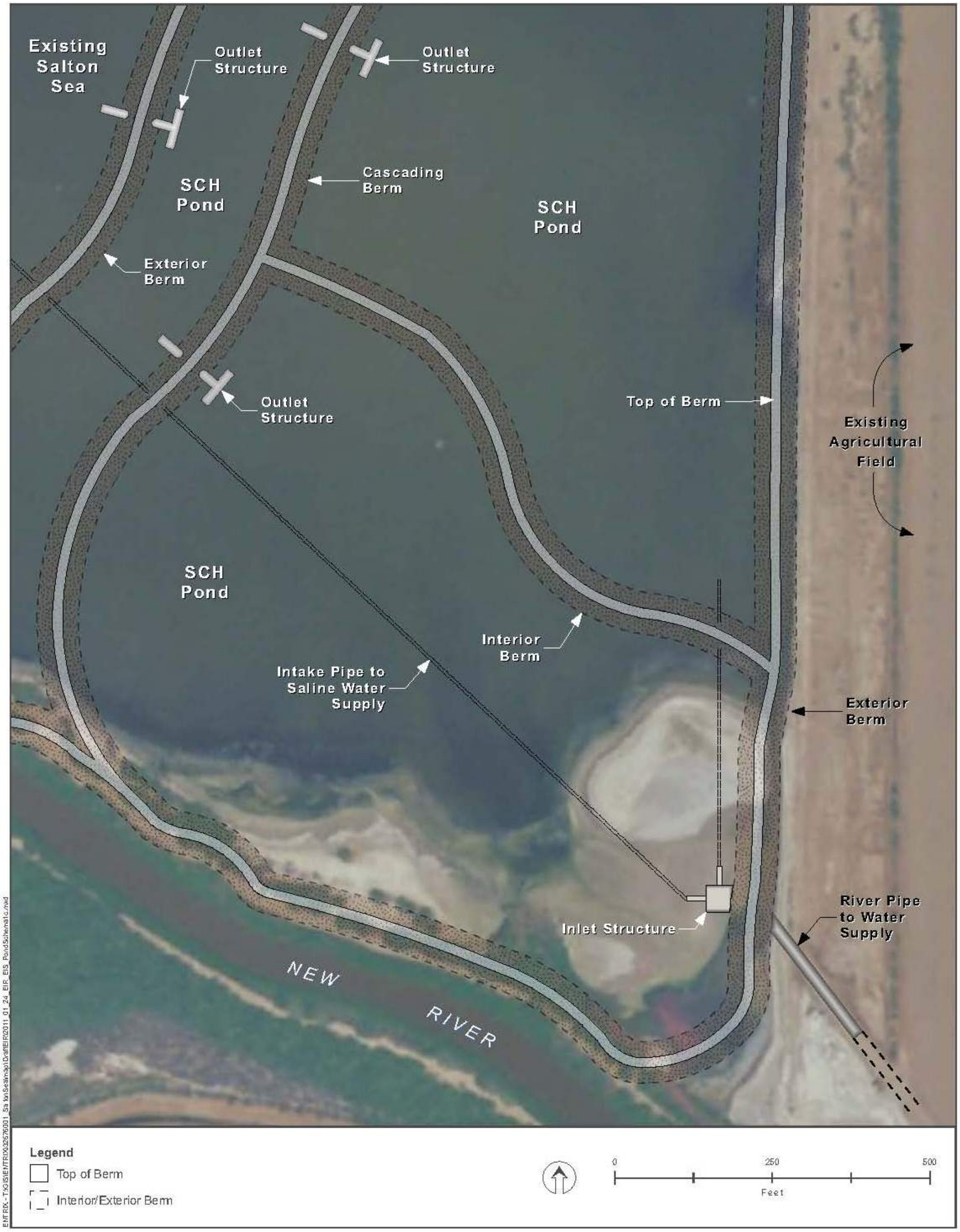
Each pond unit could be either independent or cascading (Figure 2-3). An independent pond unit would have one inflow point for brackish and saline water that could be subdivided into multiple smaller ponds. Water would be conveyed between the smaller ponds through a gated pipe, and the ponds would have 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 1 and 3. For Alternatives 4 and 6, the difference would be about 5 feet. Cascading would be used to help aerate the water in the lower pond unit (Figure 2-3).

2.4.1.3 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.
- **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 1, 3, 4, and 6).
- **Improved river berm** – The improved river berm would 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 would 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.

1 

2 **Figure 2-3 Conceptual Plan of Cascading and Individual SCH Pond Units**

Berms would be constructed by two methods. “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). Figure 2-4 shows a typical cross section of a berm and an outlet structure. A berm would include a single-lane, light-duty vehicle access road on top and turn-outs 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 be built 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 following period while 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; those under consideration include the following:

- **Sacrificial soil barrier** – This barrier would consist of soil excavated onsite and placed to create an extra-wide buttress to the berm. It would be constructed as a low-level shelf or a shoal on the Sea side of the berm. A portion of the shelf width may be eroded by waves on windy days. The shelf width would be sized to minimize the risk of erosion extending back to the main section of the berm. The sacrificial portion of the berm may require replenishment or supplemental facing until a more resistant facing was installed or the level of the Sea recedes.
- **Rubble rock mound** – This is the most traditional form of breakwater, consisting of placing uniform-sized quarried stone in a trapezoidal section. Other durable materials may be used for the rubble pieces, including broken concrete. The rubble would be placed on a geotextile.
- **Sheet pile barrier** – This type of barrier involves driving sheet pile ahead of the berm construction to block the wave action. The sheetpiles may need to be driven into the stiff alluvium beneath the Sea sediments to develop the needed lateral support.
- **Timber breakwater** – This type of breakwater consists of wood plank facing bolted to horizontal timbers (walers) spanning vertical piles. Piles may be spaced from 8 to 12 feet. The vertical piles could be timber, steel, or prestressed concrete.
- **Geotube** – A Geotube is an oval (in cross section) geotextile tube with closed ends that is hydraulically filled with soil. The Geotube would be placed at the seaward toe of the berm fill, creating a wave barrier. Once installed and filled, sediment fill for the berm would be placed directly against the Geotube. The Geotube would be permanently left in place. The geotextile material would be selected with sufficient resistance to ultraviolet radiation to maintain the Geotube’s integrity until the level of the Sea receded below the toe of the fill. During filling, finer grained suspended-sediments would flow through the pervious geotextile, creating a temporary turbid water condition. With the high clay fraction in the sediments, the viability of using Geotubes may need to be verified by a demonstration test.
- **Large sand bags** – Bags that can hold up to 1 to 1.5 tons of sand may be placed in a line to create an erosion- resistant barrier that would be left in place. These bags would function similar to the Geotube, creating a soil-filled, geotextile-faced gravity structure to resist wave action.

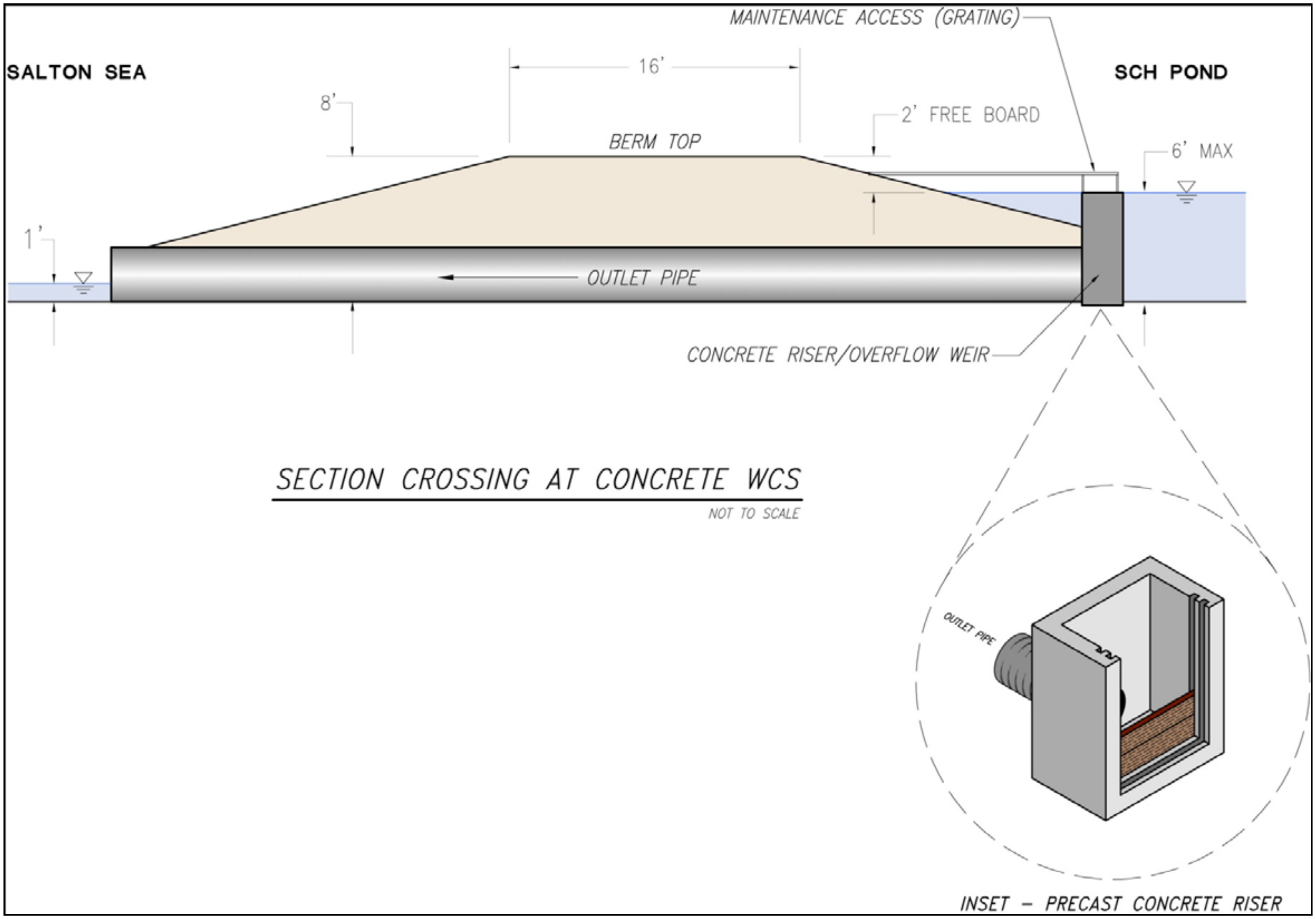


Figure 2-4 Conceptual Cross-Section of Pond Berm and Outlet Structure

- **Water-filled bladder** – A water-filled bladder is a rubber tube that would be placed seaward of the berm fill to create a calm water condition on the pond side of the bladder. The bladder would accept the wave action while the berm was being constructed. This structure would be temporary and would be removed after the berm was stabilized and supplemental erosion protection, such as riprap, was added on the seaward face.
- **Floating tire breakwater** – A floating tire breakwater could be used to absorb wave energy seaward of the planned berm alignment. The tires would be lashed or chained together, creating a wide floating structure. One common configuration is known as the Goodyear floating tire breakwater. The breakwater would be sited so that the tires did not touch the seafloor. As the Sea recedes, the breakwater may need to be positioned to keep the tires off the bottom. Once it was no longer needed at a given location, the breakwater could be moved to another site in need of protection.

2.4.1.4 Boat Ramps

Boat ramps would be needed in the ponds to allow boat access for monitoring and maintaining the ponds, Project features, and habitat conditions.. An airboat similar to the DFG or USFWS boats currently used on the Sea would be used in the SCH ponds. 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 would be used on the windward side of the ramp to protect the boat during launch and recovery.

2.4.1.5 Borrow Excavations

On-site borrow material would be needed to construct the berms and habitat features such as 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 ultimate source of borrow material within the Project footprint would be determined by berm construction methods, geotechnical properties of the playa material, and habitat requirements. The borrow areas generally would be adjacent channels, swale channels, and shallow excavations. Swales and channels would be excavated within the ponds with scrapers and excavators to a depth of 2 feet or more. They would ultimately serve as habitat features that connect shallow and deep areas of a pond. Shallow borrow areas would be taken from the highest and driest ground and would provide approximately 2-foot-deep water depths in areas that would otherwise have very shallow water less than 1 foot.

2.4.1.6 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 be used to 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 footprint or outside of the exterior berm in the Sea.

2.4.1.7 Water Supply

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 water in 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. 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.

2.4.1.8 Inflow and Outflow Structures

The water supply would be brought into the ponds through an inflow structure. This structure would be connected to a pumped or gravity flow system for the river and a pumped system for the saline water. A single inflow structure would be used to 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 the different salinity water.

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 that would 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 also the overflow during a 100-year rainfall on the pond. 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. The top of these structures, which would act as an overflow weir, would be at least 2 feet below the top of the berms.

2.4.1.9 Water Control Structures

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 ponds units in which an independent supply is not cost effective, or to provide flexibility in the management of water resources supplied to the ponds.

2.4.1.10 River Diversion Gravity Diversion Structure

For alternatives that consider supplying river water to the Project via gravity diversion (Alternatives 1 and 4), 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, through the sedimentation basin, down the brackish water pipeline, and into the SCH ponds.

2.4.1.11 Brackish Water Pipeline

The gravity brackish water pipeline that would convey water from the sedimentation basin to the SCH ponds would consist of several large-diameter polyvinyl chloride (PVC) pipes that would be buried along the route. The final configuration of the brackish water pipeline would depend on topographic information, available right-of-way, and cost. The brackish water pipeline could travel either along the river or along public roads. The exact route that would be followed is not identified at this time because it would be dependent on the availability of land from willing owners and the ability to negotiate a lease or easement from such owners. The area in which the brackish water pipeline and associated diversion facilities could be located is shown on Figure 2-2. It is estimated that three 5-foot-diameter pipes would be needed to minimize the velocity in the brackish water pipeline (thereby minimizing head loss).

2.4.1.12 River Diversion Pump Stations

A pump station would be required for alternatives using a river water diversion located at the Project site (Alternatives 2, 3, 5, and 6). A pump station would be required because the water surface elevation in the river at the Project sites is below the design elevation of -228 feet msl for the SCH ponds. A single pump station could deliver water to the SCH ponds on both sides of the river. Water would be pumped directly into sedimentation basins located on either side of the river. The pump station would be composed of multiple pumps, which would allow for the diversion rate to vary by operating a different number of pumps. In addition, the use of multiple pumps would allow some pumps to be taken out of service for maintenance without eliminating the entire diversion. The power to operate the pumping station would be supplied from existing three-phase power lines owned by IID.

2.4.1.13 Saline Water Supply Pump Station

Supplying saline water to the SCH ponds to achieve the desired salinity would require pumping from the Salton Sea, which has a lower water surface than that of the SCH pond units. The pump station could be located on a platform in the Sea, which would require existing three-phase power to be brought out to the station. Pumps in a saline environment would have a limited life span because of the salinity. The pump station may have to be relocated farther out as the Sea recedes and as pumps need to be replaced for maintenance. Another option would be to excavate a channel to bring the seawater to a pump station located closer to the Project site. This option would require less supply pipeline and a shorter run of utility lines, but would require that the channel be maintained and deepened as the Sea recedes. It is important to note that as the Sea recedes, it gets progressively saltier. At some point in time seawater may not need to be used because of its hypersaline condition, and salinity may be achieved through a tailwater return system or similar process.

2.4.1.14 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 would otherwise 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.

2.4.1.15 Power Supply

Electrical power would be needed to operate the pumps. Existing aboveground power lines operated by IID would be extended to reach the pumping plant located at the SCH ponds or in the Salton Sea; a three-phase, 480-volt aboveground system would be required at the SCH ponds while a three-phase, 480-volt underwater conduit system would be required to reach the pumping plant located in the Salton Sea. At the New River, the supply would be extended 1 mile for the river pumps and 1 mile for the Sea pumps. At the Alamo River, the supply would be extended 1.5 miles for the river pumps and 1 mile for the Sea pumps (Figure 2-5). Aboveground electrical power lines extended as a result of the SCH Project would be modified to prevent bird collisions and electrocutions (e.g., bird deterrents).

2.4.1.16 Sedimentation Basin

A sedimentation basin would be needed for all alternatives to remove the suspended sediment from the influent river water before it entered the SCH ponds. For alternatives considering a gravity diversion, the sedimentation basin would be located adjacent to the river upstream of the SCH ponds at the point of diversion, with water delivered to the SCH ponds with a brackish water pipeline from the sedimentation basin. For pumped diversion alternatives, sedimentation basins would be located at the SCH ponds on each side of the river and would feed water directly into the ponds.

Source: Aerial Imagery: U.S. Dept. of Agriculture, Nat. Agricultural Imagery Program, Imperial County, 2005.

Figure 2-5 Location of IID's Three-Phase Power Lines and Potential Project Extensions

A preliminary investigation of each river, upstream of the Project sites, discovered that the surrounding terrain elevation is up to 15 feet higher than the river water surface. The sedimentation basin and brackish water pipeline would need to be excavated down below the ground surface to below the river water surface elevation to allow water to flow toward the SCH ponds, which could be in excess of 20 feet of excavation. The basin is estimated to be between 10 and 30 acres with a 40 to 120 acre-foot capacity, depending on the alternative. The basin would have steep side slopes (2:1) to discourage establishment of emergent vegetation.

The sedimentation basin would detain the diverted water for about 1 day to allow the suspended sediment to settle out of the water column. The material would settle to the bottom of the basin where it would accumulate over time. The basin would be divided into two parts: the active basin and the maintenance basin. The maintenance basin would be dried and the sediment removed. This basin would then become the active basin and the other side would be dried. The 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.

2.4.1.17 Interception Ditch/Local Drainage

Existing drainage ditches located along the Salton Sea's perimeter discharge agricultural drainwater to the Sea. To keep the drainwater out of the SCH ponds, an interception ditch would be constructed that collects the drainwater and routes the water around the Project. The interception ditch would be excavated along the existing shoreline to intercept any water discharging from the land side, and drain it around the SCH ponds to the Sea. A berm would be constructed on the SCH pond side of the interception ditch to serve as the containment structure. The interception ditch would also serve other important functions. Because the design water surface for the SCH ponds may be at a higher elevation than the agricultural drains, it would prevent the Project from causing water to back up in the these drains, which would prevent the discharge of drainwater. Another important function is to mitigate the potential of the higher water in the ponds to create a localized shallow groundwater table that would be higher than that which currently exists on neighboring properties. The interception ditch would cause a break in the hydraulic movement of water through shallow soils and carry it away as drainwater to the Sea. Finally, this feature would maintain connectivity among pupfish populations in drains adjacent to the Project (allow fish movement along the shoreline between drains), which is a requirement of IID's Water Conservation and Transfer Project.

SCH berms would be located in a way that would allow natural runoff to proceed to the Sea unobstructed.

2.4.1.18 Aeration Drop Structures

For cascading ponds, small-diameter pipes could be placed in the cascading berm to allow flow from the upper pond to enter the lower pond. Because of the elevation difference (2 to 5 feet, depending on the alternative), the water would spill from the pipe, creating a localized zone of increased dissolved oxygen. The pipes would be placed near the top of the water column of the upstream pond, allowing the surface water to discharge to the lower pond. In the process of discharging the water out of the pipe, it would be agitated as it fell to the lower water surface elevation to increase dissolved oxygen. The structures could be grouped or placed at some interval along the intermediate berm.

2.4.1.19 Bird Habitat Features

Islands for roosting and nesting would provide habitat for birds that is relatively protected from land-based predators. Each pond would include several islands: one to three nesting islands (suitable for tern species) and three to six smaller roosting islands (suitable for cormorants and pelicans). 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 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 and gulls. The islands would be constructed by mounding up 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. Islands would be placed at least 900 feet from shore and in at least 2.5-feet-deep water to discourage access by land-based predators such as coyotes and raccoons.

An alternative island habitat technique could be constructing islands that would float on the pond's surface rather than be 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.

2.4.1.20 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 be varied to test performance of different techniques as part of the proof-of-concept approach. Examples of habitat features being considered for potential inclusion follow:

- **Swales or channels** – These features would be excavated through the middle of ponds to the exterior berm approximately 2 to 4 feet below the surface of the pond bottom and approximately 20 to 150 feet wide. The channels would be sloped toward the exterior berm to be self draining if a pond's water level was lowered or the pond was emptied for emergency purposes. The width of the swales may be larger depending on the soil conditions and the need to prevent sloughing of soil into the channel during pond operation. The swales or channels would create variable depths to enhance habitat diversity and would provide connectivity along a depth gradient from shallower habitat to deeper areas toward the Salton Sea. Swales would be created along the sides of the pond as a result of excavation and construction of berms.
- **Hard substrate on berms** – Berms would be armored with riprap to protect the toe, spanning approximately a 1- to 2-foot depth at the waterline. This rocky substrate would also provide diverse microhabitat amid the interstitial spaces and hard attachment points for algae or invertebrates.

- **Bottom hard substrate** – The Project could include some patches of submerged hard substrate in certain ponds to increase the amount of cover and attachment sites for sessile or benthic organisms (e.g., benthic macroinvertebrates, algae) that support food for fish.
- **Floating islands** – Another feature being considered for possible inclusion would be floating islands to provide cover for fish from bird predators and possible attachment sites for sessile organisms. Experimental concepts to be evaluated would include size, number, and seasonal placement of islands within the ponds.

2.4.1.21 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 be used; no septic tanks or sewerage would be required. Boats and other equipment would be stored at Imperial Wildlife Area's Wister Unit in existing facilities.

2.4.1.22 Fish Rearing

A goal of the SCH Project is to raise fish to support piscivorous 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 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 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).

2.4.1.23 Land Acquisition

The land where the SCH ponds would be located is owned by IID and would be leased from IID for the Project's duration, with the exception of the land at the Wister Beach SCH pond, which is owned by a number of private parties. 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 NWR. An agreement between DFG and USFWS would be established prior to construction of the SCH Project in order 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. Access roads would be needed for construction vehicles to move from the public right-of-way to the construction site. In the case of 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 at another site. The easement would be structured so as to not preclude the continued use of the property by the landowner. The land in the easement would be disturbed during construction but then would be returned to the preexisting condition after construction, except at the sites of permanent facilities, such as pump stations, diversion works, and pipeline access manholes.

2.4.1.24 Public Access

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 they would be compatible with the management of the SCH ponds as habitat for piscivorous (fish-eating) birds dependent on the Salton Sea and nearby sensitive resources. Such activities would include day use, hiking, bird-watching, and non-motorized 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 is observed by SCH managers, human approach would be limited by posted signs. Hours of public access would be restricted to 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 became well established and appeared to provide fish in excess of what birds were consuming, angling would be allowed. Waterfowl hunting may be allowed, consistent with the protection of other avian resources.

2.4.1.25 Project Compatibility with other Potential Future Land Uses

The SCH Project would be designed and operated to be compatible with other projects in the area.

Geothermal Development

The proposed SCH pond sites are located in an area that has the potential to be developed with geothermal uses (subject to the appropriate environmental compliance and approval processes), including one 10-acre well pad in each quarter section in unspecified locations within the SCH Project's boundaries, pipelines to convey geothermal water, roads that can support heavy loads, and electric transmission lines. Geothermal pipelines, roads, and electric transmission lines may require easements up to 600 feet wide for construction, access, and maintenance. Geothermal power generation plants typically require sites up to 50 acres. At this time, it is not known whether such facilities would be constructed and where they would be located. Their siting, construction, and operation would require permits and independent environmental analysis.

Geothermal development companies were consulted while the SCH Project alternatives were being developed, and the SCH Project is based on information that is currently available regarding their requirements, and how the SCH ponds and berms could be adapted, as needed, to accommodate future geothermal facilities such as well pads and access roads. Although this accommodation could incrementally reduce the amount of habitat restored as part of the SCH Project, this loss would not affect the overall viability of the SCH Project and the benefits it provides. Modifications to the SCH Project to accommodate this potential future development would be the responsibility of the geothermal developers and the impacts of such development are outside the scope of this EIS/EIR. As such, geothermal development in the Project area, should it occur, would be completely separate and distinct from the SCH Project and would be subject to its own environmental review and permitting processes. Such development is not the subject of this EIS/EIR, and impacts of geothermal development are not addressed herein.

Sonny Bono Salton Sea NWR Habitat Restoration Projects

The USFWS has indicated interest in developing approximately 700 acres of shallow water habitat in Red Hill Bay in an effort to maintain recent historic wetland values on this part of the NWR. As discussed above, this site was originally considered as a location for the SCH Project, but this area was removed from the SCH Project alternatives based on the USFWS' plans for the area. 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 alternatives 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).

2.4.2 Construction

SCH Project construction would be extensive, involving earthwork, concrete placement, electrical, and structural processes. The general construction activities are summarized below. The Project would be constructed over a 2-year period beginning in late 2012. Most construction would take place during the daytime, but dredging could take place 24 hours a day.

2.4.2.1 Pond Construction Techniques

Construction activities would occur in both wet and dry areas of the proposed pond sites. The dry areas (exposed playa) would be those areas between the Sea's elevation at the time of construction (estimated to be about -233.9 feet msl) and the -228-foot contour. This construction would be accomplished with land-based equipment. The wet areas would be those portions of the Sea that were inundated at the time of construction. Construction in these areas would be accomplished with floating equipment. Transition areas may start dry but become wet during construction. These areas would become wet because Project-related excavation may expose shallow groundwater or because of the presence of soft soils. The soft soil areas may appear dry but typically have water less than 2 feet below the surface and the soils lack the structural capability to support construction equipment. In these areas, low-ground pressure vehicles, construction mats, or constructing temporary elevated roadbeds could be used to move equipment through these areas.

Excavation equipment and techniques would vary depending on soil and water conditions at the time and location of the activity. Excavation activities would produce channels that allow for easier water-borne excavation, swales in the newly constructed habitat that would not be adjacent to berms, and widespread shallow borrow areas. Barge-mounted equipment would be used to construct borrow channels and berms in areas that would be flooded at the time of construction. The barge would operate from the channel it was constructing while excavating and piling material for a berm. Swales would be constructed with scrapers and excavators, and achieve 2- to 4-foot or potentially deeper water depths. These would ultimately serve as habitat features that connect shallow and deep areas of a pond. Shallow borrow areas would be taken from the highest and driest ground, and would provide approximately 2-foot-deep water depths in areas that would otherwise have very shallow water (less than 1 foot deep). Scrapers or excavators would be used to accomplish this recontouring.

2.4.2.2 Land-Based Equipment

The equipment used to construct in the dry would include scrapers, bulldozers, excavators, front loaders, and dump trucks. Scrapers are effective in excavating soil and moving it to a placement site, while bulldozers, excavators, and front loaders are useful in excavating and piling the soil in the same area. Excavators and front loaders could be paired with a dump truck to move the excavated material to a different location. The objective of the dry construction would be to minimize the distance that excavated material is moved. The land-based equipment would be used for earthmoving activities such as shaping the ponds, constructing the berms, and constructing the habitat features. An additional piece of land-based equipment that could be used is a pile driver to place piles for the inlet and outlet works. The land-based equipment would use, if needed, equipment with low-ground pressure tires.

2.4.2.3 Floating Equipment

Floating equipment would be used in the inundated areas and would consist of a barge-mounted excavator or clamshell dredge. The dredge would require a water depth of between 5 and 10 feet deep to operate, depending on the size of the barge. However, a clamshell dredge could also work from the channel it excavated. Floating equipment would be used to construct the exterior berms of the ponds.

2.4.2.4 Construction Staging Areas

A central construction staging area would be used to store construction equipment and supplies. The staging area would be located adjacent to the SCH ponds at about the -228-foot contour. The area would be about 2 acres and would be designed to avoid any off-site movement of spilled fluids or stormwater. After construction, the staging area would be restored to the condition prior to construction or incorporated into the Project. Additional staging areas located outside the public right-of-way would be established near the upstream diversion under Alternatives 1 and 4 through easements with the landowner.

2.4.2.5 Inlet and Outlet Works

Facilities such as outlet and inlet works located in the pond area would be constructed with land-based equipment. Equipment such as front loaders could be used to move precast structures to the site and an excavator or small crane rig could be used to place piles to support the structures. These piles would be driven into the playa until solid material (typically the clay layers that are present) is encountered. Depending on the timing of the installation of these structures relative to berm placement, the outlet works may be constructed from the top of the berm.

2.4.2.6 Pumping Plants

The pumping plant for the river diversion would be constructed using land-based equipment kept at the main staging area. The equipment would include excavators to excavate the diversion bay and a small crane rig to place sheet pile to separate the construction area from the river. Temporary pumps would be used to dry out the inlet to the river diversion. The pumped water would be stored in a temporary basin to settle the suspended material and then returned to the river downstream of the excavation.

The saline pumping station would be constructed from a floating barge. Equipment on the barge would drive piles into the seabed to support the pumping facility. Temporary framework would be placed to allow for a concrete deck to be poured above the current Sea elevation. The pipeline to convey the saline water to the SCH would be placed in a trench on the seabed or on piles, depending on the soil conditions. The electrical wiring for the power supply would be placed in conduit alongside the pipeline. The design may also include a 4-inch brackish water pipeline that would convey river water out to the pumping plant as a non-saline water supply for maintenance flushing of the saline water pumps. The seawater pump station would be above the Sea elevation and accessed by boat. The facility may include deterrents to prevent birds from roosting or nesting on the structure.

Alternatively, the saline pumping station may be constructed at the outer perimeter of the SCH ponds. Construction would involve similar methods as those for the river diversion pump station and would occur from the completed berm top.

2.4.2.7 Gravity Diversion

The gravity diversion from the river would take place several miles upstream of the SCH ponds and would operate from a secondary staging area. The equipment would include excavators to excavate the diversion bay and a small crane rig to place sheet pile to separate the construction area from the river. Additional excavation would be needed for the brackish water pipeline corridor and the sedimentation basin.

2.4.2.8 Brackish Water Pipeline Construction

Excavation of the sedimentation basin and brackish water pipeline corridor would occur with excavators, bulldozers, scrapers and dump trucks. The sides of the trench could be laid back to avoid side wall collapse but this design specification would require additional excavation and right-of-way. As an alternative, the trench could be shored to minimize the construction area. Brackish water pipeline testing would be conducted prior to its operation. The brackish water pipeline would be cleaned, filled with river water, and checked for leakage. The water would be discharged into the SCH ponds or sedimentation basin once the test was completed.

2.4.2.9 Power Line Construction

Three-phase power would be required to operate the river or saline pumps. In both instances, power would have to be extended from 1 to 2 miles from the current locations to supply the pumps (Figure 2-5). Extension of the power lines would occur using aboveground power lines and require the placement of power poles. The extension would be similar to what is currently found in the area. The required equipment includes an auger, small crane, and a power line machine. Provision of the power and connecting into the existing system would require coordination with IID. Power lines for the saline pumps would be provided in underwater conduit. Aboveground electrical power lines extended as a result of the SCH Project would be modified to prevent bird collisions and electrocutions (e.g., bird deterrents).

2.4.2.10 Interaction with Existing Facilities

Numerous public and private improvements in the Project area could be encountered during construction. The most common would be related to agricultural land uses and include IID and private irrigation ditches and pipelines, IID drains, and private drains. Other facilities include pipelines for geothermal operations, power lines, roadways, and existing NWR wildlife structures. Alignments that conflicted with existing facilities would either be rerouted or the Project engineer would work with the facility owner to minimize the effects. For example, if the gravity brackish water pipeline were to intersect an agricultural drain, the drain would be rerouted to bypass the work area until the brackish water pipeline was placed and backfilled. The drain would then be restored to the pre-Project condition.

2.4.2.11 Vehicle Routes

Construction vehicles, including personal vehicles driven by workers, would use the established public roads. It is assumed that both commuters and haul trucks (tractor trailers) would approach the Project sites by traveling along State Route (SR)-86 or SR-111, both of which run primarily in a north-south direction and connect Imperial County’s primary population centers. Tractor trailers hauling riprap material to the Project site likely would originate on the Salton Sea’s northwestern side. To reach the New River sites, they would travel south on SR-86, exiting at West Bannister Road, where they would travel east for approximately 2 miles before heading north on Bruchard Road for about 4 miles. To reach the Alamo River sites, they would approach via SR-86/SR-78, exit the highway at Forrester Road (Highway 30), travel north, then continue north on Gentry Road. Attempts would be made to avoid the use of local roads adjacent to residences to the extent practicable. At West Sinclair Road, construction vehicles would turn east until reaching the Project area. Some of the public roads that would be used are not paved. In these cases, the roads would be watered during construction periods to reduce the dust emissions in accordance with Imperial County Air Pollution Control District’s requirements.

2.4.2.12 Erosion Control

Standard erosion control measures would be used during construction to control off-site runoff of sediment that is loosened during construction.

2.4.3 Operations

Several permanent employees would be required to manage the ponds.

Proposed SCH operations are based on a proof-of-concept model. With this 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 provides examples of the range of operations for the SCH Project.

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
- 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).

Fish and bird die-offs could occur periodically during pond operations; if dead birds were detected, they would be removed by DFG staff, in keeping with current practices at the Salton Sea.

2.4.4 Monitoring and Adaptive Management

Each SCH pond or set of ponds would be operated with different conditions to evaluate Project effectiveness and address key uncertainties about habitat function and potential impacts. A monitoring program would be implemented to collect data necessary to operate the ponds (e.g., flow and salinity), to evaluate their effectiveness (e.g., water quality parameters such as dissolved oxygen and temperature, presence and abundance of fish and bird species), and to assess status of threats (e.g., selenium concentration in water, sediment and bird eggs). Monitoring data would be collected in accordance with guidelines proposed for the Salton Sea Ecosystem Monitoring and Assessment Plan (USGS, in preparation). The frequency of data collection and evaluation would be guided by the purpose and need for monitoring. For example, operational triggers such as water supply flow rates would be monitored daily, while status of target resources would be monitored seasonally or annually. An overall data review would be conducted annually to evaluate SCH status and performance. A decision-making framework would be established to provide recommendations to SCH managers for maintaining or adjusting operations. Further details of the Monitoring and Adaptive Management Framework are provided in Appendix E.

2.4.5 Mosquito Control

A mosquito control plan would be implemented that addresses monitoring mosquito populations, the surveillance of mosquito-borne pathogens that cause diseases in human and wildlife, and the implementation of a treatment program to control mosquitoes at the SCH ponds and sedimentation basins at the outflows of the New River or Alamo River into the Salton Sea, if needed. Monitoring activities would be used to locate mosquito life stages (larvae, pupae, and adults), estimate their abundance, and determine species composition for the purpose of making treatment decisions. Disease surveillance would

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

be used to detect the presence of mosquito-borne disease as part of a state-wide program. Mosquito treatments would be used to reduce the abundance of mosquito populations and associated mosquito-borne disease risk, as needed. The detailed plan is included in Appendix F.

2.4.6 Maintenance and Emergency Repairs

Ongoing maintenance would be an integral part of SCH operations. Activities would include maintaining the sedimentation basin, interior and exterior berms, protective riprap, pumping plants, and gravity diversion. Material excavated from the sedimentation basin would be used to construct habitat features or add to the berms. The gravity diversion would be maintained to keep the diversion facilities free of sediment and also monitor the river bed elevation to be aware of any downcutting that may occur as the Salton Sea's water level drops. The saline pumping facilities would be maintained to reduce fouling caused by the hypersaline water flowing through the pumps.

The potential for biological fouling at pipes and pumps exists and would be addressed in maintenance plans. Typically, clogging of pipes would be reduced by periodic cleaning and flushing of the pipes. However, if the buildup of organisms in pipelines became excessive, pipe replacement may be required. Draining the ponds would not be a routine maintenance activity, but may be required if a berm were damaged or under another type of emergency situation.

2.4.7 Best Management Practices

Best management practices would be used to minimize impacts on the environment during construction, operations, and maintenance. An Erosion and Sediment Control Plan and a Stormwater Pollution and Prevention Plan would be prepared and implemented to minimize impacts on water quality during construction and maintenance activities. 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. This regulation is included in Appendix G. Additionally, during construction and maintenance, contractors and staff would implement the following measures to reduce emissions from fuel combustion and work activities:

- Limit idling of inactive equipment and queuing vehicles to 2 minutes;
- Use low or zero-emission vehicles, including construction vehicles;
- Promote riding sharing among construction workers or provide shuttle service to the Project site;
- Maintain vehicle and equipment engines to manufacturer's specifications;
- Maintain on-road vehicle and off-road equipment tire pressures to manufacturer specifications. Check and reinflate tires at regular intervals;
- Use lower-carbon fuels such as biodiesel blends where feasible;
- Use construction materials from local sources to the extent feasible; and
- Minimize vegetation removal necessary for construction to the extent feasible.

During facility operation, the operations and maintenance staff also would implement the following measures to reduce electrical demand, and thereby reduce greenhouse gas emissions from electric power generation needed to supply the SCH Project pumps:

- Check pump inlet screens regularly and remove accumulated debris as necessary;
- Operate the minimum number of pumps needed at any given time;
- Operate pumps only as necessary during the year; and
- Keep and reconcile logs of pump operation with monthly records of electric power usage (i.e., bills) to foster and promote energy awareness within the staff.

2.4.8 Decommissioning

The SCH Project would be designed to last for approximately 75 years. At the end of this period, or when funds are no longer available to operate the Project, the SCH facilities would be decommissioned. Decommissioning would require breaching the berms and removing the pumping plants and diversion structures and filling in the sedimentation basin. The environmental impacts of such activities would be speculative because it is not known what conditions would be present that far in the future. Thus, they are not analyzed in this document, although they likely would be less than those that would occur during the initial construction. Such activities would be subject to environmental review at the time they occurred.

2.5 Alternative 1 – New River, Gravity Diversion + Cascading Ponds

Alternative 1 would be located at the New River and would use independent and cascading pond units totaling approximately 3,130 acres. A gravity diversion would be used to provide river water to the ponds and would be located approximately 2 miles upstream of the SCH ponds. Alternative 1 would use the large bay to the northeast of the New River (East New) and the shoreline to the southwest (West New). Construction workers would include 2 managers, 3 foremen, 50 truck drivers, 6 laborers, and 36 heavy equipment operators, for a total of 97 workers. Features of Alternative 1 would include the following and are shown on Figure 2-6[4]:

River Water Source. Water would be diverted from the New River by gravity through a lateral structure approximately 2 miles upstream of the SCH ponds. The water would immediately flow to a sedimentation basin adjacent to the river. From the sedimentation basin, buried brackish water pipelines would convey the water to the SCH ponds. The alignment of the brackish water pipelines would be along the river or under roads. A metal bridge structure would be used to support the brackish water pipelines across the river.

Saline Water Source. The saline water pump would be located on a platform in the Salton Sea, north of the cascading pond unit at East New. Saline water would be conveyed to the SCH ponds through a pressurized pipeline.

Sedimentation Basin. Diverted water would flow to a sedimentation basin adjacent to the river, where it would be detained for approximately 1 day before being delivered by gravity to the SCH ponds through multiple brackish water pipelines. The basin would be 60 acres and be excavated below ground surface to approximately 20 feet. The basin would be fenced to prevent unauthorized access.

[4] The selected site would be surveyed prior to construction, and the boundaries shown on Figures 2-6 through 2-11 may be adjusted somewhat based on the results of these surveys.

Pond Layout. The pond layout includes two general areas: East New and West New, which contain independent pond units and cascading pond units.

Water Surface Elevation. The water surface elevation in the independent pond units would be a maximum of -228 feet msl and the maximum in the cascading units would be -230 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 form the northern boundary of the cascading pond units and a cascade berm would divide the independent and cascade pond units. Overflow pipes would be present in the intermediate berm that would allow water to drop 2 feet into the cascading pond. The exterior berm would be placed at an elevation of -236 feet msl, and the intermediate berm would be placed at an elevation of -234 feet msl.

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 connected directly to the Sea. Each overflow pipe would be sized to handle the overflow from a 100-year rainfall on the pond.

Borrow Source. The source of material for the berms would be a combination of shallow excavations in the independent units and an excavation trench along the cascade and exterior berms. The exterior berm would be constructed from a floating unit, and the cascade berm would be constructed using land-based equipment such as an excavator.

Agricultural Drainage and Natural Runoff. Agricultural drains operated by 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 ponds is also present in two drains that intercept the Project. The exterior berms would be aligned so as to not interrupt the flowpath of the occasional stormflows from these watersheds to the Sea. The exterior berms at West New would stop before a drainage channel that enters the Sea from the south.

Tailwater Return. A tailwater return pump could be placed in the saline water delivery line within the cascading pond unit in East New.

Pond Size. The individual ponds would range from 90 to 630 acres.

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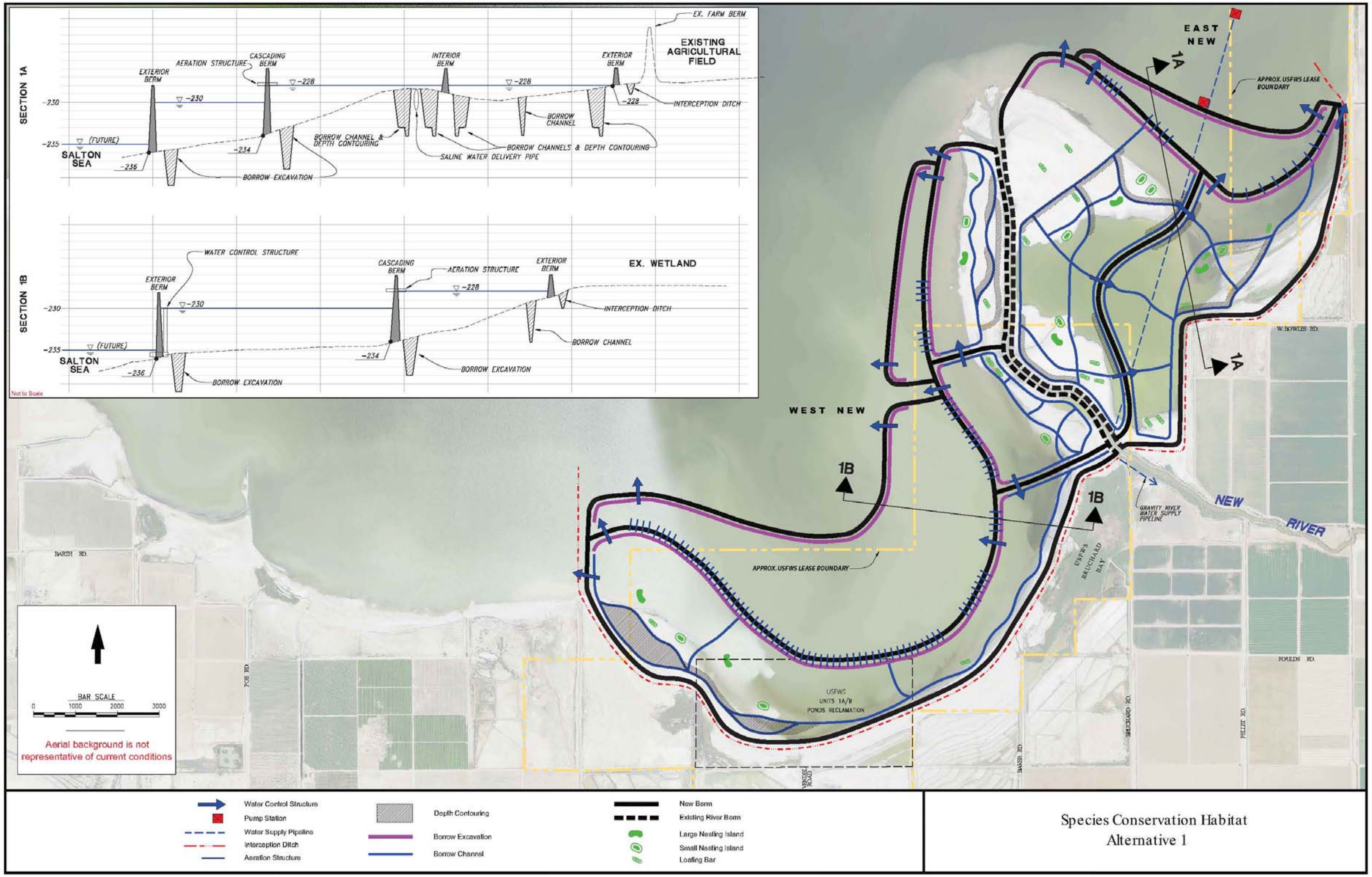

Figure 2-6 **Conceptual Layout of Alternative 1**

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2.6 Alternative 2 – New River, Pumped Diversion

Alternative 2 would be located at the New River and would use independent pond units totaling approximately 2,670 acres. The river diversion would be a pumped diversion located at the SCH site. Alternative 2 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 west (Far West New). Construction workers would include 2 managers, 2 foremen, 40 truck drivers, 6 laborers, and 27 heavy equipment operators, for a total of 77 workers. Features of Alternative 2 would include the following and are shown on Figure 2-7:

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. The saline pump would be located to the north of West 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 included in Alternative 2. Each one would be located within the SCH Project area and 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 40 acres and would be fenced to prevent unauthorized access.

Pond Layout. Alternative 2 would consist of several independent pond units at East New, West New, and Far West New. Within each pond unit, interior berms would form individual ponds. The pond at Far West New would receive its water supply from a pipeline from West New.

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.

Berm Configuration. Exterior berms would be placed at an elevation of -234 feet msl to separate the ponds from the Sea.

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 would connect 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 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 is also present in two drains that intercept the Project. The exterior berms would be aligned so as to not interrupt the flowpath of the occasional stormflows from these watersheds to the Sea.

Tailwater Return. A tailwater system could be provided for one side of the SCH Project.

Pond Size. The sizes of the individual ponds would range from 160 to 620 acres.

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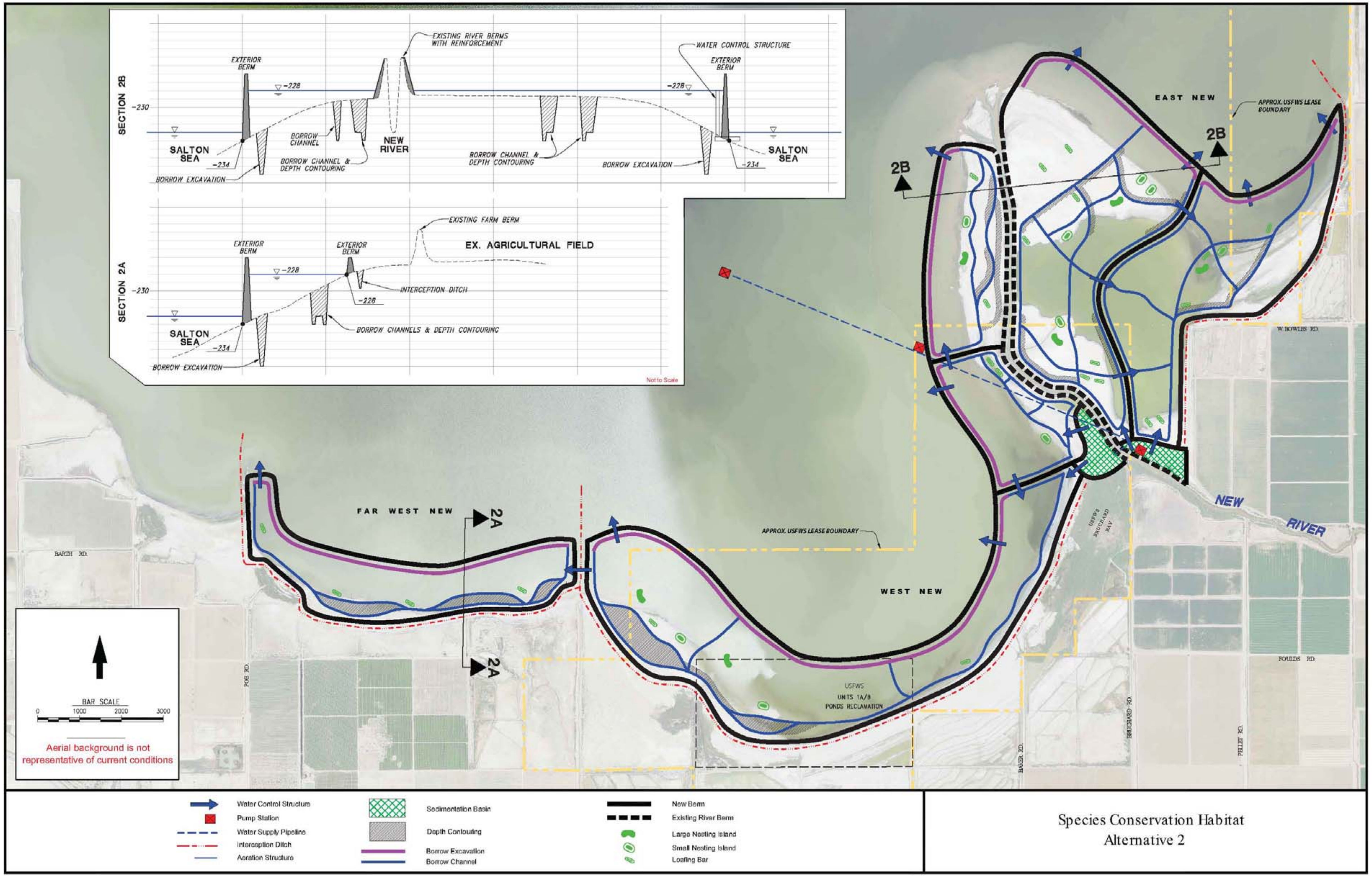

Figure 2-7 Conceptual Layout of Alternative 2

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2.7 Alternative 3 – New River, Pumped Diversion + Cascading Ponds

Alternative 3 would be located at the New River and would use independent pond and cascading pond units totaling approximately 3,770 acres. This is the Natural Resources Agency's preferred alternative; the Corps has yet to determine its preferred alternative. The river diversion would be a pumped diversion located at the SCH pond site. Alternative 3 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. Construction workers would include 2 managers, 3 foremen, 60 truck drivers, 6 laborers, and 44 heavy equipment operators, for a total of 115 workers. Features of Alternative 3 would include the following and are shown on Figure 2-8:

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. The 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 used for Alternative 3 and 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. Alternative 3 would consist of several independent pond units at Far West New, West New, and East New. Within each pond unit, interior berms form individual ponds. The ponds at Far West New 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.

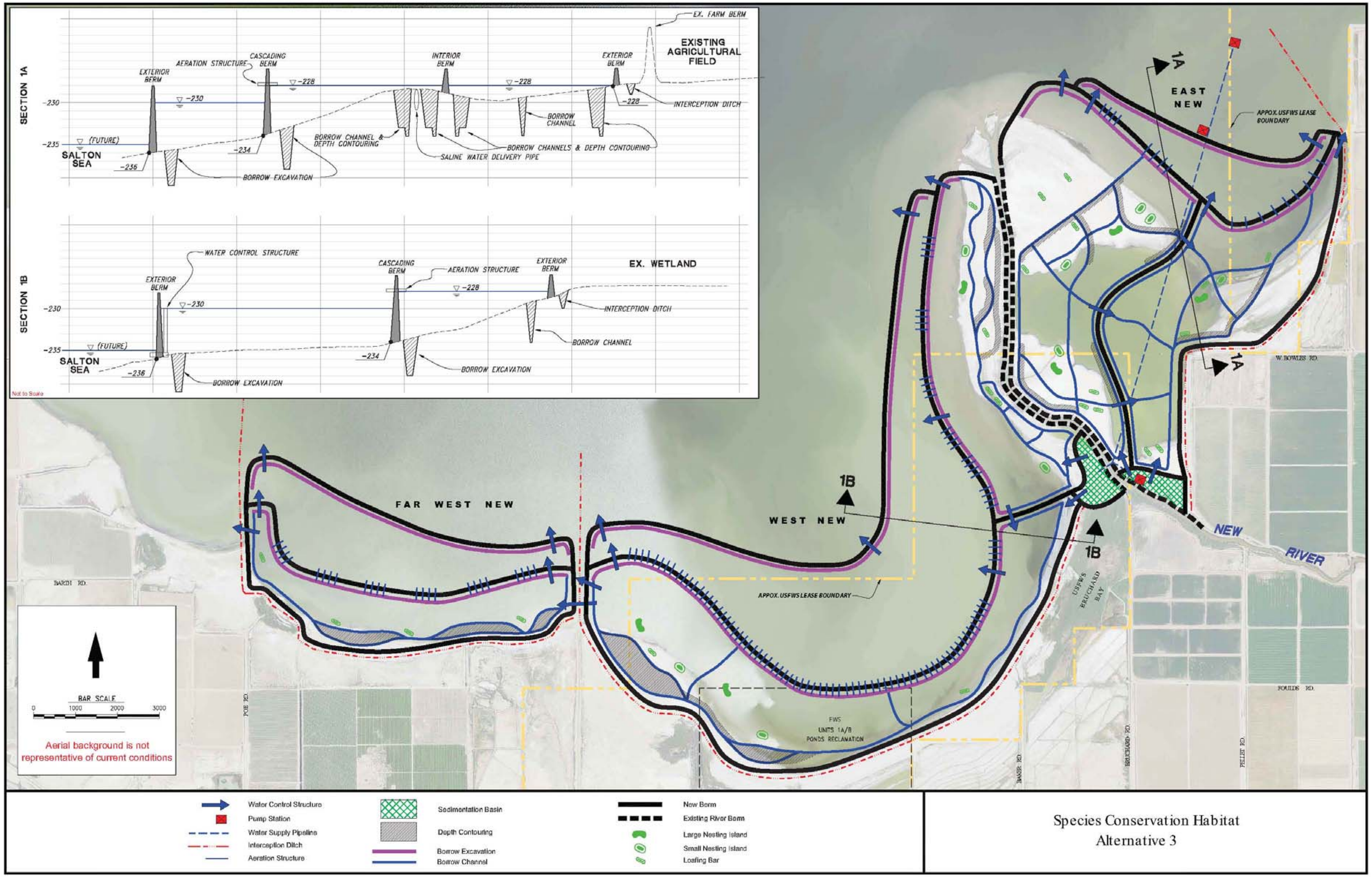
Pond Connectivity. Interior berms would subdivide the independent pond units, and gated control structures would be present in the interior berms to allow controlled flow between individual ponds. Each individual pond would have an ungated overflow structure that connects directly to the Sea with an 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 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 is also present in two drains that intersect the Project. The exterior berms would be aligned so as to not 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.



2 **Figure 2-8 Conceptual Layout of Alternative 3**

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2.8 Alternative 4 – Alamo River, Gravity Diversion + Cascading Pond

Alternative 4 would be located at the Alamo River and would use independent ponds and a cascading pond unit totaling approximately 2,290 acres. The river diversion would be a gravity diversion located approximately 3.5 miles upstream of the SCH ponds. Alternative 4 would use Morton Bay. Construction workers would include 2 managers, 2 foremen, 20 truck drivers, 6 laborers, and 17 heavy equipment operators, for a total of 47 workers. Features of Alternative 4 would include the following and are shown on Figure 2-9:

River Water Source. Water would be diverted from the Alamo River by gravity through a lateral structure approximately 3.5 miles upstream of the SCH ponds. The water would immediately flow to a sedimentation basin adjacent to the river.

Saline Water Source. The saline water pump would be located at Red Hill west of the pond units. A channel would be excavated from the Salton Sea to the pump station location. The pipeline would travel around Red Hill to the distribution point through a pressurized pipeline.

Sedimentation Basin. Diverted water would flow to a sedimentation basin adjacent to the river and would be detained for approximately 1 day before being delivered by gravity to the SCH ponds through multiple brackish water pipelines. The basin would be 37 acres and would be fenced to prevent unauthorized access.

Pond Layout. Alternative 4 would use an independent pond unit and a cascading pond unit at Morton Bay. The independent pond would be subdivided into two individual ponds.

Water Surface Elevation. The maximum water surface elevation in the independent ponds would be -228 feet msl, and the maximum water surface for the cascading pond would be -233 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.

Berm Configuration. Exterior berms would form the western boundary of the cascading pond unit and a cascading berm would divide the independent and cascading pond units. Overflow pipes would be present in the intermediate berm that would allow water to drop 5 feet into the cascading pond. The intermediate berm would be placed at an elevation of -234 feet msl. The exterior berm would be located on the Sea side of Mullet Island with a base elevation of -239 feet.

Pond Connectivity. Interior berms would subdivide the independent pond unit, 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 connected directly to the Sea. Each overflow pipe 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 excavation trenched along the exterior berm of the cascading pond, 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 IID terminate at the beach along the eastern side of the Morton Bay independent pond unit. This drainage would be collected in an interception ditch.

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

Pond Size. The sizes of the individual ponds would range from 420 to 1,020 acres.

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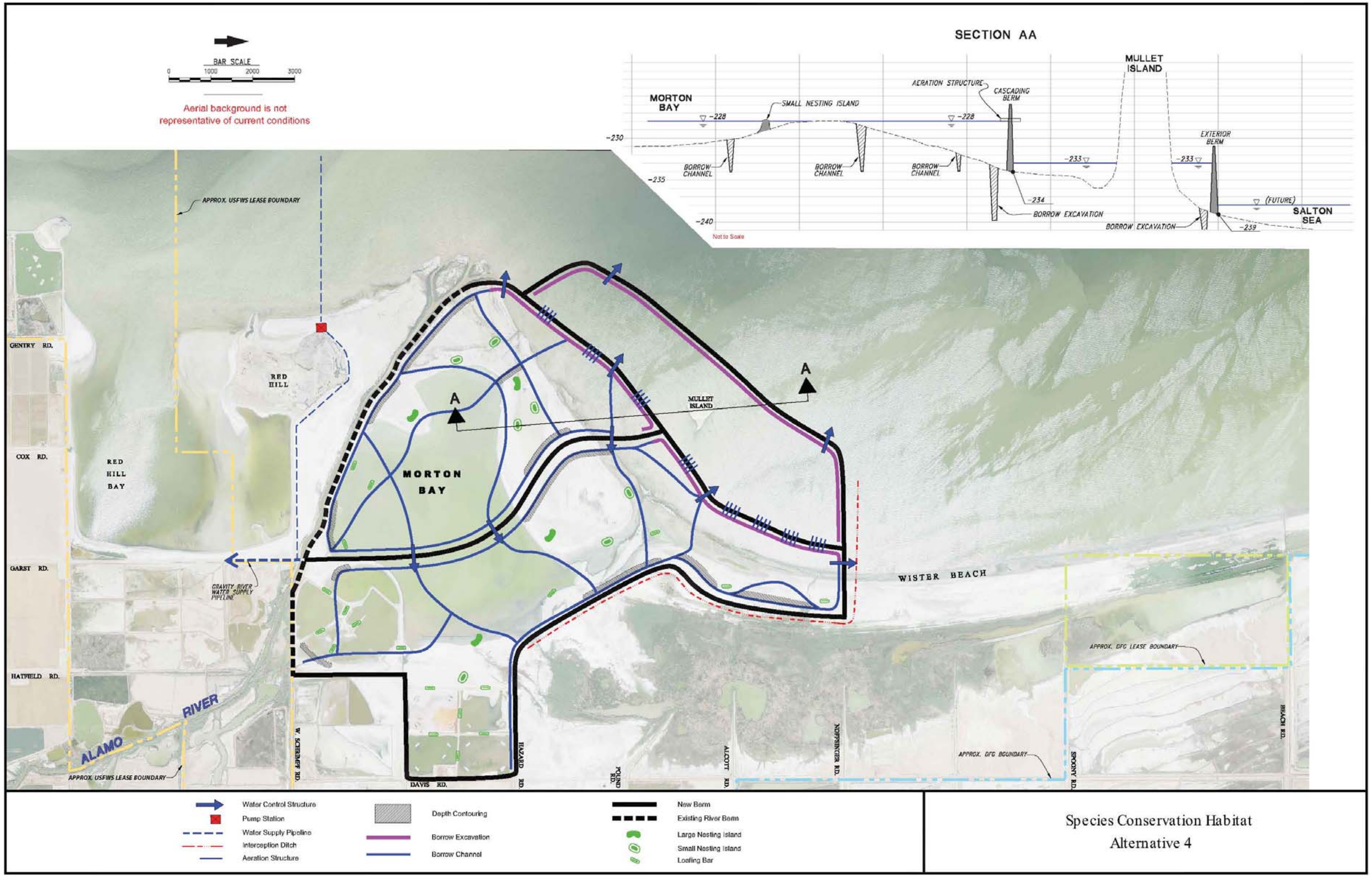

Figure 2-9 Conceptual Layout of Alternative 4

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2.9 Alternative 5 – Alamo River, Pumped Diversion

Alternative 5 would be located at the Alamo River, would use independent pond units, and would consist of approximately 2,080 acres. The river diversion would be a low-lift pumped diversion located at the SCH pond site. Alternative 5 would use Morton Bay to the northeast of the Alamo River. Construction workers would include 2 managers, 2 foremen, 18 truck drivers, 6 laborers, and 15 heavy equipment operators, for a total of 58 workers. Features of Alternative 5 would include the following and are shown on Figure 2-10.

River Water Source. Water would be pumped from the Alamo River at the eastern edge of the SCH ponds using a low-lift pump to a sedimentation basin on the north side of the river.

Saline Water Source. The saline water pump would be located in the Sea west of Red Hill. The pipeline would travel around Red Hill to the distribution point through a pressurized pipeline.

Sedimentation Basin. One sedimentation basin would be located within the SCH ponds. Water would be released from the basin to a distribution system serving the individual ponds. The basin would be 30 acres and would be fenced to prevent unauthorized access.

Pond Layout. Alternative 5 would consist of independent pond units at Morton Bay, and Wister Beach. An interior berm that forms individual ponds would be present within the Morton Bay independent pond unit.

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.

Berm Configuration. Berms would be placed at an elevation of -234 feet msl to separate the ponds from the Sea. The exterior berm would not include Mullet Island.

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 would connect directly to the Sea. Each overflow pipe 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 IID terminate at the beach along the eastern side of the Morton Bay independent pond unit. This drainage would be collected in an interception ditch.

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

Pond Size. The sizes of the individual ponds would range from 470 to 720 acres.

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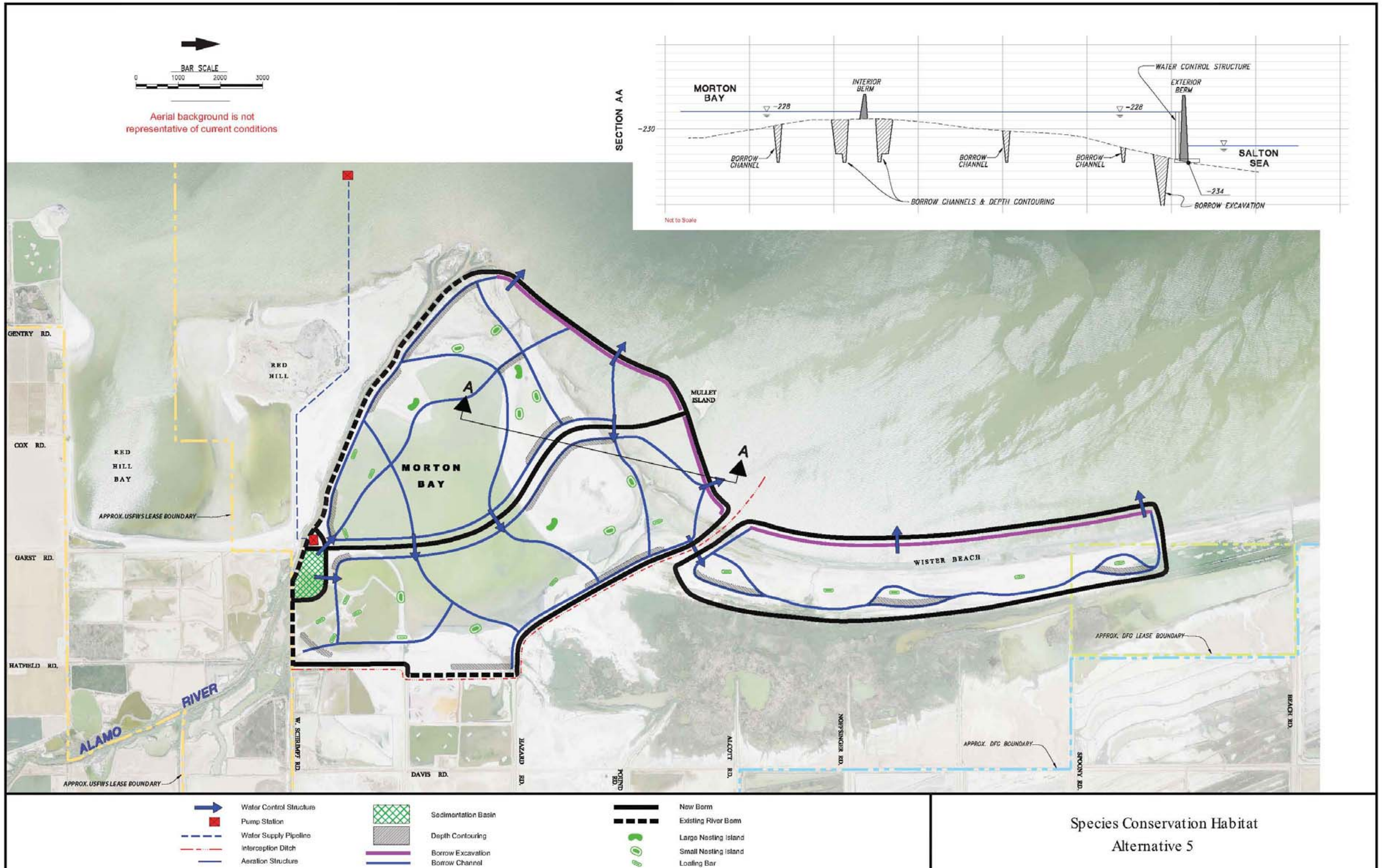

Figure 2-10 Conceptual Layout of Alternative 5

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2.10 Alternative 6 – Alamo River, Pumped Diversion + Cascading Ponds

Alternative 6 would be located at the Alamo River, would use independent and cascading pond units, and would consist of approximately 2,940 acres. The river diversion would be a low-lift pumped diversion located at the SCH pond site. Alternative 6 would use Morton Bay to the northeast of the Alamo River and Wister Beach. Construction workers would include 2 managers, 2 foremen, 24 truck drivers, 6 laborers, and 24 heavy equipment operators, for a total of 58 workers. Features of Alternative 6 would include the following and are shown on Figure 2-11.

River Water Source. Water would be pumped from the Alamo River at the eastern edge of the SCH ponds using a low-lift pump to a sedimentation basin on the north side of the river.

Saline Water Source. Saline water would be supplied from a pumping station located on a platform in the Salton Sea northwest of Morton Bay.

Sedimentation Basin. A sedimentation basin would be located within the SCH ponds. Water would be released from the basin to a distribution system serving the individual ponds. The basin would be 50 acres and would be fenced to prevent unauthorized access.

Pond Layout. Alternative 6 would consist of independent pond units at Morton Bay and Wister Beach, and a cascading pond on each. Interior berms that form individual ponds would be present within the Morton Bay independent pond unit.

Water Surface Elevation. The maximum water surface elevation in the independent ponds would be -228 feet msl, and the maximum water surface for the cascading ponds would be -233 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.

Berm Configuration. Exterior berms would form the western boundaries of the cascading pond units and cascading berms would divide the independent and cascading pond units. Overflow pipes would be present in the intermediate berms that would allow water to drop 5 feet into the cascading pond. The intermediate berms would be placed at an elevation of -234 feet msl. The exterior berm would be located on the Sea side of Mullet Island with a base elevation of -239 feet.

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 connected directly to the Sea. Each overflow pipe 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 IID terminate at the beach along the northeast side of the Morton Bay independent pond unit. This drainage would be collected in an interception ditch.

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

Pond Size. The sizes of the individual ponds would range from 340 to 680 acres.

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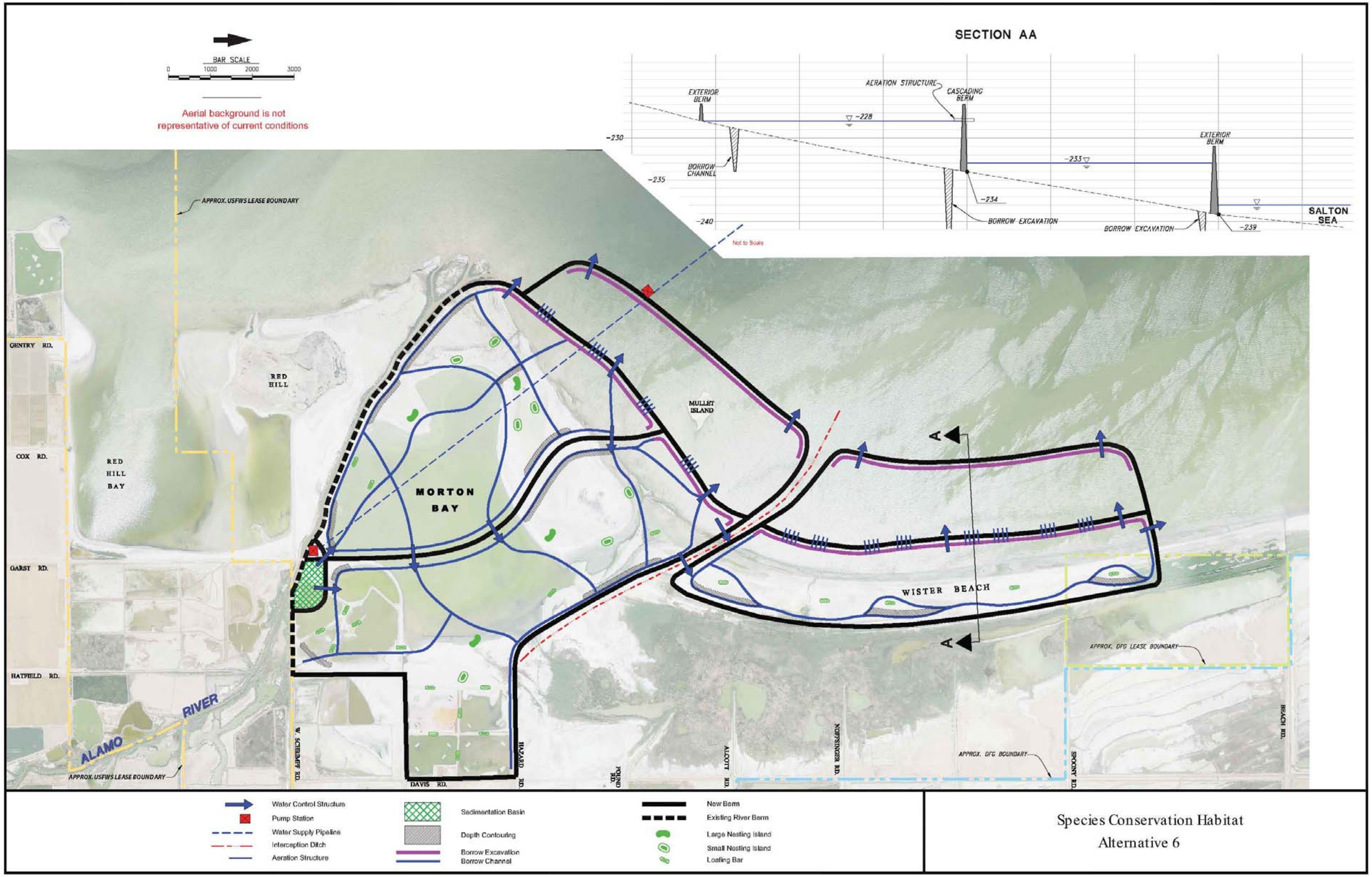

Figure 2-11 Conceptual Layout of Alternative 6

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2.11 References

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

United States Geological Survey. In preparation. Salton Sea ecosystem monitoring and assessment plan.

2.12 Personal Communications

Schoneman, Christian. 2011. Project Leader, Sonny Bono Salton Sea National Wildlife Refuge Complex. Email to Sarah Bumby, Cardno ENTRIX, April 19.

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