Lower Colorado River
Multi-Species Conservation Program

Balancing Resource Use and Conservation

Mohave Valley Conservation Area Restoration Development & Monitoring Plan

U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION

September 2015

Lower Colorado River Multi-Species Conservation Program Steering Committee Members

Federal Participant Group

Bureau of Reclamation
U.S. Fish and Wildlife Service
National Park Service
Bureau of Land Management
Bureau of Indian Affairs
Western Area Power Administration

Arizona Participant Group

Arizona Department of Water Resources
Arizona Electric Power Cooperative, Inc.
Arizona Game and Fish Department
Arizona Power Authority
Central Arizona Water Conservation District
Cibola Valley Irrigation and Drainage District
City of Bullhead City
City of Lake Havasu City
City of Mesa
City of Somerton
City of Yuma
Electrical District No. 3, Pinal County, Arizona
Golden Shores Water Conservation District
Mohave County Water Authority
Mohave Valley Irrigation and Drainage District
Mohave Water Conservation District
North Gila Valley Irrigation and Drainage District
Town of Fredonia
Town of Thatcher
Town of Wickenburg
Salt River Project Agricultural Improvement and Power District
Unit "B" Irrigation and Drainage District
Wellton-Mohawk Irrigation and Drainage District
Yuma County Water Users' Association
Yuma Irrigation District
Yuma Mesa Irrigation and Drainage District

Other Interested Parties Participant Group

QuadState County Government Coalition
Desert Wildlife Unlimited

California Participant Group

California Department of Fish and Game
City of Needles
Coachella Valley Water District
Colorado River Board of California
Bard Water District
Imperial Irrigation District
Los Angeles Department of Water and Power
Palo Verde Irrigation District
San Diego County Water Authority
Southern California Edison Company
Southern California Public Power Authority
The Metropolitan Water District of Southern California

Nevada Participant Group

Colorado River Commission of Nevada
Nevada Department of Wildlife
Southern Nevada Water Authority
Colorado River Commission Power Users
Basic Water Company

Native American Participant Group

Hualapai Tribe
Colorado River Indian Tribes
Chemehuevi Indian Tribe

Conservation Participant Group

Ducks Unlimited
Lower Colorado River RC&D Area, Inc.
The Nature Conservancy

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1.0 Introduction

The Lower Colorado River Multi-Species Conservation Program (LCR MSCP) is a multi-stakeholder federal and non-federal partnership responding to the need to balance the use of lower Colorado River (LCR) water resources and the conservation of native species and their habitats in compliance with the Endangered Species Act.

The LCR MSCP is a long-term (50 year) plan consisting of conservation measures that provide protection along the LCR from Lake Mead to the Southerly International Boundary with Mexico for 26 species currently threatened or endangered and five species on the verge of becoming threatened or endangered. The LCR MSCP anticipates development and/or protection of a minimum of 8,132 acres of habitat consisting of a mosaic of cottonwood-willow, honey mesquite, marsh, and backwater components. The program uses adaptive management principles to research and monitor species and habitats, and to adjust and enhance management actions and science applications over the life of the program.

Under the guidance of the LCR MSCP's Habitat Conservation Plan (HCP), the program is tasked with creating 85 acres of connected backwater habitat between Davis and Parker Dams. HCP Conservation Measure FLSU1 states, "Create 85 acres of flannelmouth sucker habitat. Of the 360 acres of LCR MSCP-created backwaters, at least 85 acres will be created in Reach 3 with water depth, vegetation, and substrate characteristics that provide the elements of flannelmouth sucker habitat."

Much of the bank line within this reach of the river is developed or runs through Topock Gorge, which is composed of steep, rocky terrain that is unsuitable for MSCP development based on site access restraints and landownership restrictions. However, within the Moabi Regional Park (Park Moabi) south of Needles, CA approximately 149 acre parcel of land residing within the historic floodplain of the lower Colorado River possesses the landscape characteristics to allow for the development of a connected backwater. (See Appendix G for historical imagery.)

Purpose

The purpose of the project is to create a connected backwater for native fishes and restore native riparian and upland habitat for the benefit of the LCR MSCP covered species. Target species include the flannelmouth sucker *(*Catostomus latipinnis) and the razorback sucker (Xyrauchen texanus). The project will create a mosaic of marsh and riparian habitat through management of the four land cover types: cottonwood-willow, honey mesquite, marsh and backwater.

Following the guidelines of the LCR MSCP HCP, the backwater must be connected to the river so that is it accessible to native fishes from the main stem. The proposed channel will connect to and induce additional flow through the existing channel to the south rather than exit directly to the river. Partners in the design of the Mohave Valley Conservation Area (MVCA) consists of representatives from the following organizations:

- California State Lands Commission
- California Department of Fish and Wildlife
- San Bernardino County
- U.S. Bureau of Reclamation
- Lower Colorado River Multi-Species Conservation Program

The project area will be 149 acres, which includes the main parcel bound by gravel roads as well as lands used to connect the backwater to the main stem of the river and the Park Moabi channel (Figure 1).

Location and Description

Park Moabi operates on 1,027 acres and has two land owners: the California State Lands Commission (CSLC) and the Bureau of Reclamation. The proposed MVCA land is located along the lower Colorado River, approximately 13 miles south of Needles, CA, between river miles 236 and 237 (Figure 1), and is owned by the CSLC. According to the lease between San Bernardino County and the CSLC, which came into effect on July 2, 1965, the property of interest commences at the center of Section 6, Township 7 N, and Range 24 E, S.B.M. The LCR MSCP is partnering with the Lands Commission and San Bernardino County, the lessee, to develop a backwater through the parcel northwest of the existing Park Moabi channel (Figure 1).

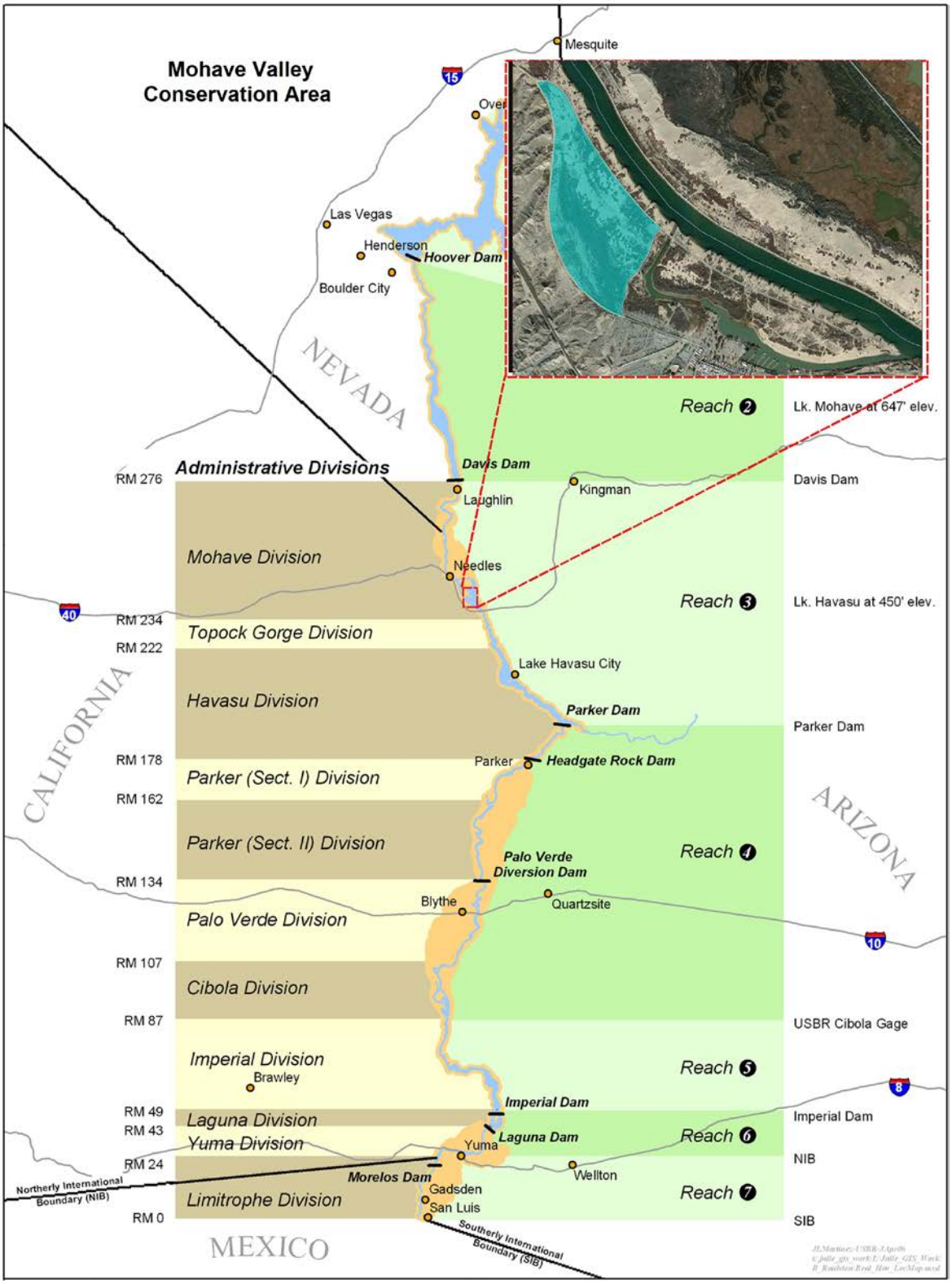

Figure 1 Mohave Valley Conservation Area Location

Figure 2 Mohave Valley Conservation Area.

Following the channelization of the river, the existing Park Moabi channel was dredged starting in 1961 to create a deep water area for boat launching and to improve the sport fishery. Currently the park provides a 7-lane launch ramp and while sport fishing does occur. The LCR MSCP monitors razorback suckers within the Park Moabi channel.

In recent years the concessionaire under contract with San Bernardino County has significantly developed the services available within the Moabi Regional Park. Services developed by the concessionaire/sub-lessee include an upgraded 7-lane launch ramp, a marina, RV and tent camping, waterfront cabins, a convenient store, and the Pirate's Cove Restaurant & Bar. The Conservation Area is upstream of the Park Moabi channel and services, but does parallel the riverside campsites on the east side of the levee road.

The site is a mixture of sand dunes formed from disposed dredge spoil during the construction of Park Moabi with salt cedar and arrow weed interspersed. A dense thicket of salt cedar runs through the proposed channel footprint. Exploratory excavation indicated more compact soil and coarser substrate are found on the far western side of the parcel that is bound by a gravel road.

Two culverts that drain storm water off the steep slopes further to the west run under the gravel road directly into the site (Figure 2). Additionally, an estimated 6000 cubic yards of rock ranging in size from 6 inches to 3 feet is stock piled within the proposed channel footprint. The rock stockpile will be utilized during the construction process for erosion control and placement in the backwater substrate. Just outside the western boundary of the project area there is a buried gas pipeline. Project activities will not disturb the pipeline, as it is out of the project boundary; nevertheless, equipment operators will be made aware of the pipeline's location prior to construction.

Less than 1.5 miles upstream of the proposed inlet, also on the California side of the river, is another backwater known as Beal Slough (Figure 2). Dredged in 1979 Beal Slough supports a population of razorback suckers. Table 1 summarizes the history and physical attributes of the two neighboring backwaters.

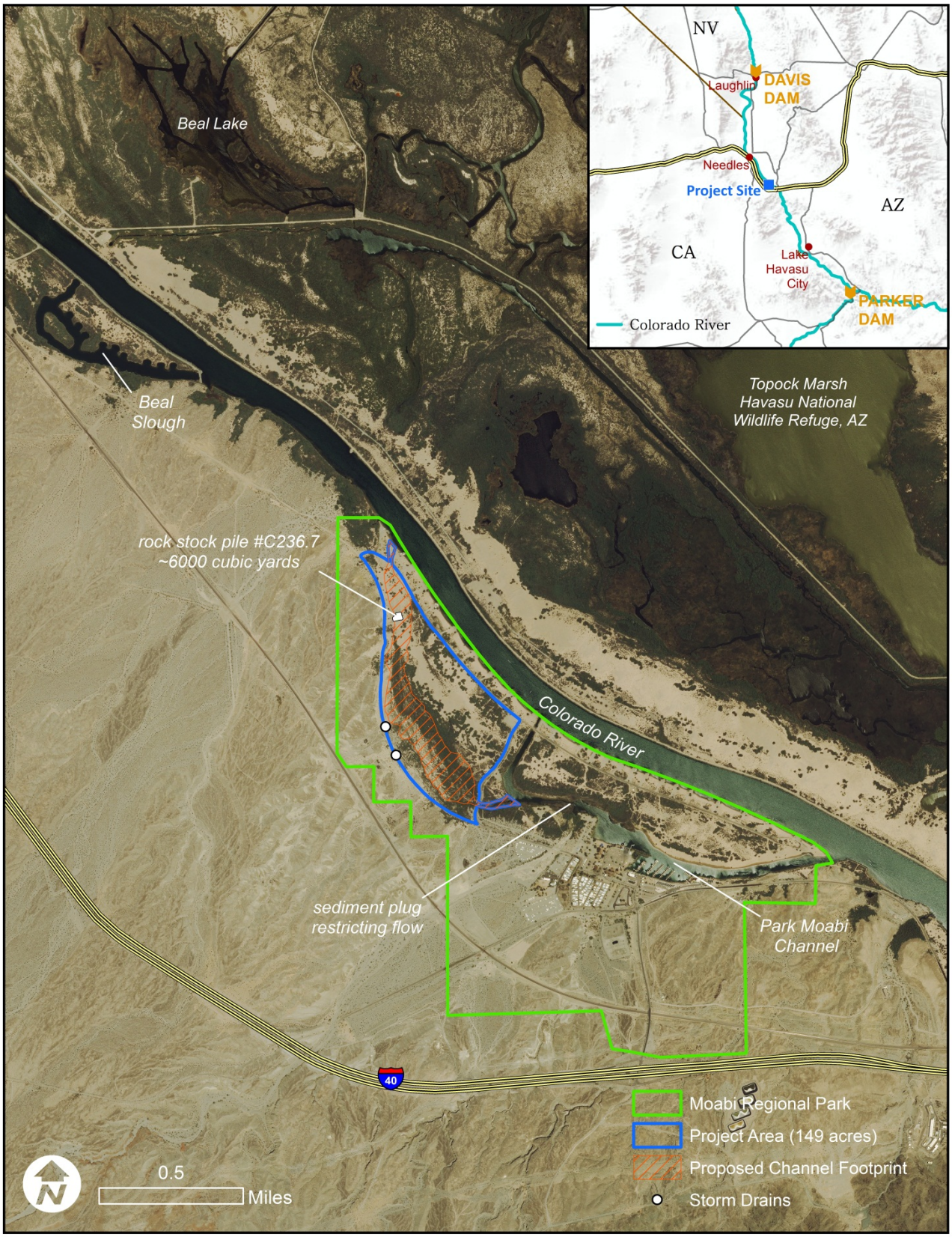

Figure 3 Extended map of the project area shows neighboring backwaters and other site features.

	Years Constructed	Purpose of Construction	Channel Width	Channel Length	Maximum Depth	Open Water Acreage	Connection to River	Additional Information
Park Moabi Channel	Started in 1961*	Deep water area created for fisheries, improve boat launching. ‡	50 – 500 ft	1.5 miles (7920 ft)	16 ft Δ	40 acres	A culvert inlet structure moves water into the upper channel; however, the sediment plug that has formed which limits the flow within the upper 7 acres. The lower 33 acres receives water through the open channel outlet.	Marina boat entrance was dredged between Dec. 1971 and Jan. 1972. 100,546 cy of material were dredged using the 12 inch "Little Colorado." ‡
Beal Slough	1979-1980‡	Entry 1: For Fish and Wildlife Agencies.‡ Entry 2: Provide game fish spawning areas.‡	150 – 550 ft	0.8 miles (4224 ft)	17 ft Δ	25 acres	A porous dike and metal pipe culvert (18-24 inches?) at inlet. Porous dike at outlet.	Beal Slough was dredged and dike was created in 1979. 460,146 cy of material were moved and used for roadways, dikes, and islands.‡

Table 1 Summary of Park Moabi and Beal Slough Backwaters

* Historical Imagery

‡ RPA Provision No. 14: Synthesis of Ecological Restoration Concepts for the Lower Colorado River (January 1999)

Δ Bathymetry surveys of Beal Slough and Park Moabi were conducted in April 2013. The results from those surveys are provided in Appendix B.

Land Ownership

The Conservation Area is located on portions of the property owned by the State of California, which is currently leased to San Bernardino County. California Department of Fish and Wildlife (CDFW) will lease the area where the backwater channel is to be constructed from CSLC. Reclamation, as implementing agency of the LCR MSCP, will enter into an agreement for restoration activities consistent with the Lower Colorado River Mult-Species Conservation Program with CDFW. Under the California Endangered Species Act (CESA) permit, habitat established in the state of California shall be protected in perpetuity.

Water

As documented in the 2012 Conceptual Design Report, the water for the project is supplied through the LCR MSCP Water Accounting Agreement passed by Congress as part of the Omnibus Public Land Management Act of 2009 (Public Law No. 111-11, Title IX, Subtitle E, 123 Statute 991, 1327-29). The Act permits Reclamation to create and manage Conservation Areas, which do not contain any water entitlement from the Secretary of the Interior, by using Colorado River water to meet the performance requirements of the LCR MSCP. Under the Water Accounting Agreement, Reclamation shall not consider any resulting increase in evaporation or percolation of Lower Colorado River water, for any backwater or marsh at an LCR MSCP Conservation Area where no entitlement exists, to be a diversion or consumptive use.

The MVCA will create approximately 50 acres of connected backwater habitat by diverting water off the main stem of the lower Colorado River, just south of river mile 237, and will return the water mainstem two miles downstream. Under the auspices of the Water Accounting Agreement, Reclamation shall not consider any resulting increase in evaporation or percolation of lower Colorado River water to be a diversion or consumptive use.

Land Use Agreement

The LCR MSCP, in coordination with CDFW, will draft a land use agreement to be reviewed and signed by CDFW. The land use agreement between will describe the paternship between LCR MSCP and CDFW for developing and maintaining the Conservation Area, and managing public access throughout. The land use agreement will be developed upon confirmation of the Lease Agreement from CSLC.

Lease Agreement

The lease agreement between the LCR MSCP's partner CDFW and the CSLC will provide the terms of use for the MVCA property within the Park Moabi Regional Park boundary. LCR MSCP will submit the application to the California State Lands Commission, on behalf of CDFW, to to modify an existing lease currently held by San Bernadino County. The lease modification will grant CDFW and LCR MSCP the authority to develop the Mohave Valley Conservation Area within the designated project area.

2.0 Restoration and Development Plan

As partial fulfillment of the LCR MSCP's backwater acreage goals within Reach 3, approximately of 50 acres of connected backwater habitat for native fishes of the lower Colorado River: the flannelmouth sucker

(Castotomus latipinnis), the razorback sucker (Xyrauchen texanus) and the bonytail chub (Gila elegans). The backwater habitat will consist of open water and marsh land cover types. The goal of the project is to maximize backwater acreage and incorporate marsh, cottonwood-willow, and mesquite land covers where appropriate.

The design lays out the excavation and grading for a backwater channel that extends from the Colorado River to the existing Park Moabi Channel and two water-crossing structures over the excavated backwater channel. Land based clearing will be done to remove existing vegetation and allow for contouring, infrastructure construction, and planting of native species. Currently, the majority of MVCA is dominated by salt cedar (Tamarix ramosissima),arrowweed (Pluchea sericea), and wetland scrub/shrub. No open water or marsh currently exists. Approximately 50 acres of MVCA will be cleared of existing vergations through land-based mechanical and hydraulic equipment. Removed material will be used to build access roads, a boat ramp and excess material will be placed adjacent to the backwater within the 149 acre boundary. Once clearing is completed excavation and contouring will be done, followed by infrastructure construction.

The structures include adjustable sills and are designed to provide hydraulic control for flows in and out of the backwater channel during moderate to high flows in the Colorado River. These water control structures will also limit the amount of Colorado River bed sediment entering the backwater channel.

The design will provide spatially variable topography with an appropriate distribution of depths and velocities for a variety of aquatic habitats. The design has been developed to reduce long-term maintenance requirements.

Conceptual Design

The project comprises a new backwater channel that extends from an inlet at the Colorado River to an exit at the existing Park Moabi Channel. The channel is contoured and graded to include deeper pools and shallower areas to provide fish habitat and to promote the establishment of healthy vegetation. Inlet and outlet structures provide hydraulic control and roadway crossings at the upstream and downstream ends of the new channel.

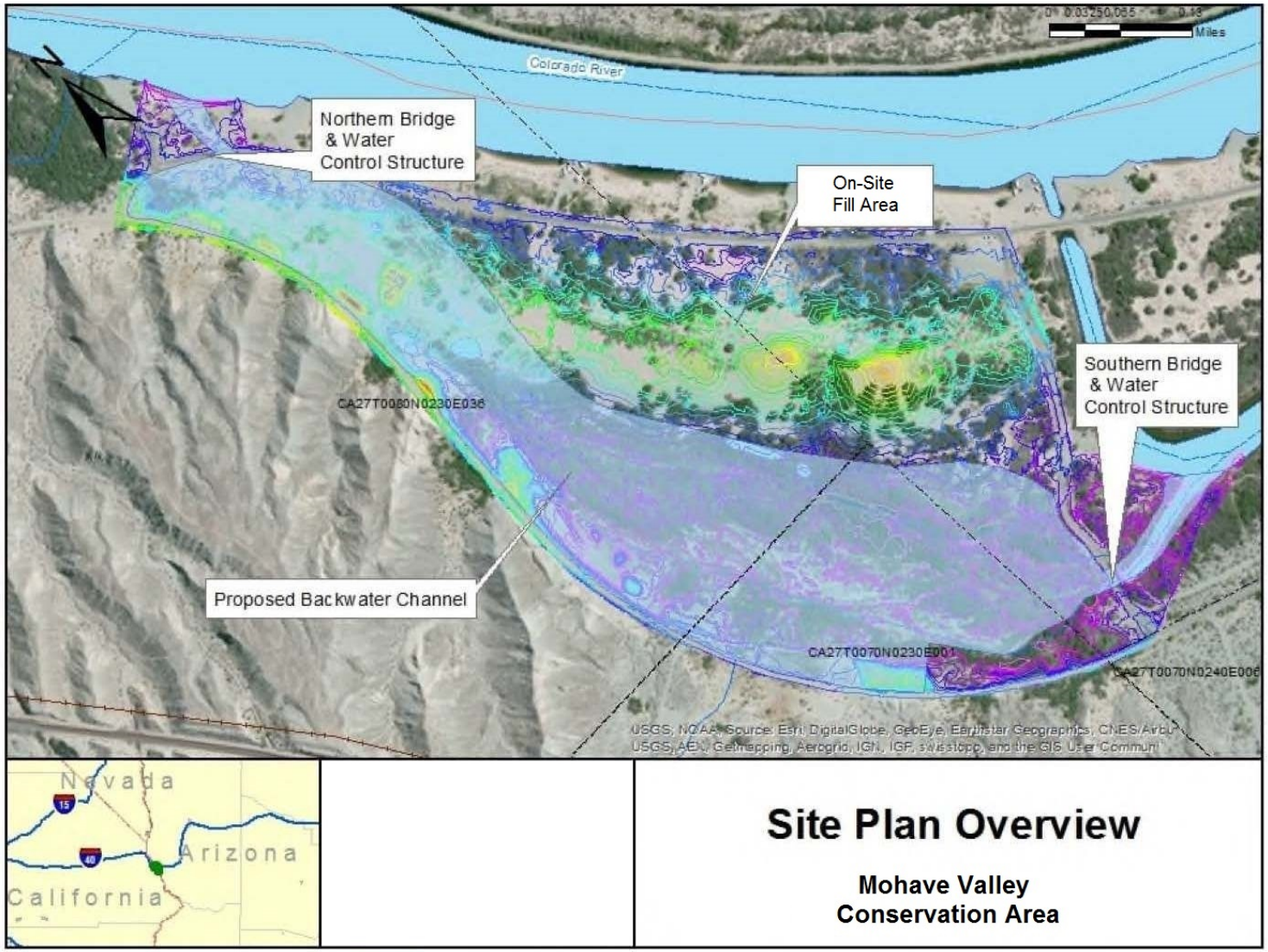

Figure 4 MVCA Site Plan Overview

Channel Design

The 60% backwater channel design is based on the grading that was included in the 30% Draft Design with modifications to reduce the number of disconnected islands. HEC-RAS modeling developed for the 60% design was documented in the Hydrologic and Hydraulic Technical Memorandum (Otis Bay and Tetra Tech 2015) included in Appendix A. The results show that mean velocities through the main section of the channel will remain below 0.5 ft/s under high flow conditions, with velocities through the concrete-arch culvert openings peaking at approximately 4 ft/s. The modeling shows that the backwater channel will decrease the water surface elevation in the Colorado River by less than 0.1 feet and will slightly increase the velocities near the outlet of the project site on the Park Moabi channel. Both changes are considered to be insignificant. Overall, the 60% design meets the design criteria for the backwater channel.

Roadway Crossings

The design includes structural roadway crossings over where the backwater channel intersects existing roadways. The selected structure for each crossing is a concrete-arch culvert equivalent to CONTECH prefabricated O-series arch structure with a concrete base slab foundation. The upstream structure, at the Colorado River inlet is 36 feet wide by 11feet and 7.75 inches high. The downstream structure, at the exit to the Park Moabi Channel is 38 feet wide by 10 feet and 8.25 inches high. The selected dimensions were based on an iterative analyses of the flow capacity using the HEC-RAS model for the 60% channel design.

The concrete-arch culverts are designed with a cast-in-place concrete floor due to the limited bearing capacities of the existing soils (see Section 7.3). CONTECH prefabricated structures are designed to meet AASHTO Standard Specifications for Highway Bridges - Section 16.8 and LRFD Bridge Design Specifications - Section 12.14, and are manufactured in accordance with ASTM C1504. With suitable foundation design and adequate bearing capacities the CONTECH O-series arch can be designed to safely carry HS20 or highway loads.

Water Control Structures

Water control structures are required at the concrete-arch culverts to regulate the fluctuation of water passing through the backwater channel during moderate to high flows in the Colorado River. The 60% HEC-RAS analysis confirmed that the optimal sill elevation of 453.5 feet that was recommended by the2012 Conceptual Design Report.

The 60% design includes a stop-log system that will provide an adjustable crest elevation to regulate the water surface in the backwater channel. The stop-log system was selected on the basis of an alternatives analysis that was included in the 30% Draft Design. A copy of this evaluation in letter format is included in Appendix D. Stop logs can either be custom fabricated or specified as one of the available prefabricated options available through a manufacturer. Further structural design of the water control structure will be developed for the 90% submittal.

The intent of the design is to provide a sill elevation with flexibility so that the inflow and outflow from the new backwater channel can be adjusted for adaptive management. Therefore the adjustable sill elevation is design to vary between 452.5 and 454.5 feet. This elevation brackets the elevation (453.5) in the 2012 Conceptual Design by ± 1 foot.

Backwater Access

The 60% draft design includes a boat ramp facility that is intended for use by the LCR MSCP for maintenance and monitoring. The new boat ramp will be accessed from the existing road along the west side of the project and will be obscured by fill areas to be inconspicuous to the public. The new boat ramp is 30 feet wide with a slope of 15 percent and intended for lightweight and non-motorized boat launching. The ramp includes 2-foot diameter boulder breakwaters and gravel fill placed within a Presto Geoweb system. The low-impact design will blend well with the surrounding features.

Planting Design

The planting design incorporates native LCR marsh, riparian, and upland species into a mosaic of created habitat. Species will be stratified according to water demand and depth outlined in Table 2. Tall emergent marsh species will be planted along the bank lines in deeper water, while shorter emergent marsh species will be planted further up slope to prevent inundation. In areas where shallow water transitions to saturated soils and upland areas, species adapted to varying water depths, seasonal drought and higher salinities will be planted. The following tables present the acreages of landcover types and the species proposed for planting in each zone.

Landcover Type	Elevations (ft)	Acreage
Backwater	451-458	26.4
Marsh	452-456.5	23.8
Combined total area of backwater and marsh		*50.2*
Cottonwood/Willow	456.5-464	15.1
Upland (honey mesquite & arrowhead)	464-472	28

Table 2 Landcover Acreage for MVCA

Plants	*Acres*	*Plants per Acre*	*Total Number of Plants*	*Plant Order*	*Propagation Collection Cost*
Marsh	**24**				
Schnoeplectus californicus	12	4356	52,272	53,000	1.823
Schmoeplectus americus	12	4356	52,272	53,000	1.823
Riparian	**15**				
Distichlis spicata	*7*	*13,560*	*94,920*	*100,000*	*0.135*
Salix exigua	*3*	*2178*	*6,534*	*7,000*	*1.823*
Salix goodingii	*3*	*2178*	*6,534*	*7,000*	*1.823*
Poplulus fremontii	*2*	*2178*	*4,356*	*4,500*	*1.823*
Upland	**28**				
Proposis glanduluousa	*28*	*195*	*5,460*	*5,500*	*3.579*

Table 3 Native Plant Species to be planted within the Mohave Valley Conservation Area

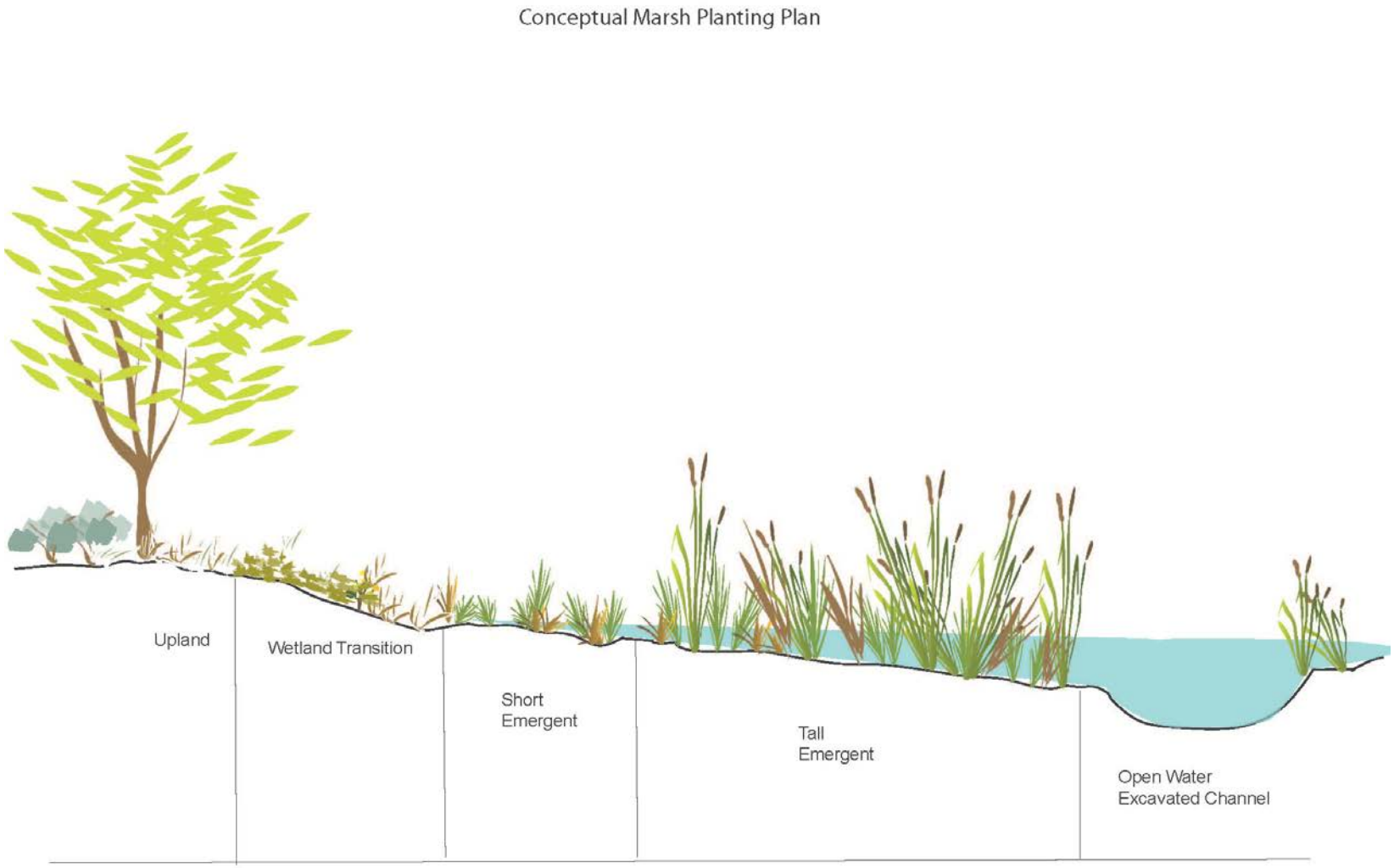

Figure 5 Planting scheme for backwater.

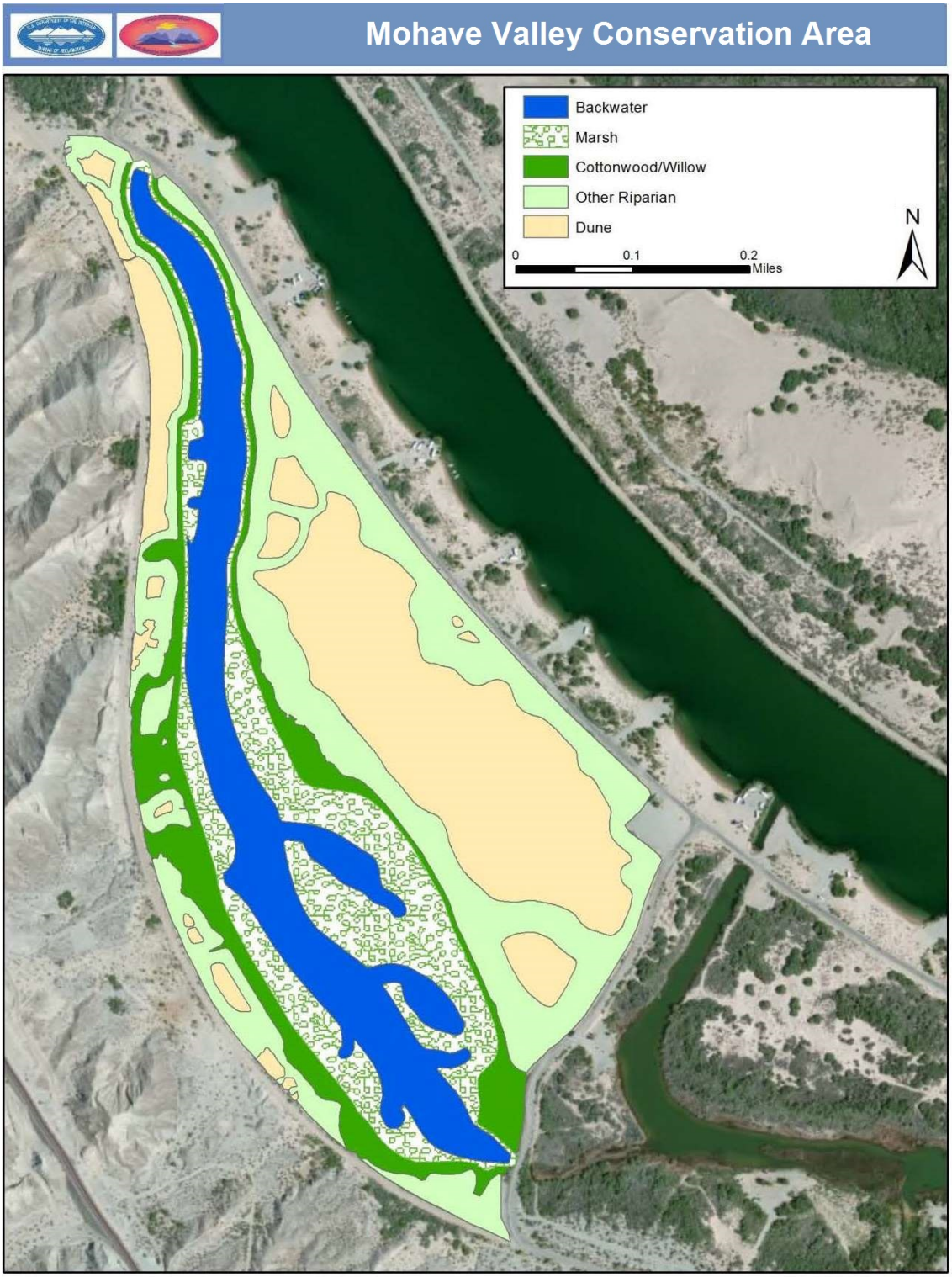

Figure 6 Landcover typed resulting from the 60% Mohave Valley Backwater design.

Planting Material / Planting Techniques

Plant material for the project would be delivered via a contractor. Planting techniques that would be used on site include:

- Automated mass transplanting
- Planting poles, potted plants, or slips with a conventional tree planter or by hand
- Perimeter planting of poles, potted plants, or slips

Marsh Plants

Schnoeplectus californicus, (California bulrush) will be planted 3 feet inline spacing with rows 40" apart for a total of 4356 per acre, planted first in the deeper water areas. Schnoeplectus americus (chairmakers bulrush, formerly scirpus) will be planted 3 feet inline spacing with rows 40" apart for a total of 4356 per acre.

Riparian plants

Distichlis spicata (saltgrass) will be planted 1 foot inline spacing with 24" rows apart for a total of 13,560 per acre. *Salix exigua, Salia goodingii and Populus fremontii (Coyote willow, goodings willow, and cottonwood)* will be planted 6feet inline spacing with rows 40" apart for a total of 2178 per acre. 1 gallon mesquite trees will be hand planted 15 feet on center for a total of 195 per acre at the highest elevation.

3.0 Management Overview

Land Manager

Reclamation will be responsible for ensuring long-term operation and maintenance of MVCA throughout the term of the LCR MSCP. The details of operation and maintenance of MVCA will be agreed upon between Reclamation and CDFW to include species monitoring, law enforcement, public use, wildfire management, research, and monitoring. After development, long-term management of each Conservation Area is documented in a site specific management plan.

Law Enforcement

CDFW is responsible for law enforcement at MVCA. Reclamation will work with BLM to provide additional assistance and to ensure these activities do not conflict with the LCR MSCP HCP.

Public Use

CDFW has the authority to regulate fish, wildlife, and recreation uses pursuant to CDFW statutes, regulations and policies. In cooperation with Reclamation, CDFW will coordinate its public use and related activities so they are consistent with and do not adversely affect restoration activities at MVCA.

Wildfire Management

As guided by commitments in the LCR MSCP HCP, wildfire management practices on MVCA would:

Reduce the risk of loss of related habitat to wildfire by providing resources to suppress wildfires, e.g., contributing to and integrating with local, State, and Federal agency fire management plans, and Implement land management and habitat creation measures to support the reestablishment of native vegetation that is lost to wildfire.

Specific fire management plan will be drafted as in described in the LCR MSCP Law and Fire Strategy

Site Maintenance

Reclamation will be responsible for maintaining the levee road adjacent to the MVCA backwater and the access roads that are used to define the footprint of MVCA. Future backwater maintenance activities may involve dredging the backwater in order to maintain a channel depth of at least 10 feet of open water habitat. The dredging and placement of the dredge material would occur within the previously disturbed project footprint. Equipment (E.g. backhoe, excavator, dump truck, etc.) may be used for land based maintenance activities such as cattail removal and vegetation clearing.

Herbicide/Fertilizer/Pesticide Application

To ensure the total eradication of non-native plant species (E.g. Tamarix ramosissima) before planting and to maintain healthy stands of native vegetation species, the application of herbicides, fertilizer, or pesticides may be required. All herbicide, fertilizer or pesticide application would be applied or supervised by a current Certified Pesticide Applicator for the chemical being applied and in compliance with the rules, regulation, and laws set by the State of California, San Bernardino County.

All records and associated chemical application documents will be stored by the land manager and will include:

- Training records of all employees handling pesticides and herbicides
- Material Safety Data Sheets for all pesticides, herbicides and fertilizers
- Location map of herbicide and pesticide storage site
- Use of California approved herbicide, pesticide, and fertilizers
- Record of herbicide, pesticide or fertilizer use

4.0 Monitoring

Fisheries Monitoring

Monitoring at MVCA is designed to documentgeneral use of the backwater by the MSCP covered fish species. Methods used will be diverse enough to detect multiple life stages over several seasons, with an emphasis during seasons of highest abundance. In addition to fish surveys, general habitat assessment will include zooplankton and phytoplankton monitoring, and water quality monitoring and analysis.

Fish Monitoring

Monitoring will include 6 trips per year to conduct presence/absence surveys for multiple year classes of native fish. Five spring surveys (January – May) will be conducted to coincide with spawning activities and larval emergence of the razorback and flannelmouth sucker (Mueller 2003), as well as the presumed spawning period for bonytail (Wagner 1955). A single fall survey (November) will be conducted to assess species use outside the spawning season. All trips will consist of two nights of surveys. The spring trips will include trammel netting, remote sensing, and larval collections; the fall survey will include trammel netting and remote sensing. Catch per unit effort (CPUE) will be determined for each survey method and will be compared for annual and seasonal variation.

Six trammel nets of two different sizes (3 at 75' x 0.5" and 3 at 150' x 1.5 ") will be deployed during each night of the survey event. The nets are typically set perpendicular to shore with one end attached to shore or anchored near shore and then stretched toward the center of the pond and marked with a small buoy. The nets will be allowed to fish throughout the night and then retrieved the following morning. All fish will be collected from the net and held in fresh water. All fish will be identified, measured for total length, weighed, and released at the capture location. In addition, native fish will be scanned for passive integrated transponders (PIT) and wire tags, and subsequently injected with a PIT tag if none is found.

Larval collections will be conducted in 15 minute intervals at a minimum of 3 locations per night. Two 12-volt "crappie" lights are connected to a battery, placed over each side of the boat, and submerged in 4-10 inches of water. Two "netters" equipped with long-handled aquarium nets are stationed to observe the area around the lights. Larval fish that swim into the lighted area are dip-netted out of the water and placed into a holding bucket. Larvae are identified and enumerated as they are placed into the holding bucket and released at the point of capture once sampling is completed (Albrecht et al. 2010). A subset of larval samples may be retained for genetic analysis or species identification.During construction, a series of antennae will be installed into the slab of the inlet and outlet structures. These antennae will run the entire length of the foundation, and be used to track the movement of tagged fish into and out of the backwater. Data collected from the antennae will be downloaded during each scheduled fish monitoring trip and supplement the manual monitoring data.

Zooplankton/Phytoplankton Monitoring

Zooplankton and phytoplankton will be monitored quarterly from two fixed locations, the deepest area near the inflow and outflow. Zooplankton are collected using a vertical tow with a 64 µm plankton net. The depth of the tow is recorded and used to calculate sample volume; multiple tows are taken to achieve the desired filtered volume (250 L). All plankton are rinsed into an amber sample bottle and preserved with 0.3mL of Lugol's iodine solution per 100mL of sample. Samples are analyzed for biomass and relative abundance, and compared to other regional backwaters.

Water Quality

Water quality will be monitored by conducting vertical profiles at least six times per year. All surveys will be separated by a minimum of one month and will encompass at least three seasons (spring,

summer, and fall). Surveys will occur during the six fish monitoring events (five spring trips and one in the fall). A profile will be taken before 9:00 a.m. from the two fixed stations near the inflow and outflow. Profiles will be recorded in 0.5 meter increments using a YSI professional plus multi-parameter probe or similar instrument. Nominal parameters measured include temperature, conductivity, dissolved oxygen (DO) and pH; Secchi depth will also be recorded when pond bottom is not visible.

Water Chemistry

Water chemistry samples will be collected once annually between July and September and will be analyzed for general chemistry. This analysis will include:

- Physical properties, conductivity, pH, TDS, TSS
- Major and minor ions
- Metals
- Nutrients, nitrate, nitrite, total nitrogen, Ortho-phosphate, and total phosphate
- Total nutrients

Three 1-liter samples will be collected from each of the water quality stations. Collection for all parameters will occur just below the water surface (approximately 0.2m depth). All sample bottles will be rinsed with the water at the sampling station prior to collecting the sample. Each sample will be immediately placed on ice after acquisition. The three samples from each station will be mixed as a single composite sample prior to being decanted into the appropriate sample bottles. The samples shall then be preserved using the appropriate methods for each water quality parameter (described below) and place on ice for shipping or delivery to the LCR – Regional Lab.

The recommended size and type of sample bottle is described below for each parameter. All sample containers shall be labeled correctly, including site name, date, sample parameter, preservation, and collector.

Sample	Preservation	Filtered	Volume	Storage
General Chemistry	None	No	500 ml	Refrigerate
Metals	Nitric Acid (HNO_3) 2 drops	Yes 0.45µm	50 ml	Refrigerate
Nitrate/Nitrite	10% Sulfuric Acid (H_2SO_4) 0.4ml	No	100 ml	Refrigerate
Ortho-Phosphate	None	Yes 0.45µm	100 ml	Frozen by 48 hrs
Total Nutrients	None	No	100 ml	Frozen by 48 hrs

Table 4 Sampling parameters.

Wildlife Monitoring

As stated above, MVCA will be managed for covered fish. Additional covered species may utilize the marsh, cottonwood-willow and mesquite land cover that will be planted. The site will be added to conservation area monitoring for marsh birds, neo-tropial birds and small mammals once habitat develops. Monitoring will be conducted to document presence and may not be required annually.

- Marsh Birds - Monitoring will be conducted using the multi-species survey from the Standardized North American Marsh Bird Monitoring Protocol (Conway 2005) after all construction is complete and marsh vegetation develops (usually one year after planting). This protocol incorporates playing calls of marsh bird species at designated survey points to elicit responses in order to determine presence of the target species.

- Neo-tropical Birds - Double-sampling, rapid-intensive, area-search surveys will be conducted in April-June 2015 prior to construction to identify species currently using the site as detailed in GBBO (2012). The site will be surveyed again at least 2 growing seasons after planting when riparian woodland vegetation reaches sufficient height and density to provide nesting habitat.

- Small Mammals - potential cotton rat and desert pocket mouse habitat develops, then presence surveys will be conducted at least once during fall and/or spring. Trapping will be conducted overnight using Sherman live traps. Traps will be placed in linear transects within the transition zone.

If habitat for additional covered species develops, monitoring may be scheduled to document presence.

5.0 Reports

Annual Report

An annual report will be prepared by Reclamation and made available each calendar year summarizing the following:

- General description of the Project status and the effects on covered species
- A table from the Mitigation Monitoring and Reporting Program (MMRP) indicating current implementation status of each mitigation measure
- A description of all restoration activities and monitoring actions conducted over the past year
- A summary of monitoring and research activities over the past year
- Results and analyses of monitoring and research data
- An assessment of the effectiveness of each mitigation measure in minimizing and compensating for Project impacts
- The total number of acres planted
- The total number of acreage that meets or exceeds the performance standards
- Any other applicable information.

Final Report

A final report will be prepared by Reclamation and submitted no later than 180 days after the completion of all mitigation measures. The final report is anticipated in 2055 and will include the following information:

- A copy of the table in the MMRP with notes showing when each mitigation measure was implemented
- All available information regarding Project-related incidental take of covered species
- Information regarding other Project impacts on the covered species in the Permit
- An assessment of effectiveness of the Permit's conditions of approval for minimizing and compensating for project impacts
- Recommendations on how mitigation measures might be changed to more effectively minimize and mitigate the impacts of future projects on the species
- Any other pertinent information.

Literature Cited

Lower Colorado River Multi-Species Conservation Program. 2010. Lower Colorado River Multi-Species Conservation Program Water Accounting Agreement. Final. March 11.

Lower Colorado River Multi-Species Conservation Program. 2004. Lower Colorado River Multi-Species Conservation Program, Volume II: Habitat Conservation Plan. Final. December 17. (J&S 00450.00) Sacramento, CA.

Mueller, G.A. 2003. The Role of Stocking in the Reestablishment and Augmentation of the Native Fish in the Lower Colorado River Mainstem (1998-2002). U.S. Geological Survey, Open File Report

Otis Bay, Inc. and Tetra Tech, Inc. 2015. Mohave Valley Conservation Area Ecological Restoration Project 60% Design Report. Draft. April 2015.

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