EAST CONTRA COSTA COUNTY HABITAT CONSERVANCY

DATE: August 20, 2012

TO: Governing Board

FROM: Conservancy Staff

SUBJECT: Consider actions related to the Upper Sand Creek Basin Expansion Project

RECOMMENDATION

DETERMINE that implementation of the Upper Sand Creek Basin Extension Project ("Project") Habitat Mitigation and Monitoring Plan will fulfill the requirements for waving temporary impact fees associated with detention basins, in accordance with requirements of the section entitled "Temporary Impact Fees for Flood Detention Basins" in Section 9.3.1 of the HCP/NCCP. WAIVE all temporary impact fees for the Project. AUTHORIZE staff to file a Notice of Determination for this Board action with the County Clerk.

DISCUSSION

Overview: The Contra Costa County Flood Control and Water Conservation District ("County Flood Control District") is a signatory to the Implementing Agreement for the HCP/NCCP and is a Permittee under the associated state and federal permits. The County Flood Control District may issue authorization for take of HCP/NCCP covered species in accordance with the applicable terms and conditions of the Implementing Agreement, the HCP/NCCP, and the state and federal permits. The County Flood Control District is proposing to construct the Upper Sand Creek Basin Extension Project ("Project"). In Chapter 9.3.1 of HCP/NCCP, there is a subsection entitled "Temporary Impact Fees for Flood Detention Basins" which enables temporary impact fees associated with detention basins to be waived if habitat restoration and management is incorporated, with the approval of the Conservancy. The County Flood Control District has submitted a Habitat Mitigation and Monitoring Plan for the Project and requested Conservancy approval for waiver of temporary impact fees associated with the Project.

CONTINUED ON ATTACHMENT: Yes
ACTION OF BOARD ON: August 20, 2012 APPROVED AS RECOMMENDED:_____
OTHER:_____

VOTE OF BOARD MEMBERS
__UNANIMOUS
AYES:_____
NOES:_____
ABSENT:____ _____
ABSTAIN:_____

I HEARBY CERTIFY THAT THIS IS A TRUE AND CORRECT COPY OF AN ACTION TAKEN AND ENTERED ON THE MEETING RECORD OF THE CONSERVANCY GOVERNING BOARD ON THE DATE SHOWN.

ATTESTED _____
CATHERINE KUTSURIS, SECRETARY OF THE EAST CONTRA COSTA COUNTY HABITAT CONSERVANCY

BY:_____, DEPUTY

Background on Project: The County Flood Control District is responsible for providing flood protection within formally designated drainage areas within Contra Costa County. Since drainage areas span city and county boundaries the County Flood Control District does maintenance, construction, and expansion of such flood protection facilities including detention basins throughout the east Contra Costa County HCP/NCCP jurisdictional area, including within the City of Antioch. Although the Project is located in Antioch, it is a specifically identified as a Covered Project in Chapter 2 of the HCP/NCCCP.

The County Flood Control District is proposing to expand the existing 49-acre Upper Sand Creek detention basin to approximately 61.5 acres, a capacity increase from approximately 123-acre feet to 900-acre feet, in order to provide regional flood protection benefits for existing and planned communities in the lower Marsh Creek watershed. This project is known as the Upper Sand Creek Basin Expansion Project ("Project"). The Project is located approximately 2,000 feet east of Deer Valley Road, south of Lone Tree Way in Antioch. The project area is geographically situated nine miles northeast of Mount Diablo, and 5 miles south of the Sacramento-San Joaquin River Delta (See Figure 1 in the Planning Survey Report).

The purpose of the basin expansion is to attenuate flows from the upper Marsh Creek watershed which will provide improved flood protection for the downstream communities. The Project proposes to excavate soil from the existing basin floor and expand the area to create a deeper basin where water will be held and slowly released downstream during major storm events. The expansion will include 3,934 linear feet of Sand Creek, which will be lowered between 2-10 feet below the existing creek bottom and re-constructed with a geomorphic creek design that will be restored and enhanced. The Project also includes construction of an earthen dam along the easterly (downstream) side of the project area to impound flood water and an emergency spillway east of the dam to direct flows greater than the 100-year storm event. Two hydraulic inlet structures will receive upstream flows from Sand Creek and urban runoff from developed areas north of the basin, and a primary outlet structure will control water flows into Sand Creek downstream. The inlet structure for the urban runoff channel will include a trash capture device upstream of the restoration area, including a mesh screen to remove debris that exceeds 5 millimeters in size. The County Flood Control District intends to award the construction contract in December and construct the project in the summer of 2013 (Figures 4a and 4b, Basin Design and 95% Design Drawing and Cross-sections in the Habitat Mitigation and Monitoring Plan).

Impacts and restoration: The Project will result in 6.72 acres of permanent impacts and 57.63 acres of temporary impacts, as further outlined below.

Land Cover Type	Impact Type		
	Permanent	**Temporary**	**On-Site Restoration**
Annual Grassland	5.95 acres	33.95 acres	Remainder of site
Ruderal	0.77 acres	20.30 acres	-
Riparian woodland/Scrub		0.73 acres	1.16 acres
Permanent Wetland		0.47 acres	1.02 acres
Seasonal Wetland		2.18 acres	5.20 acres
Stream (length)	292 ft	3,642 ft	3,642 ft
TOTAL	**6.72 acres**	**57.63 acres**	

The County Flood Control District plans to mitigate temporary impacts by implementing a Habitat Mitigation and Monitoring Plan ("HMMP"). The HMMP outlines a habitat restoration and enhancement design for the basin which includes re-contouring of the basin, stream channel, and floodplain in order to provide a new low-flow channel with surface flows sufficient to flood the new basin floodplain. The floodplain was designed to retain floodwaters in floodplain depressions, known as troughs, with the capacity to retain water for a sufficient amount of time so as to support the development of permanent and seasonal wetlands. In addition to the creation and enhancement of wetland and aquatic habitat types, the HMMP includes a planting plan consisting of a wetland species seed mix and three varieties of riparian woodland/scrub cuttings. The planting plan aims to improve the ecological connectivity between upstream and downstream areas of the Project site through the establishment of native plants and riparian habitat.

The enhanced and restored wetlands and creek channel will provide increased functions and values over the current degraded habitat of the existing wetlands and creek channel. The Project has been designed to increase flood storage while reducing bank erosion, filter water more effectively and provide enhanced downstream water quality benefits, resulting in a net increase in enhanced habitat to a variety of plant and wildlife species.

Consistency with HCP/NCCP: Development of the HMMP relied heavily upon meeting certain goals and criteria outlined in the HCP/NCCP for Conservancy restoration/creation projects (Chapter 5). Some of the objectives that the County Flood Control District modeled the HMMP on are as follows:

- Implement conservation actions in support of the biological goals and objectives of covered special status species and habitats.
- Benefit covered species.
- Create/Restore/Enhance hydrologic functions.
- No net loss of habitat features or functions.
- A detailed monitoring and management plan focused on the characteristics of the wetland and riparian habitat communities created/restored.

The HCP/NCCP recognizes that certain detention basins may have small effects on covered species as they are generally maintained and managed as grasslands and provide some habitat function for grassland wildlife species. The primary impacts of detention basin expansion and creation on covered wildlife are generally restricted to the construction period, the time to recovery after construction, and immediately after flood events when the basin holds water. Consequently, the HCP/NCCP provides that temporary impact fees may be reduced or waived entirely if habitat restoration and management is incorporated into the project design and management.

The County Flood Control District is requesting a waiver of all temporary impact fees consistent with Section 9.3.1 of the HCP/NCCP for "Temporary Impact Fees for Flood Detention Basins." This subsection of 9.3.1 states the following:

> "Expansion and maintenance of flood control detention basins described in Chapter 2 will be subject to the temporary impact fee and temporary wetland impact fee according to the guidelines described above for the various types of temporary impacts. However, the temporary impact fees may be waived or reduced for detention basins because these projects have a number of significant characteristics. These basins store water temporarily only in very high-flow conditions, are typically maintained as grassland or other land cover types when not in use, and may provide significant habitat value when designed and managed to promote habitat values; consequently, their temporary effects are much lower than other activities subject to the temporary impact fee.
>
> The temporary impact fee for flood control detention basins can be offset in part or in full if habitat restoration and management is incorporated into the project design and management. Temporary impact fee discounts will be determined by the Implementing Entity on a case-by-case basis, considering, but not limited to, the factors listed below.
>
> - Project footprint.
> - Frequency and amount of dredging needed to maintain design capacity during the permit term.
> - Expected recovery time of habitat.
> - The value of habitat restoration and enhancement conducted on site relative to what could be accomplished with the full temporary impact fee."

As outlined in Section 9.3.1, the Project may receive a reduction of the temporary impact fees with the approval of the Conservancy (which is the Implementing Entity) on a case-by-case basis. Conservancy staff has reviewed the Project including the Habitat Mitigation and Monitoring Plan and supporting Planning Survey Report submitted by the Flood Control District and find that the Project meets the requirements in 9.3.1 for incorporating habitat management and design. The habitat restoration and enhancement proposed in the HMMP are substantial, are expected to result in higher functions and values than currently exist and exceed what could be accomplished with payment of the temporary impact fees. While the project is large, the extent of restoration to wetlands is well in excess of impacts, the design is anticipated to result in relatively short recovery time, and the site will be managed to maintain restored habitat values. Consequently, Conservancy staff is recommending that all temporary impact fees for the Project be waived.

The table below summarizes the total development and wetland mitigation fees and the proposed reduction of temporary impact fees in accordance with Section 9.3.1:

PROPOSED FEE SUMMARY for the Project	
Permanent Impact Development Fee:	$268,178.09
Temporary Development/Wetland Impact Fees:	$231,984.05
Temporary Impact Fees Waiver:	($231,984.05)
TOTAL FEES REQUIRED	**$268,178.09**

As the Project moves through the final design and permitting phases, staff will continue to work with the County Flood Control District on any necessary refinements to the Habitat Mitigation and Monitoring Plan, making small modifications as necessary through final design of the Project.

Attached to the cover memo are the proposed Habitat Mitigation and Monitoring Plan and completed Planning Survey Report ("PSR") for the Project, prepared by the County Flood Control District in consultation with Conservancy staff. The proposed Habitat Mitigation and Monitoring Plan describes the restoration and monitoring components, including overall restoration goals and objectives, supported by various detailed site plans, maps, and figures specific to the restoration plan proposal.

The PSR documents the results of the planning-level surveys conducted at the Project site where ground disturbing impacts will occur and describes the specific pre-construction surveys, avoidance/minimization/construction monitoring, and mitigation measures that are required in order for the Project to be covered through the HCP/NCCP. The PSR contains project vicinity and location maps, the project site plans and detailed maps showing the project impacts, land cover types, and species habitat, and the Fee Calculator Worksheets. Several additional figures and appendices are included in the PSR.

CEQA: For the Project, the County Flood Control District is the CEQA lead agency. The County Flood Control District prepared an Initial Study/Mitigated Negative Declaration ("IS/MND") for the Project in conformance with CEQA. The IS/MND evaluated and addressed potential impacts as a result of the Project and determined that no significant environmental impacts are anticipated to be associated with the Project. The Conservancy has considered the IS/MND and finds that anticipated impacts were fully disclosed and analyzed and no significant environmental impacts are anticipated.

Attachments:

- Request for Temporary Impacts Fee Waiver

- The Habitat Mitigation and Monitoring Plan:
  - Main body of HMMP
  - Project Maps, Site and Basin Design Plans, Restoration Area Plan Figure
- Planning Survey Report:
  - Main body of planning survey report
  - Project Vicinity Maps, Impact and Land Cover Maps, Species Habitat Maps
  - Fee Calculator (Exhibit 1 and Exhibit 2)
- Initial Study/Mitigated Negative Declaration

Contra Costa County
Flood Control
& Water Conservation District

Julia R. Bueren,
ex officio Chief Engineer
R. Mitch Avalon,
Deputy Chief Engineer

August 16, 2012

Krystal Hinojosa
East Contra Costa County Habitat Conservancy
Contra Costa County Department of Conservation and Development
30 Muir Road
Martinez, CA 94553

Re: Request for Temporary Impacts Fee Waiver
Contra Costa County Flood Control and Water Conservation District
Upper Sand Creek Basin, Antioch, CA

Dear Ms. Hinojosa:

This letter is to request a waiver of temporary impact fees for the Upper Sand Creek Basin expansion project. The Contra Costa County Flood Control and Water Conservation District (Flood Control District) plans to expand an existing flood control basin east of Deer Valley Road in Antioch. The purpose of the expansion is to provide improved flood protection for downstream communities in the lower Marsh Creek watershed of east Contra Costa County. The expansion will result in impacts to sensitive features including Sand Creek and on-site wetlands. The Flood Control District plans to restore impacts to the existing habitats that will improve the overall function and habitat value of Sand Creek as proposed in the Habitat Mitigation and Monitoring Plan (attached).

The East Contra Costa County Habitat Conservation Plan/Natural Community Conservation Plan states that temporary impacts within flood control basins for expansion and maintenance can qualify for a fee waiver since flood control basins have beneficial values than other types of projects, as flood control basins are typically maintained as grasslands or other land cover types when not in use and may provide significant habitat value when designed and managed to promote habitat values and therefore, their temporary impacts are much lower than other activities subject to the temporary impact fee. Requests for temporary impact fees are determined by the Habitat Conservancy (Implementing Entity) on a case-by-case basis considering, but not limited to, project footprint; frequency and amount of dredging needed to maintain design capacity during the permit term; expected recovery time of habitat; and value of habitat restoration and enhancement conducted on-site relative to what could be accomplished with the full temporary impact fee.

The Flood Control District engineering and environmental staff has consulted with the Habitat Conservancy regarding the proposed on-site mitigation and mitigation fees. The Habitat Conservancy has indicated a willingness to waive the temporary impact fees given adequate justification. The Flood Control District respectfully requests that the Conservancy to waive the temporary impact fees for the following reasons:

- The Restoration Area will be owned, protected and maintained in perpetuity by the Flood Control District. The basin inlet structure includes a concrete stilling basin to

capture silt and sediment material transported down the main stem of Sand Creek. Frequency of dredging within the stream of the Restoration Area is expected to be minimal and occur only as necessary (once every 5 to 10 years).

- The Restoration Area will be physically protected from the public and grazing livestock with the installation of a chain-linked fence around the ultimate basin and a barbed-wire fence around the Restoration Area.
- Continuous water flow from urban runoff will support the proposed habitat restoration and enhancement.
- Water quality within the Restoration Area and downstream within Sand Creek will be improved with the installation of a trash capture device at the basin inlet structure for urban water flows and a stilling basin at the basin inlet structure within Sand Creek that will capture silt and sediment. The improvement will benefit the aquatic environment in the basin and Sand Creek downstream.
- The restored creek and wetland habitats will be stabilized and enhanced with native plants and riparian shrubs, and trees that will provide habitat cover for aquatic and terrestrial species, and will be monitored for 5 years to determine success as proposed in the HMMP. Invasive plants will also be removed during the 5-year monitoring period.
- The upland areas will be re-vegetated with a native annual grassland seed mix, as proposed in the HMMP.
- Temporary impact fees would total $231,984.05 (Exhibit 2). The Conservancy has previously indicated that it would be less effective for stream restoration within the Preserve System as mitigation for this impact due to the complicated nature of this type of stream restoration. The Conservancy indicated support of on-site mitigation as this site has been proven to be conducive to wetland establishment and therefore, will result in improved wetland functions and values (pers. comm. Kopchik 2011).

Therefore, the Flood Control District will pay development and wetland fees for permanent impacts for a total amount of **$268,178.09** (Exhibit 1). Fees will be paid to the Habitat Conservancy at project contract award.

Respectfully,

for

Claudia Gemberling
Environmental Analyst II

CG:tr
G:\engsvc\ENVIRO\Flood Control\Upper Sand Creek (DA 104) (WO #8518)\HMMP FC Cover Ltr 08-16-2012.dotx

Enclosure: Habitat Mitigation and Monitoring Plan

C: C. Roner, Flood Control District
File

Cardno ENTRIX

Shaping the Future

Upper Sand Creek Basin Project

Habitat Mitigation and Monitoring Plan

August 16, 2012

Prepared For

Contra Costa County Flood Control & Water Conservation District

Upper Sand Creek Basin Project

Habitat Mitigation and Monitoring Plan

August 16, 2012

USACE File #: SPK-2009-00996

Prepared for

Contra Costa County Flood Control & Water Conservation District
255 Glacier Drive, Martinez, CA 94553

Prepared by

Cardno ENTRIX
701 University Road, Suite 200, Sacramento, CA 95825
Tel 916 923 1097 Fax 916 923 6251 Toll-free 800 368 7511
www.cardnoentrix.com

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Acronyms and Abbreviations

APN	Assessor Parcel Number
BMP	Best Management Practices
CDFG	California Department of Fish and Game
CEQA	California Environmental Quality Act
cfs	cubic feet per second
CIPC	California Invasive Plant Council
EPA	Environmental Protection Agency
GPS	Global Positioning System
HCP/NCCP	Habitat Conservation Plan/Natural Community Conservation Plan
PCA	Pest Control Advisor
RWQCB	Regional Water Quality Control Board
SAA	Streambed Alteration Agreement
SWPPP	Storm Water Pollution Prevention Plan
USACE	U.S. Army Corps of Engineers
USCB	Upper Sand Creek Basin

Chapter 1

Introduction

1.1 Background

1.1.1 Introduction

The Contra Costa County Flood Control and Water Conservation District (Flood Control District, applicant) proposes to expand an existing flood control basin, Upper Sand Creek Basin, in Antioch, east Contra Costa County (Figure 1, Project Location Map and Figure 2, Road Map). Upper Sand Creek Basin (USCB, basin, or project site) is located in the lower Marsh Creek watershed (Figure 3, Marsh Creek Watershed Map). The purpose of the basin expansion is to attenuate flows from the upper Marsh Creek watershed and provide improved flood protection for the downstream communities.

The USCB project will expand the existing 49-acre basin to 62.5 acres, a capacity increase from approximately 123 acre-feet to 900 acre-feet. The project will consist of excavating soil from the existing basin floor and expanding the area to create a deeper basin where water will be held and slowly released downstream during major storm events. The expansion will include 3,934 linear feet of Sand Creek, which will be lowered approximately 2 to 10 feet below the existing creek bottom and re-constructed with a geomorphic creek design. The project also includes construction of an earthen dam along the easterly (downstream) side of the project area, which will impound flood water, and an emergency spillway east of the dam to direct flows greater than the 100-year storm event. Two hydraulic inlet structures will receive upstream flows from Sand Creek and urban runoff from developed areas north of the basin, and a primary outlet structure will control water flows into Sand Creek downstream (Figure 4a, Basin Design and Figure 4b, 95% USCB Design Drawing and Cross-Sections). The inlet structure for the urban runoff channel will include a trash capture device upstream of the restoration area which will include a mesh screen to remove debris that exceeds 5 millimeters in size. Construction of the basin expansion is scheduled to commence in Spring 2013.

A jurisdictional delineation of waters and wetlands within the basin expansion area (Nomad Ecology 2009a, revised 2011a; USACE 2012) identified 3.47 acres of state jurisdictional features and 0.73 acre of federal jurisdictional features (Figure 5, Wetland Delineation Map). The basin expansion area also includes 0.73 acre of riparian woodland/scrub. The Flood Control District proposes to mitigate temporary and permanent impacts by implementing this Habitat Mitigation and Monitoring Plan (HMMP or Plan). This Plan includes the restoration of wetland and aquatic habitat; re-contouring of the basin, stream channel, and floodplain; removal of non-native invasive species; re-establishment of the hydrological regime through creation of a redesigned channel and floodplain; and re-establishment of native riparian habitat appropriate to the area herein referred to as Restoration Area (Figure 6, Restoration Plan, Areas “A”-“C”). The mitigation portion of the Plan consists of two parts: (1) U.S. Army Corps of Engineers (USACE)-required mitigation that is consistent with the Environmental Protection Agency’s (EPA) and USACE’s Final Compensatory Mitigation Rule for Losses of Aquatic Resources (2008) as well as mitigation ratios that are consistent with the Sacramento District’s Regional

General Permit 1 (RGP 1) for activities that would cause no more than minimal adverse impacts to the aquatic environment within the Plan Area of the East Contra Costa County Habitat Conservation Plan/Natural Community Conservation Plan (HCP/NCCP), and (2) Additional mitigation required under the HCP/NCCP that is not already addressed in the mitigation included for part (1). The mitigation plan elements are listed below and discussed in more detail in Section 1.3. The mitigation would be implemented on site as described below and as shown in Table 1 and Figure 6.

USACE mitigation:

- On-site, in-kind replacement of 0.67 acre (3,642 linear feet) of Sand Creek (channel) for temporary impacts to 0.67 acre of Sand Creek (1:1 ratio);
- On-site, in-kind replacement for 0.03 acre (292 linear feet) of channel that will be permanently removed by widening the restored channel to include an additional 0.03 acre of stream habitat (1:1 ratio) with increased habitat function;
- On-site, in-kind replacement of 0.02 acre of perennial wetlands along the restored channel to replace 0.02 acre that will be temporarily impacted during construction of the project (1:1 ratio); and
- On-site, in-kind replacement of 0.01 acre of seasonal wetland to replace 0.01 acre that will be temporarily impacted during construction of the project (1:1 ratio).

HCP/NCCP mitigation:

- On-site, in kind replacement for permanent and temporary impacts to Sand Creek, as provided above under USACE mitigation;
- On-site, in kind replacement of 0.08 acre of drainage culverts at the basin inlet structures to replace 0.08 acre that will be permanently removed during construction of the project (1:1 ratio);
- On-site, in-kind replacement of 0.45 acre of state-jurisdictional perennial wetland in addition to the 0.02 acre of USACE-jurisdictional perennial wetland replacement to replace a total of 0.47 acre that will be temporarily impacted during construction of the project (1:1 ratio);
- On-site, in-kind replacement of 4.34 acres of state-jurisdictional seasonal wetland in addition to the 0.02 acre of USACE-jurisdictional seasonal wetland replacement to replace a total of 2.18 acres that will be temporarily impacted during construction of the project (2:1 ratio);
- On-site, in-kind replacement of 0.73 acre of riparian woodland/scrub habitat to replace 0.73 acre that will be temporarily impacted during construction of the project (1:1 ratio).

In addition to the on-site mitigation, the Flood Control District will mitigate permanent impacts to wetland and stream habitats by providing compensation of approximately $305,651.67 to the East Contra Costa County Habitat Conservancy and enhancing the Restoration Area to improve water quality, flood water retention, and wildlife habitat via implementation of this HMMP.

This Plan describes the restoration and monitoring components, and identifies and discusses the existing site conditions, post-construction conditions, the overall restoration goals and objectives, anticipated regulatory requirements and compliance, restoration drawings, planting palette, soil treatments, erosion and sediment control measures, and weed abatement measures.

Table 1 Project Impacts and Proposed Mitigation

On-Site Waters and Wetland Features	Feet (ft)	Acre (ac)	Temporary Impacts		Proposed On-Site Mitigation		Permanent Impacts		Proposed On-Site Mitigation	
			ft	ac	ft	ac	ft	ac	ft	ac
Federal Jurisdiction										
Sand Creek (SC-1 – SC-4; culverts 3A-3C)	3,934	0.70[1]	3,642	0.67	In-kind replacement (1:1)		292	0.03	In-kind replacement (of acreage @ 1:1)	
					3,642	0.67			N/A	0.03
Perennial/Permanent Wetland (Sand Creek; PW-2[2])	N/A	0.02	N/A	0.02	In-kind replacement (1:1)		N/A		N/A	
					N/A	0.02				
Seasonal Wetland (SW-1)	N/A	0.01	N/A	0.01	In-kind replacement (1:1)		N/A		N/A	
					N/A	0.01				
Total Federal Jurisdiction	***3,934***	***0.73***	***3,642***	***0.70***	***3,642***	***0.70***	***292***	***0.03***	***0***	***0.03***
State Jurisdiction										
Sand Creek (SC-1 – SC-4; culverts 3A-3C)	3,934	0.70	3,642	0.67	In-kind replacement (1:1)		292	0.03	In-kind replacement (of acreage @ 1:1)	
					3,642	0.67			N/A	0.03
Existing Basin (culverts 1A, 1B; 2A-2D)[3]	280	0.08	N/A	N/A	N/A		280	0.08	In-kind replacement (of acreage @ 1:1)	
									0	0.08
Permanent/ Perennial Wetland (PW-1, PW-2[2])	N/A	0.47	N/A	0.47	In-kind replacement (1:1)		N/A		N/A	
					N/A	0.47				
Seasonal Wetland (SW-1 – SW-4)	N/A	2.18	N/A	2.18	In-kind replacement (2:1)		N/A		N/A	
					N/A	4.36				
Subtotal (State waters and wetlands)	***4,214***	***3.43***	***3,642***	***3.32***	***3,642***	***5.50***	***572***	***0.11***	***0***	***0.11***
Riparian Woodland/Scrub	N/A	0.73	N/A	0.73	In-kind replacement (1:1)		N/A		N/A	
					N/A	0.73				
Total State Jurisdiction	***4,214***	***4.16***	***3,642***	***4.05***	***3,642***	***6.23***	***572***	***0.11***	***0***	***0.11***

1. Actual on site acreage is 0.72 but 0.02 of that is permanent/perennial wetlands as identified below, based on an average 8-foot width
2. Already included in length for Waters of U.S.
3. Acreages and feet given for impacts to these features do not include culverts 1A and 1B because these features will remain in place

1.1.2 Responsible Parties

Project Applicant:

- Contra Costa County Flood Control and Water Conservation District
  (Flood Control District)
  255 Glacier Drive
  Martinez, California 94553
  Contact: Ms. Claudia Gemberling
  Telephone: (925) 313-2192
  Email: cgemb@pw.cccounty.us

The preparer of the Habitat Mitigation and Monitoring Plan:

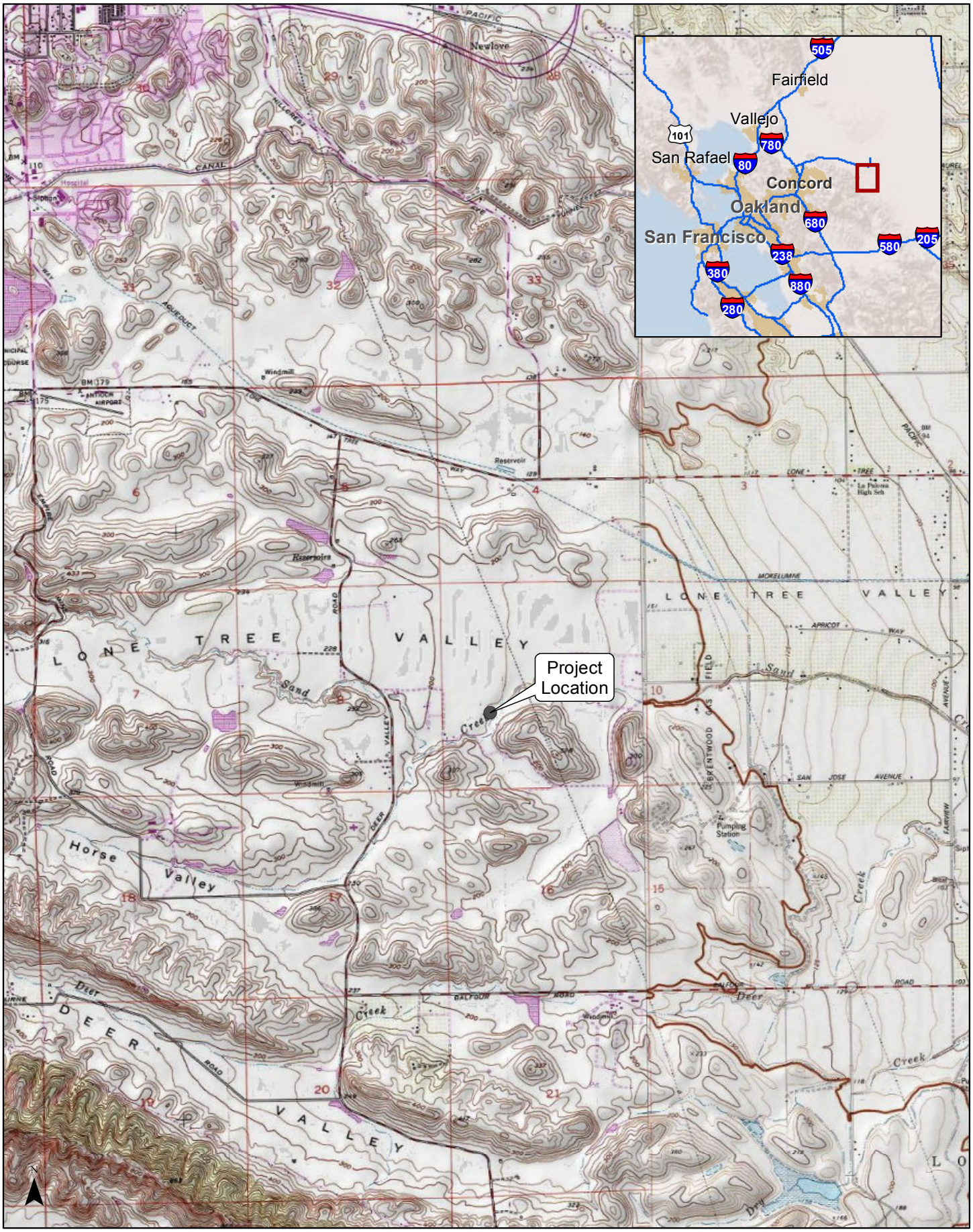
- Cardno ENTRIX
  701 University Avenue, Suite 200
  Sacramento, CA 95825
  Contact: John Spranza
  Telephone: 916-923-1097
  Email: john.spranza@cardno.com

1.1.3 Project Location

The USCB is located in the southern portion of the City of Antioch in east Contra Costa County, south of Lone Tree Way and east of Deer Valley Road (Figures 1 and 2). The USCB is located in the lower Marsh Creek watershed, approximately 9 miles northeast of Mount Diablo, 5 miles south of the Sacramento-San Joaquin River Delta, and approximately 4 miles upstream of the confluence of Sand Creek and Marsh Creek (Figure 3). The site includes six entire parcels (APNs 057-050-008, 057-050-010, 057-050-012, 057-050-019, 057-050-020, 057-050-023) owned by the Flood Control District and easements on four adjacent parcels (APNs 057-050-009, 057-050-021, 057-030-005, and 057-050-022).

1.1.4 Existing Conditions

The existing basin was constructed in 1994 and contains a man-made depression with elevated berms, associated basin inlet and spillway outlet pipes, and a gravel access road (Figure 7, Aerial View). The basin ranges from 175 feet elevation at the bottom of the basin to steeply sloping gradients at approximately 190 feet elevation above mean sea level. The basin has a flood storage capacity of 123 acre-feet. A basin inlet pipe on the northwest side of the basin drains stormwater runoff from developed areas north of the basin into the center of the existing basin floor which drains into an existing 36-inch diameter spillway outlet pipe at the southeast side of the basin and outfalls into Sand Creek. The basin floor primarily contains annual grassland that is grazed by cattle; the low-flow channel contains wetland vegetation. Sand Creek borders the basin's southern boundary. This portion of Sand Creek is a narrow, incised channel with steep, eroded banks and sparse riparian vegetation. Current land use includes the existing flood control basin and cattle grazing.



Date: 10-14-10

Contra Costa County, CA

Figure 1. Project Location

UPPER SAND CREEK BASIN

0 0.5 1 2 Miles

Cardno ENTRIX

Date: 06-04-12

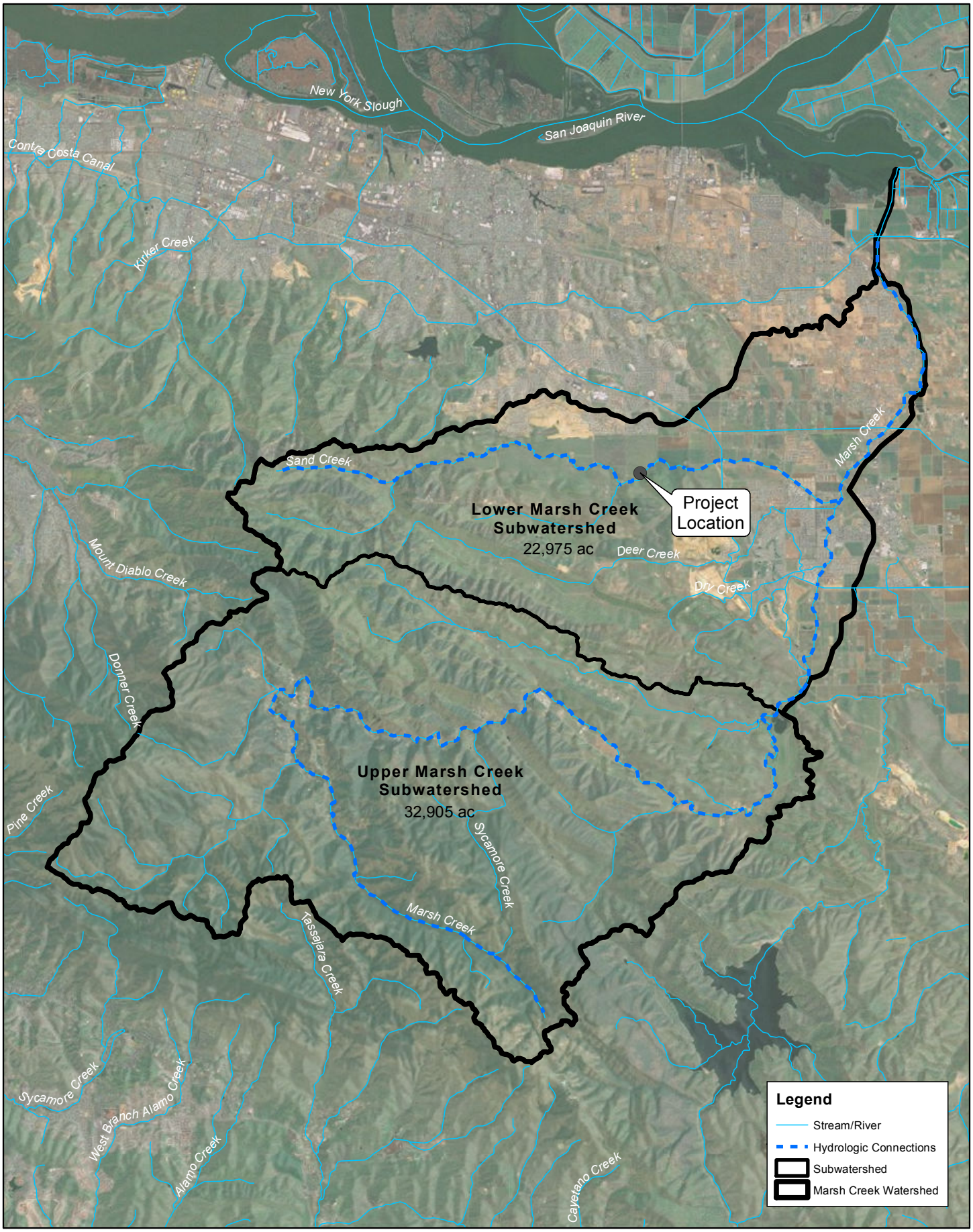
Contra Costa County, CA

Figure 2. Road Map

UPPER SAND CREEK BASIN

0 0.5 1 2 Miles

Cardno ENTRIX



Date: 05-01-12

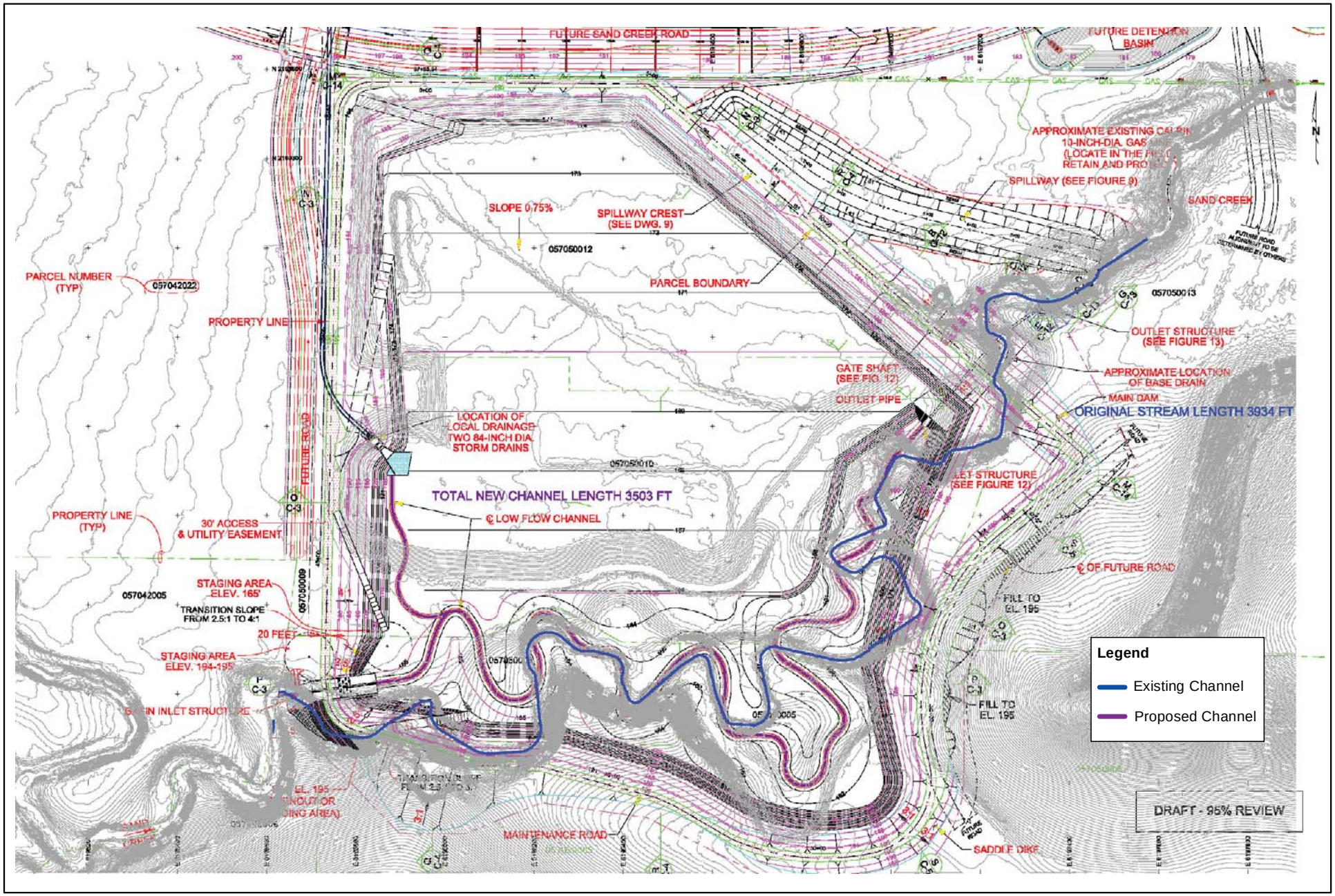
Contra Costa County, CA

Figure 3. Marsh Creek Watershed

UPPER SAND CREEK BASIN

Miles
0 0.5 1 2

Cardno ENTRIX



Date: 08-15-12

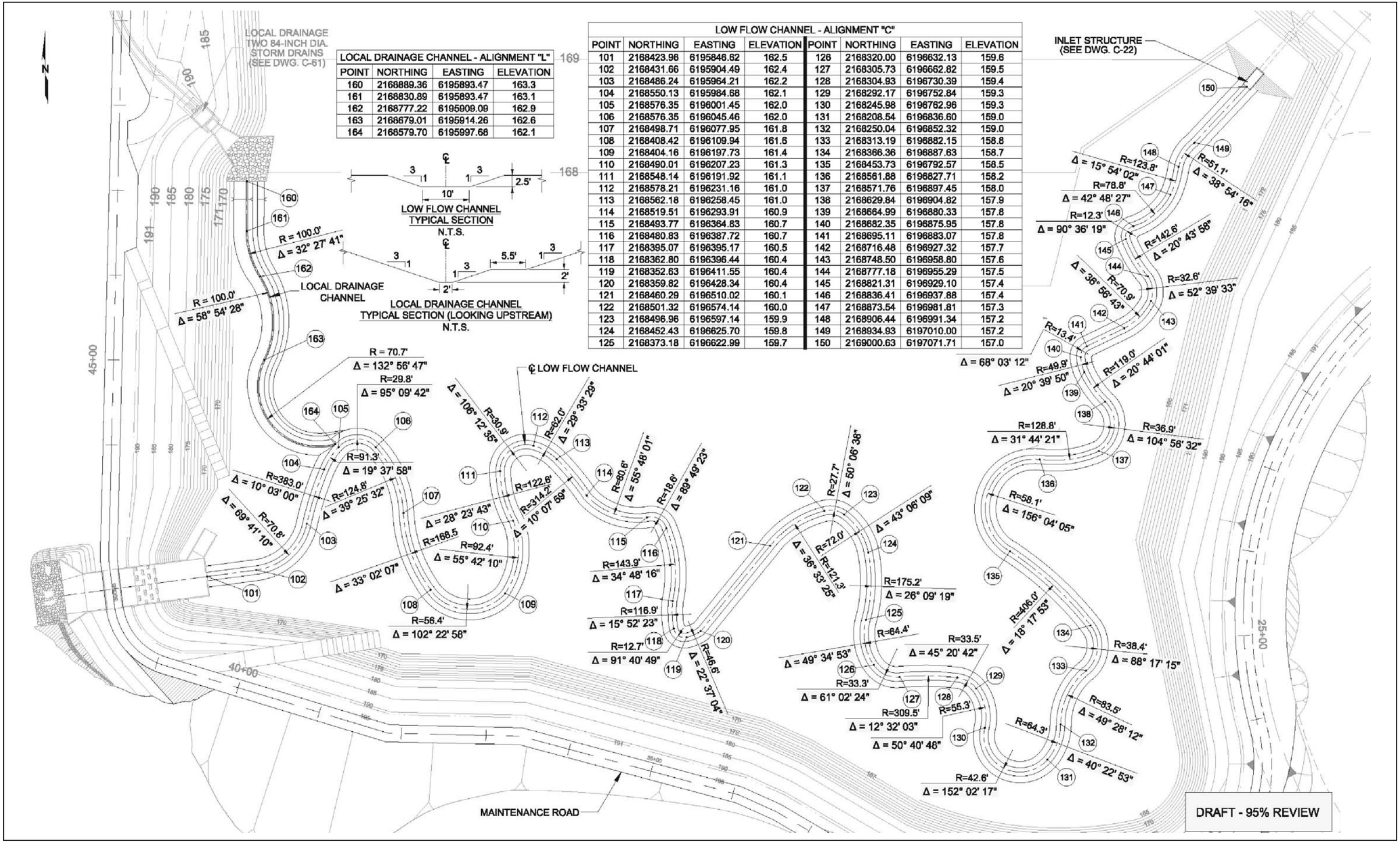
Contra Costa County, CA

Figure 4a. Basin Design

UPPER SAND CREEK BASIN

Source: GEI Consultants, 2012

Cardno ENTRIX



LOCAL DRAINAGE CHANNEL - ALIGNMENT "L"			
POINT	NORTHING	EASTING	ELEVATION
160	2168889.36	6195893.47	163.3
161	2168830.89	6195893.47	163.1
162	2168777.22	6195909.09	162.9
163	2168679.01	6195914.26	162.6
164	2168579.70	6195997.68	162.1

LOW FLOW CHANNEL - ALIGNMENT "C"							
POINT	NORTHING	EASTING	ELEVATION	POINT	NORTHING	EASTING	ELEVATION
101	2168423.96	6195846.62	162.5	126	2168320.00	6196632.13	159.6
102	2168431.66	6195904.49	162.4	127	2168305.73	6196662.82	159.5
103	2168486.24	6195964.21	162.2	128	2168304.93	6196730.39	159.4
104	2168550.13	6195984.68	162.1	129	2168292.17	6196752.84	159.3
105	2168576.35	6196001.45	162.0	130	2168245.98	6196762.96	159.3
106	2168576.35	6196045.46	162.0	131	2168208.54	6196836.60	159.0
107	2168498.71	6196077.95	161.8	132	2168250.04	6196852.32	159.0
108	2168408.42	6196109.94	161.6	133	2168313.19	6196882.15	158.8
109	2168404.16	6196197.73	161.4	134	2168366.36	6196887.63	158.7
110	2168490.01	6196207.23	161.3	135	2168453.73	6196792.57	158.5
111	2168548.14	6196191.92	161.1	136	2168561.88	6196827.71	158.2
112	2168578.21	6196231.16	161.0	137	2168571.76	6196897.45	158.0
113	2168562.18	6196258.45	161.0	138	2168629.84	6196904.82	157.9
114	2168519.51	6196293.91	160.9	139	2168664.99	6196880.33	157.8
115	2168493.77	6196364.83	160.7	140	2168682.35	6196875.95	157.8
116	2168480.83	6196387.72	160.7	141	2168695.11	6196883.07	157.8
117	2168395.07	6196395.17	160.5	142	2168716.48	6196927.32	157.7
118	2168362.80	6196396.44	160.4	143	2168748.50	6196958.80	157.6
119	2168352.63	6196411.55	160.4	144	2168777.18	6196955.29	157.5
120	2168359.82	6196428.34	160.4	145	2168821.31	6196929.10	157.4
121	2168460.29	6196510.02	160.1	146	2168836.41	6196937.88	157.4
122	2168501.32	6196574.14	160.0	147	2168873.54	6196981.81	157.3
123	2168496.96	6196597.14	159.9	148	2168906.44	6196991.34	157.2
124	2168452.43	6196625.70	159.8	149	2168934.93	6197010.00	157.2
125	2168373.18	6196622.99	159.7	150	2169000.63	6197071.71	157.0

Date: 08-15-12

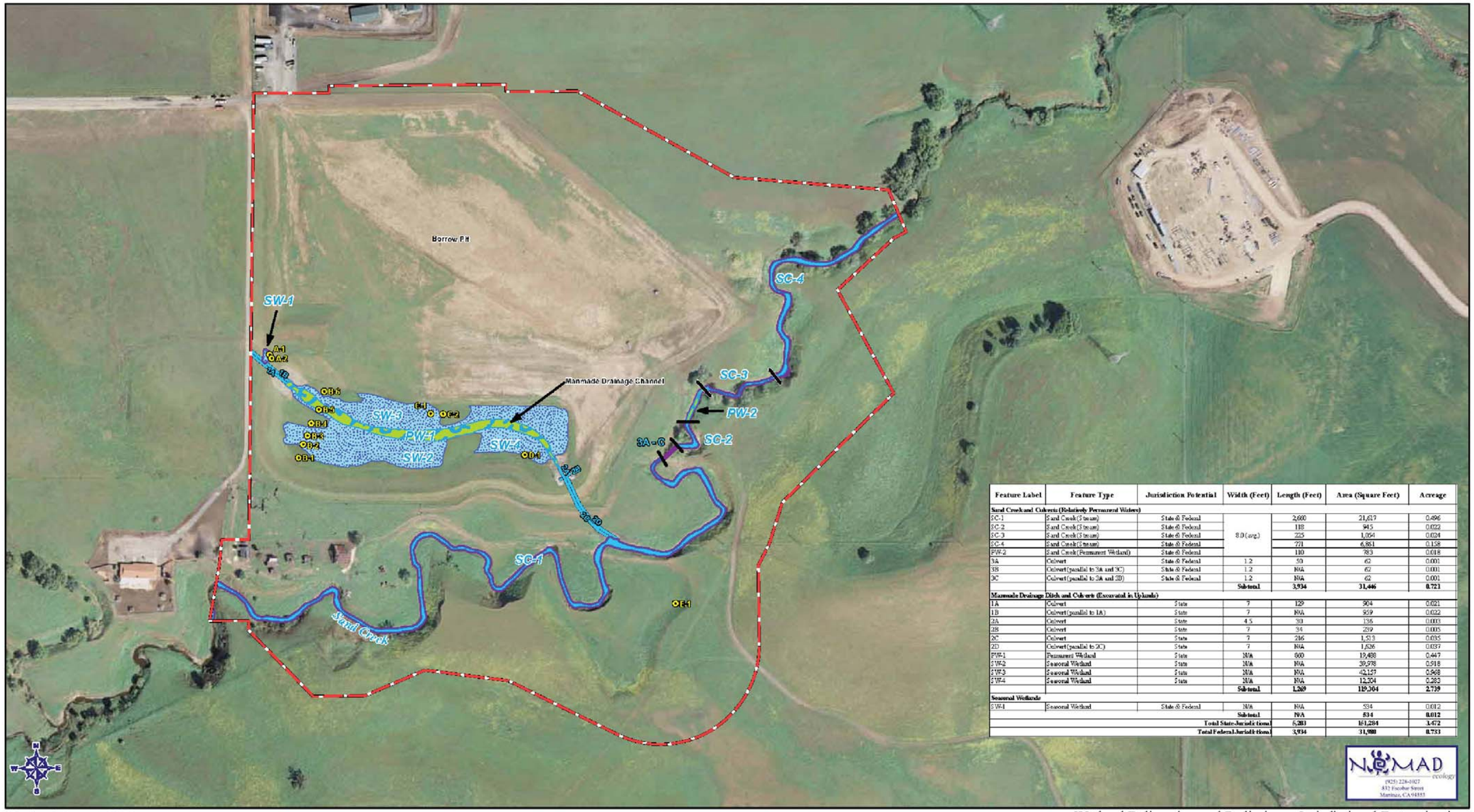
Contra Costa County, CA

Figure 4b. 95% Design and Typical Cross-sections for the Upper Sand Creek Basin Project

UPPER SAND CREEK BASIN

Source: GEI Consultants, 2011

Cardno ENTRIX



Feature Label	Feature Type	Jurisdiction Potential	Width (Feet)	Length (Feet)	Area (Square Feet)	Acreage
Sand Creek and Culverts (Relatively Permanent Waters)						
SC-1	Sand Creek (Stream)	State & Federal	8.0 (avg)	2,600	21,637	0.496
SC-2	Sand Creek (Stream)	State & Federal		118	945	0.022
SC-3	Sand Creek (Stream)	State & Federal		225	1,054	0.024
SC-4	Sand Creek (Stream)	State & Federal		721	6,861	0.158
PW-2	Sand Creek (Permanent Wetland)	State & Federal		110	783	0.018
3A	Culvert	State & Federal	1.2	50	62	0.001
3B	Culvert (parallel to 3A and 3C)	State & Federal	1.2	N/A	62	0.001
3C	Culvert (parallel to 3A and 3B)	State & Federal	1.2	N/A	62	0.001
			Subtotal	**3,934**	**31,446**	**0.721**
Manmade Drainage Ditch and Culverts (Excavated in Uplands)						
1A	Culvert	State	7	129	904	0.021
1B	Culvert (parallel to 1A)	State	7	N/A	959	0.022
2A	Culvert	State	4.5	30	136	0.003
2B	Culvert	State	7	34	239	0.005
2C	Culvert	State	7	216	1,513	0.035
2D	Culvert (parallel to 2C)	State	7	N/A	1,526	0.037
PW-1	Permanent Wetland	State	N/A	900	19,488	0.447
SW-2	Seasonal Wetland	State	N/A	N/A	39,978	0.918
SW-3	Seasonal Wetland	State	N/A	N/A	42,127	0.968
SW-4	Seasonal Wetland	State	N/A	N/A	12,204	0.283
			Subtotal	**1,269**	**119,204**	**2.739**
Seasonal Wetlands						
SW-1	Seasonal Wetland	State & Federal	N/A	N/A	534	0.012
			Subtotal	**N/A**	**534**	**0.012**
			Total State Jurisdictional	**5,203**	**151,284**	**3.472**
			Total Federal Jurisdictional	**3,934**	**31,980**	**0.733**

Revised August 2012

Wetland Delineation and Preliminary Jurisdictional Determination

Legend

Upper Sand Creek Project Footprint (61.5 acres)

Data Points

Transect Letter - Point Number

Field Assessed Land Cover Types

Stream (SC-1, SC-2, SC-3, S-4)

Permanent Wetland (PW-1,PW-2)

Seasonal Wetland (SW-1, SW-2, SW-3, SW-4)

Culvert (1A, 1B, 2A, 2B, 2C, 2D, 3A, 3B, 3C)

Jurisdictional Features

RPWs (Relatively Permanent Waters)

SW-1

1:3,000

0 125 250 Feet

Figure 5

Jurisdictional Wetlands and Waters of the Study Area

Contra Costa County Department of Public Works

Upper Sand Creek Basin

Project boundary determined by Contra Costa County Public Works Department personnel in the field. Field Assessed wetland features as mapped during March, April, and May 2008 site visits.

Antioch, Contra Costa County, California

Date: 08-14-12

Contra Costa County, CA

Figure 5. Wetland Delineation Map

UPPER SAND CREEK BASIN

Source: Nomad, 2012

A WETLAND SPECIES SEED MIX (NATIVE)		
Common Name	***Scientific Name***	**Bulk lbs/acre**
Creeping wildrye	*Leymus triticoides*	10
Creek clover	*Trifolium obtusiflorum*	10
Meadow barley	*Hordeum brachyantherum*	9
Baltic rush	*Juncus balticus*	2
Deer sedge	*Carex praegracilis*	1
Water cress	*Nasturtium officinale* (formerly *Rorippa nasturtium aquaticum)*	1
Yellow monkeyflower	*Mimulus guttatus*	0.10
Total		33.1

B RIPARIAN WOODLAND / SCRUB SPECIES		
Common Name	***Scientific Name***	**Number of Cuttings**
Red willow	*Salix laevigata*	1,198
Arroyo willow	*Salix lasiolepis*	1,198
Black willow	*Salix gooddingii*	109

D UPLAND SPECIES SEED MIX (NATIVE)		
Common Name	***Scientific Name***	**Bulk lbs/acre**
Blue wildrye	*Elymus glaucus*	7
Small fescue	*Vulpia microstachys*	8
California brome	*Bromus carinatus*	7
Purple needlegrass	*Nassella pulchra*	6
Common fiddleneck	*Amsinckia menziesii var. intermedia*	3
California poppy	*Eschscholzia californica*	2
Total		33

RESTORATION AREA HABITAT TYPES

MAP LABEL	HABITAT	Proposed Mitigation*	ACRES BY HABITAT TYPE				
			Perennial	Seasonal	Riparian	Open Water	Total
A_1	Perennial / Permanent Wetland	0.47	1.02**				1.02**
A_2	Seasonal Wetland	4.36		5.20**			5.20**
B	Riparian	0.73			1.16**		1.16**
C	Waters of the U.S. / Stream	0.70 3,642 ft.				0.70	0.70
	Total		1.02	5.20	1.16	0.70	8.08
D	Upland	18.12	N/A	N/A	N/A	N/A	18.12

*Refer to Table 1 of HMMP
**Restored acreage exceeds proposed mitigation to allow for areas that do not meet minimum performance criteria.

General:

1. The Restoration Contractor shall remove and dispose of all invasive plant species within the Restoration Area through the designated plant establishment period. Removal shall be at the direction of the Engineer and the Restoration Biologist.
2. Herbicide shall only be used if approved by the Restoration Biologist and shall be in compliance with label directions and as permitted by State, Federal and State agencies.

Erosion Control:

1. The Restoration Contractor shall grade the Restoration Area to the contours and elevations shown on the civil plans.
2. Following final grading operations and approval of final grades by the Engineer, the Restoration Contractor shall apply seed mixes in locations and amounts as shown on this sheet in a slurry with paper or wood mulch at the manufacturer's suggested rate.

Planting Notes:

1. All native plant material shall be obtained from a native plant nursery, except as approved by the Restoration Biologist.
2. The Restoration Contractor shall plant the Restoration Area with plant species shown on this sheet.
3. Substitutions to the planting palette may be made by the Restoration Biologist with approval from the Flood Control District.

Date: 08-16-12

0 50 100 200

Upper Sand Creek Basin Project

Prepared for Contra Costa County Flood Control and Water Conservation District

Figure 6. Restoration Area Plan

Date: 05-01-12

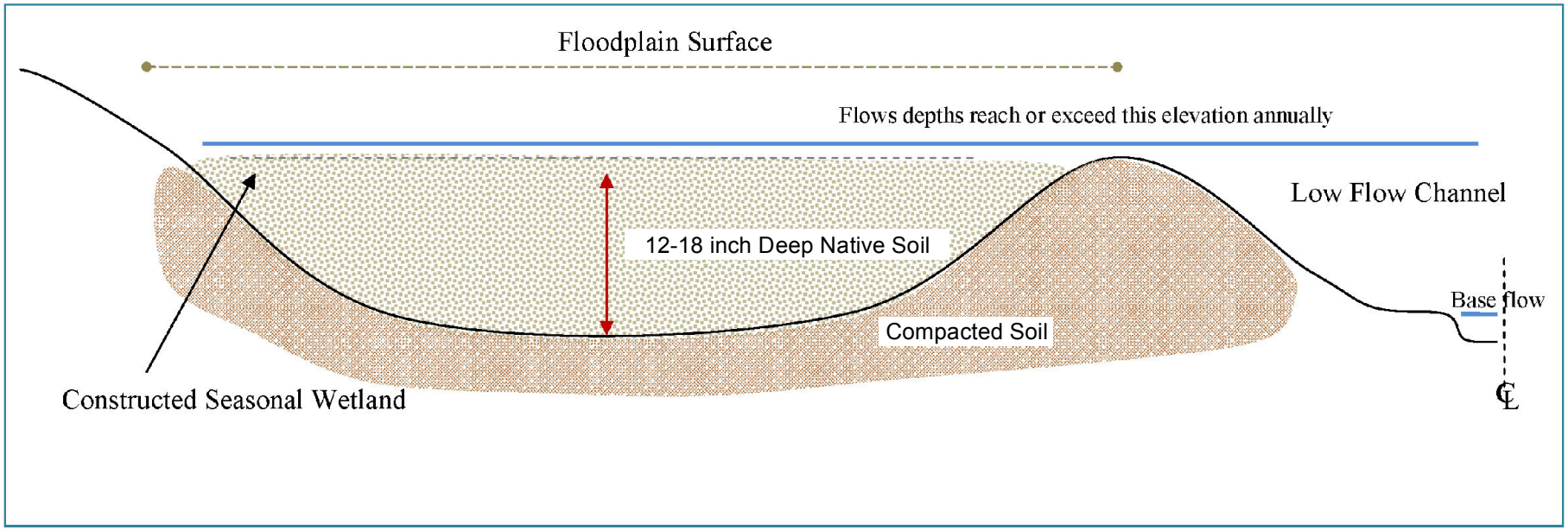
Contra Costa County, CA

Figure 7. Aerial View of the Project Area

UPPER SAND CREEK BASIN

Source: Bing Aerial Imagery, 2010

Cardno ENTRIX



Date: 06-04-12

Contra Costa County, CA

Figure 8. Conceptual Cross Section, Trough 6

UPPER SAND CREEK BASIN

Source: Cardno ENTRIX, 2011

1.1.4.1 Jurisdictional Areas

The project area contains a total of 0.73 acre of USACE jurisdictional features which include 0.70 acre of waters (Sand Creek; 3,934 feet), 0.02 acre perennial/permanent wetland present within Sand Creek downstream of the existing outfall pipes, and 0.01 acre of seasonal wetland located above the basin drainage inlet. The project area also includes a total of 3.43 acres of state jurisdictional features which include 0.70 acre of waters (Sand Creek; 3,934 feet), 0.08 acre of culverts within Sand Creek and from the existing man-made basin bordering Sand Creek,[1] 0.47 acre of perennial/permanent wetlands (0.45 within the basin and 0.02 acre within Sand Creek proper), and 2.18 acres of seasonal wetlands within the basin (Table 1, Figure 5, Photos 1-10; Nomad Ecology 2011a).

1.1.4.2 Topography

The natural terrain surrounding the existing basin consists of rolling hills along the west and south that give way to flat lands to the north and east. Ground elevations in the area range from 200 feet in elevation to the west to 180 feet in elevation to the east with a low of about 160 feet in elevation at the creek bottom to a high of about 330 feet in elevation atop the hill south of the basin. Sand Creek borders the basin along its southern and eastern boundaries; the relatively steep banks are 15 to 20 feet high. Prior to construction of the existing basin, the elevation ranged from 194 feet along the west side of the basin to 180 feet along the east side (Figures 1 and 7).

1.1.4.3 Hydrology

Sand Creek

Sand Creek upstream of the existing basin is an ephemeral stream and, as a result of the urban runoff entering the basin, is a perennial stream downstream of the existing basin outfall pipes. Historically, Upper Sand Creek was an ephemeral stream, carrying water immediately following rainfall events, then drying quickly (Jones and Stokes 2006). Since the addition of residential and other development north of the basin, the creek downstream of the basin outfall pipes now sustains low flows of urban runoff all year. In addition, the project site has sparse riparian vegetation as compared to adjacent areas upstream and downstream. This lack of riparian vegetation is likely a result of historical farming and grazing on site, which has degraded the quality and ecological function of the habitat.

Groundwater was measured at a depth of 21 to 26 feet below existing ground surface during subsurface explorations. The existing basin floor is at approximately 175 feet elevation and will be excavated to 158 feet elevation (CAL Engineering & Geology 2010). Therefore, excavation will extend to a depth roughly 1 to 5 feet above the groundwater table. It is likely that the groundwater table will be near the level of the water in the creek during the wet season.

Approximately 3,900 feet of Sand Creek borders the existing basin's southern boundary. Sand Creek, a third-order stream, is considered jurisdictional waters of the U.S. because it is hydrologically connected to traditional navigable waters (San Joaquin River). Sand Creek flows

[1] Note that an additional 0.04 acres of culverts shown on the wetland delineation map (Figure 5) are not included in this figure or in the impact analysis because they would remain in place and be unaffected by the project

into Marsh Creek approximately 4 miles downstream; Marsh Creek then flows northeast until it joins the San Joaquin River at Big Break in Oakley (Figure 3).

This portion of Sand Creek is a narrow, incised channel with steep, eroded banks exhibiting relatively high sinuosity. The low-flow channel (ordinary high water mark) ranges from 2 to 8 feet in width. It generally has low quality runs and pools, and is typically dry by June in most years (Photos 1 and 2).

Photos 1 and 2
Sand Creek upstream of outfall pipes (March 2008, July 2010).

1.1.4.4 Aquatic Functions

Streams can harbor a variety of common fish and amphibian species including threespine stickleback *(Gasterosteus aculeatus)*, California roach *(Hesperoleucus symmetricus),* Sacramento sucker *(Catostomus occidentalis)*, river lamprey *(Lampetra ayresi)*, hitch *(Lavinia exilicauda)*, and prickly sculpin *(Cottus asper)*. A variety of bird species including great egret *(Ardea alba)*, great blue heron *(Ardea herodias)*, mallard *(Anas platyrhynchos)*, black phoebe *(Sayornis nigricans)*, song sparrow *(Melospiza melodia)* and belted kingfisher *(Megaceryle alcyon)* forage and nest within this habitat type. Mammalian predators such as raccoons *(Procyon lotor)*, gray fox *(Urocyon cinereoargenteus)*, and striped skunk *(Mephitis mephitis)* may hunt along the corridor (Nomad Ecology 2010b).

Habitat quality in this portion of the creek is poor based on the low water flow, relatively high water temperatures, minimal emergent or aquatic vegetation required by many sensitive aquatic species, as well as cattle grazing and human disturbances (refuse, stream crossings) within the existing basin and along the creek (Photos 3 and 4). Scattered oak trees and scrub primarily occur along the banks and floodplain in this portion (Photo 1, Figure 7).

Photo 3
Cattle grazing impacts in creek (December 2009).

Photo 4
Dirt road crossing that overlays three corrugated pipe culverts (March 2008).

Downstream of the outfall, the habitat quality of Sand Creek increases due to the perennial water flow from urban runoff (1 to 2 cubic feet per second [cfs]), increased emergent and aquatic vegetation, trees, muddy to rocky substrate, and alternating run/pools. Sand Creek narrows as it continues northeast and is characterized by steep, vegetated streambanks and a moderate overstory of valley oak and blue oak trees. Sand Creek exits the expansion area to the east in a moderately incised channel through non-native grasslands and agricultural lands with scattered riparian trees (Photos 5 and 6).

Photo 5
Increased habitat quality downstream of basin outfall pipes; northwest view (July 2010).

Photo 6
Sand Creek narrows towards riparian canopy; northeast view (July 2010).

1.1.4.5 Soils/Substrate

There are four mapped soil units in and adjacent to the project area: Altamont-Fontana Complex, 30 to 50 percent slopes; Capay Clay, 0 to 2 percent slopes; Pescadero clay loam; and Rincon clay loam, 0 to 2 percent slopes. The Altamont Series consists of well-drained soils underlain by shale

and soft, fine-grained sandstone. Most of the hill slope south of Sand Creek consists of this soil type. Permeability is slow; where the soil is bare, runoff is medium to rapid, and the hazard of erosion is moderate to high. The Capay Series consists of moderately well-drained soils formed in alluvium from sedimentary rock. The existing drainage basin consists of this soil type. Permeability is slow with very slow surface water runoff, minimal hazard of erosion, and high shrink-well potential. The Pescadero Series consists of poorly-drained soils that formed in alluvium from sedimentary rock. The hill slope south of Sand Creek consists of this soil type in an approximately 500-foot section dividing Altamont Series soils. Permeability is slow with very slow surface water runoff. There is no hazard of erosion where the soil is tilled and exposed. The Rincon Series consists of well-drained soils mainly on benches. These soils formed in alluvial valley fill from sedimentary rock. The creek and adjacent uplands consists of this soil type. Permeability is slow with slow surface water runoff. The hazard of erosion is none to slight where the soil is tilled and exposed (NRCS 1977).

On-site subsurface explorations by a geotechnical firm indicate that subsurface conditions generally consist of lean clay and sandy lean clay with interbedded layers of clayey and silty sand. Isolated lenses of poorly graded sand and poorly graded sand with silt and clay were encountered. The different soil layers were grouped into three units: 1) lean clay, 2) interbedded sandy clay/sandy silt, and 3) clayey and silty sands. In general, the upper lean clay consists of stiff to hard sandy lean clay and lean clay within the upper 15 feet. The interbedded layers of sandy clay/sandy silt underlie the upper lean clay and consist of medium dense to dense clayey sand and medium stiff to stiff lean clay that extends to a depth of approximately 35 feet. Discontinuous lenses of loose sand, silty sand, and sandy silt are found within the interbedded unit. The lower lean clay underlies the interbedded sandy clay/sandy silt layer and generally consists of very stiff to hard lean clay and sandy lean clay and extends to the depths explored. Sandstone bedrock is anticipated to be located at a depth of approximately 8 to 25 feet below the proposed basin bottom (CAL Engineering & Geology 2010).

1.1.4.6 Vegetation

Wetland and upland vegetation types on the project parcels consist of annual grassland, ruderal, urban, stream, permanent wetland, seasonal wetland, riparian, and culvert (, HCP/NCCP Land Cover Types Map). Habitat types that overlap the project area are described below including permanent (perennial) wetlands (including culverts and stream habitats), seasonal wetlands (including culverts), riparian, and annual grasslands (uplands).

Perennial Wetlands

The low-flow channel within the existing basin contains approximately 0.45 acre of perennial wetlands (Figure 5, perennial wetland (PW)-1; Photo 7) that support whorled marsh pennywort (*Hydrocotyle verticillata*) and narrow-leaved cattail (*Typha angustifolia*). Sand Creek contains approximately 0.02 acre that supports narrow-leaved cattail, American tule *(Scirpus americanus)*, salt rush *(Juncus lesueurii)*, Baltic rush *(Juncus balticus)*, water bentgrass *(Agrostis gigantea*)*, spiny buttercup *(Ranunculus muricatus*)*, cursed crowfoot *(Ranunculus sceleratus)*, whorled marsh pennywort, brass-buttons *(Cotula coronopifolia*)*, and rabbitsfoot grass *(Polypogon monspeliensis*)* (Figure 5, PW-2; Photo 8). Asterisks denote species that occur naturally but are not native to California (Nomad Ecology 2010b). These perennial wetlands are federal and state jurisdictional features.

Perennial wetlands support resident bird species that use the stable nesting and foraging habitat, and serve as essential layover habitat for migratory bird species. Among the species that could be found in the basin area include great blue heron, least bittern *(Ixobrychus exilis)*, sora *(Porzana carolina)*, common merganser *(Mergus merganser)*, and northern shoveler *(Anas clypeata)*. Common amphibians and reptiles of perennial wetlands include American bullfrog *(Rana catesbeiana)* and Pacific chorus frog (*Pseudacris regilla)*. Turbid, nutrient-rich wetlands are suitable habitat for common fish species, such as mosquitofish *(Gambusia affinis)*, bluegill *(Lepomis macrochirus)* and common carp *(Cyprinus carpio)* (Nomad Ecology 2010b).

Photo 7
Perennial wetland (PW-1) within existing basin; northwest view (January 2012).

Photo 8
Perennial wetland (PW-2) within Sand Creek downstream of basin outfall pipes; west view (July 2010).

Seasonal Wetlands

Areas adjacent to the perennial wetlands of the low-flow channel within the basin consist of approximately 2.17 acres seasonal wetlands that support California semaphoregrass (*Pleuropogon californicus*), water cress *(Nasturtium officinale*), rabbitsfoot grass*, brass-buttons*, water cress*,* green dock *(Rumex conglomeratus)*, spiny buttercup**,* cursed crowsfoot*,* Italian ryegrass *(Lolium multiflorum*)*, meadow barley *(Hordeum brachyantherum*)*, hyssop loosestrife *(Lythrum hyssopifolium*)*, and strawberry clover *(Trifolium fragiferum*)* (Figure 5 -, seasonal wetlands (SW)-2 to SW-4; Photos 7 and 10).

Species present in the 0.01 acre seasonal wetland above the basin inlet include stalked popcornflower *(Plagiobothrys stipitatus)*, dwarf allocarya *(Plagiobothrys humistratus)*, green dock, and toad rush *(Juncus bufonius)* (Figure 5, SW-1; Photo 9). Asterisks denote non-native species that occur naturally but are not native to California (Nomad Ecology 2010b).

The seasonal wetlands are state jurisdiction features. The USACE did not take jurisdiction of the seasonal wetlands within the existing basin as the basin was constructed in uplands. However, the USACE did take jurisdiction of the 0.01 acre seasonal wetland located above the basin inlet.

Photo 9
Seasonal wetland (SW-1) above drainage inlet; southeast view (January 2010).

Photo 10
Seasonal wetlands (SW-2 to SW-4) adjoins perennial wetland PW-1; southeast view (December 2009).

The type and complexity of seasonal wetlands varies widely but can be a valuable and productive habitat for a variety of species, including Pacific chorus frogs, western aquatic garter snake *(Thamnophis couchii)*, northern harrier *(Circus cyaneus)*, red-winged blackbird *(Agelaius phoeniceus)*, and black phoebe. Seasonal wetlands can provide cover and food for waterfowl and shorebirds including egrets and herons, mallard, American coot *(Fulica americana)*, killdeer *(Charadrius vociferus)*, and Canada goose *(Branta canadensis)*. Mammals common in this habitat include raccoon, muskrat *(Ondatra zibethicus)*, striped skunk, and gray fox (Nomad Ecology 2010b).

Riparian Woodland/Scrub

Sand Creek contains approximately 0.73 acre riparian woodland/scrub at the downstream end of the project site, which consists of an open canopy overstory of red willow (*Salix laevigata*); further downstream the overstory is composed of valley oak (*Quercus lobata*) and blue oak (*Quercus douglasii*) (Figure 7; Photos 4, 6, 8). Other tree and shrub species include California rose (*Rosa californica*), California sagebrush (*Artemisia californica*), blue elderberry (*Sambucus nigra*), blue witch (*Solanum xanti*), and tree tobacco (*Nicotiana glauca*). The understory includes herbaceous species such as California man-root (*Marah fabacea*), broad-leaved pepperweed (*Lepidium latifolium**), Bermuda buttercup (*Oxalis pes-caprae**), white fiesta flower (*Pholistoma membranaceum*), miner's lettuce (*Claytonia perfoliata*), and common chickweed (*Stellaria media**) (Nomad Ecology 2010b).

Riparian woodland scrub communities provide habitat for small mammal species such as western grey squirrel *(Sciurus griseus)*, raccoon, deer mouse *(Peromyscus maniculatus)*, Audubon's cottontail *(Sylvilagus audubonii)*, and striped skunk. These habitat types also serve as travel corridors for larger mammal species including black-tailed deer *(Odocoileus hemionus californicus)*, coyote *(Canis latrans)* and gray fox. Amphibians and reptiles common to this habitat include slender salamander (*Batrachoseps attenuatus*), sharp-tailed snake *(Contia tenuis)*, Pacific chorus frog, arboreal salamander *(Aneides lugubris)* and common garter snake *(Thamnophis sirtalis)*. Bird species associated with riparian woodland/scrub include red-shouldered hawk *(Buteo lineatus)*, Cooper's hawk *(Accipiter cooperii)*, California towhee

(Melozone crissalis), black phoebe, chestnut-backed chickadee *(Poecile rufescens)*, and yellow-rumped warbler *(Dendroica coronata)*.

Uplands

The predominant upland vegetation is annual grassland which occurs on the slopes and terraces adjacent to Sand Creek and is dominated by non-native species such as wild oats (*Avena fatua*), soft chess (*Bromus hordeaceus*), hare barley (*Hordeum murinum*), ripgut brome (*Bromus diandrus*), Spanish brome (*Bromus madritensis*), brome fescue (*Vulpia bromoides*), Italian ryegrass, and Mediterranean barley (*Hordeum marinum*). Many non-native forbs are present as well, including several invasive non-native species such as purple star thistle (*Centaurea calcitrapa*), bull thistle (*Cirsium vulgare*), and black mustard (*Brassica nigra**) scattered shrubs and trees are present that comprise less than 5 percent canopy cover and include valley oak (*Quercus lobata*), almond tree waifs (*Prunus dulcis**), Northern California black walnut (*Juglans californica* var. *hindsii*), and California sagebrush (*Artemisia californica*) (Nomad 2010b).

The annual grassland provides habitat for seed-eating and insect-eating species. California quail *(Callipepla californica)*, mourning dove *(Zenaida macroura)*, and western meadowlark (*Sturnella neglecta*) are seed-eaters that nest and forage in grassland. Other common bird species associated with grassland habitat include golden-crowned sparrow *(Zonotrichia atricapilla)*, western scrub jay *(Aphelocoma californica)*, barn swallow *(Hirundo rustica)*, and northern mockingbird *(Mimus polyglottos)*. Mammal species such as California meadow vole (*Microtus californicus*), deer mouse, Botta's pocket gopher *(Thomomys bottae)*, Beechey ground squirrel (*Spermophilus beecheyi),* and black-tailed jackrabbit *(Lepus californicus)* forage and nest within grasslands. Small rodents attract raptors, such as red-tailed hawk *(Buteo jamaicensis)*, American kestrel *(Falco sparverius)*, barn owl *(Tyto alba)* and great-horned owl *(Bubo virginianus).* Black-tailed deer and coyote are also commonly observed within grassland habitat. Reptiles and amphibians such as southern alligator lizard *(Elgaria multicarinatus)*, western fence lizard (*Sceloporus occidentalis*), and Pacific slender salamander feed on invertebrates found within and beneath fallen logs in grassland habitats.

Ruderal areas also occur within the grassland of the existing basin north of the drainage channel in areas that have been subjected to ground disturbance or grading and in other scattered locations within the basin expansion area, particularly along Sand Creek. Species include black mustard*, charlock *(Sinapis arvensis*)*, burclover *(Medicago polymorpha*)*, sour clover *(Melilotus indicus*),* milk thistle *(Silybum marianum*),* Italian thistle *(Carduus pycnocephalus*),* wild oats*, soft chess*, hare barley *, ripgut brome*, red-stemmed filaree *(Erodium cicutarium*),* vetch *(Vicia villosa*),* field bindweed *(Convolvulus arvensis*),* rose clover *(Trifolium hirtum*),* shining peppergrass *(Lepidium nitidum var. nitidum),* cut-leaved geranium *(Geranium dissectum*),* bull thistle*, cardoon *(Cynara cardunculus*),* and bellardia *(Bellardia trixago*).* Asterisks denote non-native species that occur naturally but are not native to California (Nomad Ecology 2010b).

Plant species composition and proximity to developed areas attract species that are accustomed to human activity such as raccoon, Virginia opossum *(Didelphus virginianus)*, Beechey ground squirrel, European starling *(Sturnus vulgaris)*, and rock dove *(Columba livia)*. Wildlife species that feed on seeds or other parts of the vegetation, including finches, goldfinches, sparrows, and rodents such as California meadow vole and deer mouse, may occur in this habitat. Insects

present in ruderal habitats provide food for species such as western meadowlark, brewer's blackbird *(Euphagus cyanocephalus)*, western fence lizard, and Pacific gopher snake *(Pituophis catenifer catenifer)*.

1.1.4.7 Special-Status Plant and Wildlife Species

The following special-status species occur or have the potential to occur within the project area (Table 2). Mitigation for potential impacts to these species and impacts to their habitats is addressed in the Biological Resources Assessment Report (Nomad Ecology 2010b) and HCP/NCCP Planning Survey Report for covered species (Nomad Ecology 2009b). In addition, both reports include measures to avoid and minimize impacts to special-status species.

Table 2 Special-status Species that Occur or Have Potential to Occur On Site

Species	Listing Status[1]	Potential for Occurrence
Federal Listed		
California red-legged frog *Rana draytonii*	Fed: FT, CH CA: SSC HCP/NCCP	Present
California tiger salamander *Ambystoma californiense*	Fed: FT, CH CA: SSC HCP/NCCP	Possible
San Joaquin kit fox *Vulpes macrotis mutica*	Fed: FE CA: ST HCP/NCCP	Possible
Vernal pool fairy shrimp *Branchinecta lynchi*	Fed: FT, CH CA: None HCP/NCCP	Possible
State Listed		
American badger *Taxidea taxus*	Fed: None CA: SSC	Possible
Burrowing owl *Athene cunicularia*	Fed: None CA: SSC HCP/NCCP	Present
California horned lark *Eremophila alpestris actia*	Fed: None CA: WL	Possible
Cooper's hawk *Accipiter cooperii*	Fed: None CA: WL	Possible
Ferruginous hawk *Buteo regalis*	Fed: None CA: WL	Possible
Loggerhead shrike *Lanius ludovicianus*	Fed: None CA: SSC	Present
Golden eagle *Aquila chrysaetos*	Fed: None CA: WL, FP HCP/NCCP (No Take)	Possible
Grasshopper sparrow *Ammodramus savannarum*	Fed: none CA: SSC	Possible

Table 2 Special-status Species that Occur or Have Potential to Occur On Site

Species	Listing Status[1]	Potential for Occurrence
Merlin *Falco columbarius*	Fed: None CA: WL	Possible
Pallid bat *Antrozous pallidus*	Fed: None CA: SSC	Possible
Swainson's hawk *Buteo swainsoni*	Fed: None CA: SE HCP/NCCP	Possible
Tricolored blackbird *Agelaius tricolor*	Fed: None CA: SSC HCP/NCCP	Present
Western red bat *Lasiurus blossevillii*	Fed: None CA: SSC	Possible
White-tailed kite *Elanus leucurus*	Fed: None CA: FP HCP/NCCP (No Take)	Possible
Other CNDDB Listed Species		
Allen's hummingbird *Selasphorus sasin*	Fed: None CA: None	Possible
Bridges' coast range shoulderband *Helminthoglypta nickliniana bridgesi*	Fed: None CA: None	Possible
California linderiella *Linderiella occidentalis*	Fed: None CA: None	Possible
Curved-foot hygrotus diving beetle *Hygrotus curvipes*	Fed: None CA: None	Possible
Nuttall's woodpecker *Picoides nuttallii*	Fed: None CA: None	Possible
Oak titmouse *Baeolophus inornatus*	Fed: None CA: None	Possible
Round-leaved filaree *California macrophyllum*	CNPS 1B.1	Possible
San Joaquin pocket mouse *Perognathus inornatus inornatus*	Fed: None CA: None	Possible

[1]See Appendix C of the Biological Resources Assessment Report for a detailed description of the listing codes and abbreviations.

Source: Nomad Ecology 2010b.

The project site is still used for cattle grazing and flood control. The immediate surrounding area primarily consists of undeveloped grasslands. A formerly-occupied residential building, now owned and used by the Antioch Unified School District as a conference center, is located just southwest of the existing basin. A magnet school and Kaiser Hospital are located approximately ¼ mile to the north followed by city of Antioch residential developments. The northern boundary of the existing basin will be adjoined by the future Sand Creek Road that will extend west from the planned Sand Creek Road/Highway 4 Bypass interchange in Brentwood. The City of Antioch General Plan (2003) has identified this area as the Sand Creek Focus Area which extends from the Sand Creek Road/Highway 4 Bypass interchange west to Black Diamond Mines. This area is

intended to function as a large-scale planned community that will include a mix of housing, business park, golf course, and open space.

1.1.5 Site Conditions following Basin Expansion

The basin will be expanded to approximately 62.5 acres and will contain a low-velocity sinuous channel. Flows that are less than the 2-year peak flow of 130 cfs would pass through the basin without detention, but flows exceeding the 2-year peak flow would be detained by an orifice at the primary spillway outlet for downstream flood control. This outflow reduction during high flows is attained by building the enlarged basin with an outlet structure that would have a maximum flow capacity of 130 cfs.

Historically, Upper Sand Creek was an ephemeral stream, carrying water immediately following rainfall events, then drying quickly (Jones and Stokes 2006). With the addition of residential and other development north of the basin, the creek downstream of the basin outfall pipes now sustains low flows of urban runoff all year. In addition, the project site has sparse riparian vegetation as compared to adjacent areas up and downstream. This lack of riparian vegetation is likely a result of farming and grazing practices, which have degraded the quality of the habitat and reduced its ecological function. Riparian and wetland plantings proposed under this Plan will improve ecological connectivity between upstream and downstream areas of the project site.

As discussed above, the project would reconstruct 3,642 linear feet of stream channel within the basin; this channel would fill and begin to flood the primary floodplain (see Figure 4a for general topography and project layout) at approximately 46 cfs, or at a 1.3-year recurrence frequency. The areas closest to the basin outlet structure would become inundated more frequently than those areas closer to the inlet structure (upstream), but the entire primary floodplain would be inundated at approximately 72 cfs, or at a recurrence frequency of approximately 1.6 years. This projected period of inundation will result in suitable areas for wetland hydrology along the entire primary floodplain of the reconstructed creek; ranging from relatively perennial wetlands at the outlet structure to seasonal wetlands at the inlet structure. Although this will differ from the historical wetland and riparian communities that occurred in this region which tended to be ephemeral and rapidly transfer water through the system, it should be noted that the primary purpose of the USCB is to retain seasonal flood flows with a recurrence of 1.3 to 1.6 years (ENTRIX 2010, Cardno ENTRIX 2011).

The proposed project would compensate for impacts to wetland, riparian, and channel losses by enhancement, reconstructing, and/or restoring those features on site. As described in detail in section 1.4.2 and Table 1, the enhanced and restored wetlands and creek channel will provide increased functions and values over the current degraded habitat of the existing wetlands and creek channel. In combination they would provide increased flood storage, reduce bank erosion, filter water more effectively and provide enhanced downstream water quality benefits, allow for sediment settling to reduce downstream turbidity, dissipate the effects of downstream flooding, and provide a net increase in enhanced habitat to a variety of plant and wildlife species. In addition, the newly created and restored wetlands and creek channel are anticipated to vastly improve the habitat functions and values of this part of Sand Creek over those that currently exist. This would occur through increasing the biological productivity of the habitat via enhanced biogeochemical cycling, a decrease in disturbance from cattle grazing and human use, and an increased diversity of native plant species throughout the Restoration Area. The project would

also greatly reduce and manage the percent cover of non-native invasive species, exclude trash and cattle from the Restoration Area, and increase the vegetative and wildlife complexity of the system.

Initial efforts will include excavation, topsoil salvage and storage, re-contouring, planting, and weed control. As the Restoration Area develops, patches of willows are expected to expand on the floodplain and wetland, and transitional vegetation will expand in open areas. Some willow species will remain dense and shrubby and others will become trees and provide perching habitat to larger bird species. This habitat complexity in vegetation will provide variety in wildlife habitat and will serve many different wildlife species and habitat needs.

Although ground water is close to the elevation of the planned floodplain, and is expected to saturate floodplain soils for periods of time in the spring, the hydrology of the basin will be substantially changed from current conditions. A hydrologic model was applied to this system to determine average and typical flow volumes and assess annual flooding and the potential for this flooding to develop seasonal wetlands. Based on this analysis, it was determined that surface flow would flood the basin floodplain between 5 and 7 days a year. Therefore, in order to support seasonal wetlands, the basin's floodplain topography will be designed to retain floodwaters in floodplain depressions (referred to as troughs) that would retain water for a sufficient amount of time such that seasonal wetland hydrology and soils would develop (Cardno ENTRIX 2011). The term "trough" is used in this case so as not to be confused or interchanged with the term "pool or depression" that could be confused with the creation of vernal pool habitat.

A total of seven troughs will be created within the floodplain to support development of seasonal wetlands (Figures 6 and 8, Conceptual Cross Section; Appendix A). These troughs will capture winter flows and allow the water to slowly percolate, creating conditions necessary for seasonal wetland vegetation to establish and for the development of wetland soils and hydrology. These troughs will be constructed of naturally occurring soils without special treatment (other than the potential addition of bentonite). Flood water will flow from Trough 2 to Trough 4 to Trough 6. Likewise, flood water will flow from Trough 1 to Trough 3 to Trough 5. Initially, excavation will be deeper at Basin 6 to accommodate 12 to 16 inches of topsoil over 6 inches of amended (e.g. with bentonite) and compacted soils to obtain a maximum permeability of 0.00425 inch per hour. It will be the responsibility of the restoration contractor to procure soil testing and determine the degree of bentonite and soil compaction necessary to reach this maximum permeability in Trough 6.

This treatment is planned for Trough 6 to hold water after each flood event and thereby force water from Trough 4 and Trough 2 to back up and increase the duration of saturated soils. This approach will create a gradient of saturation duration and a comparable gradient in wetland conditions, contributing to habitat diversity and complexity. None of the other basins are proposed for soil treatment. However, the flood waters of Trough 1 and 3 will flow into Trough 5, creating a similar gradient in those basins. Trough 7 is further downstream and topographically lower, and will therefore be more greatly influenced by subsurface flow. Following construction, the site soils will be stabilized by a variety of Best Management Practices (BMPs) such as reseeding the slopes, planting, and placement of erosion control devices (e.g. straw wattles) on slopes to prevent erosion.

1.2 Project Construction Schedule

In general, construction will be performed up to 6 days per week, 12 hours per day. Based on this work schedule, the duration of the construction phase would take approximately 5 months beginning in the second quarter of 2013 and finishing in the fourth quarter of 2013.

1.3 Regulatory Requirements

1.3.1 Habitat Conservation Plan/Natural Community Conservation Plan

The HCP/NCCP provides comprehensive species, wetlands, and ecosystem conservation and contributes to the recovery of endangered species in east Contra Costa County. The HCP/NCCP has obtained authorization for take of covered species under the Federal Endangered Species Act (FESA) and California Endangered Species Act (CESA) for the reasonable expansion of urban development and specific rural infrastructure projects outside these urban boundaries that will support anticipated urban growth. The HCP/NCCP inventory area is located in the eastern portion of Contra Costa County. The inventory area is identified as the area in which impacts are evaluated and conservation activities will occur. Covered species are those species fully addressed in the HCP/NCCP and are included in the ESA and NCCP incidental take permits by evaluating and complying with avoidance and minimization requirements at a regional scale. In addition, the HCP/NCCP covers "no-take" species, which are species for which take is not authorized under the Natural Community Conservation Plan Act (NCCPA). In order to comply with the terms of the HCP/NCCP, the applicant must avoid all direct and indirect impacts on no-take species.

The project will be required to obtain coverage under the HCP/NCCP for impacts to covered species and their habitat, and therefore, this Plan also fulfills mitigation requirements for on-site restoration. The HCP/NCCP guidelines for mitigation of wetlands require a 1:1 ratio for stream and perennial wetland loss and a 2:1 ratio for seasonal wetlands.

On-site restoration is proposed to maintain habitat continuity with other sections of Sand Creek. Off-site mitigation through the East Contra Costa County Habitat Conservancy is not an option at this time, but the Conservancy has indicated support for on-site mitigation for this project.

1.3.2 Clean Water Act of 1977, Section 404

This section of the Clean Water Act (33 USC 1251 et seq., 33 CFR §§320 and 323) gives the USACE the authority to regulate discharges of dredge or fill material into waters of the U.S., including wetlands. Approximately 3,934 feet (0.70 acre) of Sand Creek will be impacted; 3,642 feet of the channel (0.67 acre) will be re-created with 292 linear feet of channel permanently lost but no net loss of stream acreage due to the wider width of the restored channel. In addition, 0.03 acre of federal jurisdictional wetlands will be impacted; 0.02 acre perennial wetlands within Sand Creek and 0.01 acre seasonal wetland just above the inlet structure to the existing basin (Table 1, Figure 5). Therefore, a Section 404 permit from the USACE will be necessary for the project.

The USACE has issued a Regional General Permit (RGP 1) that provides a simplified and expeditious means to authorize activities in waters of the U.S., including wetlands that are substantially similar in nature and cause only minimal individual and cumulative impacts, within the area covered by the HCP/NCCP. The RGP applies only to HCP/NCCP-covered activities; the

project is a covered activity as described in Section 2.3.2 and identified in Table 2-5 of the HCP/NCCP. The RGP states that the loss of waters of the U.S. (including wetlands) may not exceed 1.5 acres or 300 linear feet of waters of the U.S.

1.3.3 Clean Water Act of 1977, Section 401

This section of the Clean Water Act requires a state-issued Water Quality Certification for all projects regulated under Section 404. In California, the Regional Water Quality Control Boards (RWQCB) issue Water Quality Certifications with jurisdiction over the study area. In addition to the federal jurisdictional features that will be impacted, another 2.70 acres of state jurisdictional features that occur in the existing basin will be impacted; 0.45 acre perennial and 2.17 acres seasonal wetlands within the existing basin created in uplands (and 0.08 acre for associated drainage culverts). Therefore, a Section 401 Water Quality Certification from the Central Valley RWQCB will be obtained.

1.3.4 Clean Water Act of 1977, Section 402

The National Pollutant Discharge Elimination System (NPDES) regulates point sources of pollution that enter waterways. A NPDES permit will be required for this project to address point source pollution, if this project is not already covered under an existing general permit. If necessary, an NPDES permit application will be submitted to the RWQCB. It will include a description of the wastes to be discharged, the setting for the discharge, and the method of treatment or containment. The permit process includes public notice of the draft permit and a hearing.

1.3.5 Fish and Game Code of California

Section 1600 of the California Fish and Game Code requires a Streambed Alteration Agreement (SAA) for any activity that may alter the bed and/or bank of a stream, river, or channel. Typical activities that require a SAA include excavation or fill placed within a channel, vegetation clearing, structures for diversion of water, installation of culverts and bridge supports, cofferdams for construction dewatering, and bank reinforcement. The project will reconstruct Sand Creek and will remove 0.73 acre of riparian woodland/scrub habitat. Therefore a SAA from the California Department of Fish and Game (CDFG) will be obtained.

1.3.6 California Environmental Quality Act (CEQA)

The California Environmental Quality Act (CEQA) of 1970 requires public agencies to evaluate the environmental implications of their actions and to prevent environmental effects by avoiding or reducing significant impacts of their decisions, where feasible. A Mitigated Negative Declaration was distributed for circulation on September 13, 2010 and was approved by the Contra Costa County Board of Supervisors on November 2, 2010. The approved CEQA document will be provided to the RWQCB and CDFG with the permit applications.

1.4 Goals and Objectives of the Plan

The goals of the restoration and enhancement are (1) to establish a functional hydraulic regime that will support native wetland and riparian vegetation along the reconstructed banks of Sand Creek, (2) to reduce erosion potential and corresponding sediment impacts, (3) to increase in-stream structure and habitat complexity to enhance habitat for wildlife, (4) restore seasonal and

perennial wetlands that have increased ecological functions and values compared to the existing wetlands, and (5) to establish hydrological conditions in the reconstructed stream similar to conditions in the channel downstream of the project site before construction. This Plan contains the necessary procedures for establishment of self-sustaining native vegetation that is appropriate to the site. These objectives are discussed in detail below and in section 3.1.2, Success Criteria.

1.4.1 Type(s) of Habitat to be Restored

The objective of this Plan is to reconstruct at least 0.47 acre of perennial wetlands, 4.36 acres of seasonal wetlands, 0.73 acre of riparian habitat, and 0.67 acre of open water stream channel, and enhance the Sand Creek channel such that it supports a suite of native plants (Table 3) and that also exhibits enhanced functions for wildlife and water quality. This project will include floodplain enhancements to allow for seasonal flooding, downstream sediment control, vegetation to stabilize the banks and provide shade over the channel, removal of non-native invasive species, maintenance of adjacent upland habitat, and removal of cattle and associated impacts (trampling, grazing, fecal contamination, etc.) from the creek. The HCP/NCCP guidelines for mitigation of wetlands are different for permanent wetlands (1 acre restored for each acre lost) than for seasonal wetlands (2 acres restored for each acre lost).

Table 3 Restoration Area Habitat Types and Species

Habitat Type Map Designator (Figure 6)	Species Mix	Acres by Habitat Type				
		Perennial	Seasonal	Riparian	Open Water	Total
A	Wetland seed mix: Creeping wildrye (*Leymus triticoides*), creek clover (*Trifolium obtusiflorum*), meadow barley, Baltic rush (*Juncus balticus*), deer sedge (*Carex praegracilis*), water cress (*Nasturtium officinale*), yellow monkeyflower *(Mimulus guttatus)*	1.02	5.20			6.22
B	Riparian woodland/scrub: cuttings: Red willow, arroyo willow *(Salix lasiolepis),* black wlllow (*Salix gooddingii*)			1.16		1.16
C	Open Water				0.70	0.70
	Total	**1.02[1]**	**5.20[1]**	**1.16[1]**	**0.70**	**8.08**

[1]Perennial wetlands, seasonal wetlands, and riparian are in excess of mitigation requirements and excess will account for areas that fail to meet performance criteria during implementation.

USACE-jurisdictional wetlands impacted by the project will be mitigated for with one replacement acre for each acre temporarily impacted and two replacement acres for each acre permanently impacted. See the Introduction section and Table 1 for details regarding the number of acres that will be removed and restored on site. This goal will meet all State and Federal wetlands mitigation requirements of the project.

1.4.2 Functions and Values of Habitat to be Restored

1.4.2.1 Hydrologic Functions

Hydrologic functions will be restored through excavation and re-contouring of the basin and the creation of a new low-flow channel and floodplain. Establishment of consistent annual flooding and a stable channel will allow for introduction of a suite of native plant species as shown on Figure 6 and set forth in Table 3. A study of the anticipated frequency and duration was conducted using existing information about flow and project plans. Based on this analysis, the entire floodplain would be flooded approximately 5 to 6 days per year (Cardno ENTRIX 2011). Due to the relatively level nature of the project, erosion or degradation of the bed is not anticipated. Reduction in sediment runoff from adjacent areas will be addressed by hydroseeding and stabilizing those adjacent areas.

1.4.2.2 Biogeochemical Functions

The current basin exhibits very limited biogeochemical function (transformation for nutrients, organic compounds, and metals) due to scattered wetland vegetation, impacts from cattle grazing, and a fragmented riparian zone. The restored basin would support more native vegetation and a perennial flow and would exhibit higher levels of biogeochemical function due to larger wetted area from the new outfall location to the former outfall location and establishment of a flooding regime. No amendments are planned for use at the Restoration Area because they would be likely to be more beneficial to non-native invasive plant species than desirable species that are planted for this restoration. Subsoil composition will be changed through addition of compactable material in Trough 6 to facilitate longer periods of saturation with a gradient of wetland conditions between basins as described in Section 1.1.5. In addition, mycorrhizal inoculum will be added to the hydromulch at the manufacturer's recommended rate to improve growth and survival of desirable plants.

1.4.2.3 Functions Related to Water Quality

The expansion of the basin will increase the flood capture capacity and greatly increase the amount of wetlands and aquatic habitat within the project site. It would also incorporate a state of the art trash removal system to prevent trash from surrounding developed areas from entering Sand Creek and being transported downstream to Marsh Creek as it does currently. By intercepting urban runoff and capturing flood flows, the water quality functions of the basin as a whole would be greatly expanded and would include enhanced removal and/or retention of inorganic nutrients and trash, increased processing of organic wastes, and a reduction of suspended sediments being transported downstream.

1.4.2.4 Functions Related to Habitat

Habitat quality of this section of Sand Creek is poor to moderate depending on location (e.g., above vs. below the man-made drainage channel carrying urban runoff), but in general, habitat functions are limited due to cattle grazing, human disturbances, low water flow, high turbidity, relatively high water temperatures, and minimal emergent or aquatic vegetation that is required by many sensitive aquatic species (Nomad Ecology 2010b). The primary focus of this project's habitat restoration will be establishment of self-sustaining open water, wetland, and riparian habitat typical of this region of east Contra Costa County. The relocation of the man-made

drainage channel to the lower portion of the project area would continue to provide perennial flows to the majority of the site and approximately double the perennial aquatic habitat of the site due to the proposed geomorphic design. In addition, seasonal and perennial wetlands would provide habitat for native species. These habitats would be expected to support special-status aquatic and terrestrial invertebrates and vertebrates (e.g. California red-legged frog), as well as numerous avian species including raptors (e.g., Swainson's hawk), and riparian species such as tri-colored blackbirds. Removal of invasive terrestrial vegetation and use and establishment of a slope stabilizing seed mix (Table 3; Figure 6, Area "D") will enhance the overall habitat value of the area by providing grassland habitat suitable for upland species such as the burrowing owl.

Chapter 2

Restoration Implementation

2.1 Rationale for Expecting Implementation Success

This project involves reconstruction of a new low-flow channel and floodplain, and the establishment of a stable perennial stream channel and seasonal flooding regime of specific off-channels wetlands. Wetland plantings and seeds were selected based on their presence in the project area and likelihood of success. Riparian vegetation (willows) will be planted along the selected outside curves in the sinuous channel to increase channel stability and enhance the habitat. In addition, the project includes a monitoring and maintenance plan to address any unanticipated problems including drought, low survivorship of plantings, and invasive non-native species.

2.2 Implementation Schedule

Project construction is scheduled to be implemented in Spring 2013 with planting to begin as soon as basin construction work is completed in the fall of the construction year. Weed control and other maintenance will continue for at least five (5) years or when all success criteria are met, whichever is later (Table 4).

Table 4 Implementation Schedule

Task	Timing
Remove topsoil and store off-site	Spring 2013 (prior to initiation of grading)
Final grading and placement of erosion control	Fall 2013
Site seeding	November 2013
Wetland and riparian planting	November 2013 to February 2014
Monitoring and maintenance	November 2013 to November 2018

2.3 Responsible Parties

The Contra Costa County Flood Control and Water Conservation District (Flood Control District) (applicant) will be the responsible party.

2.4 Personnel

This Plan refers to several stakeholders for this project. They include:

- *Flood Control District:* The Flood Control District is the lead agency for the project and the primary point of contact for all aspects of the project. In addition, Flood Control District staff or its contractors will provide much of the routine maintenance labor, such as removal of non-native invasive species. The Flood Control District will be Resource Managers for long-term management.
- *Restoration Biologist:* The Restoration Biologist is a component of the consulting team to the Flood Control District and will monitor, provide recommendations, and report on the

status/success of the program, as required by various resource agencies and as described in the following sections.

- *Restoration Contractor:* The Restoration Contractor is responsible for making sure that work on the Restoration Area is completed as detailed in project plans and specifications. The Restoration Contractor is also responsible for installation of plants and compliance with the Storm Water Pollution Prevention Plan (SWPPP), and Erosion Control Plan as shown on project plans.

2.5 Site Preparation

Site preparation will be supervised by a qualified Restoration Biologist, knowledgeable in stream and wetland restoration. Site preparation will consist of topsoil salvage, excavation and fine grading necessary to re-contour the Restoration Area, and establishment of elevations that include areas of low-, mid-, and high-flooding regimes (from perennial inundation to 1.6 year recurrence) (Appendix A).

Typical heavy construction equipment will be used, which may include but is not limited to, excavators, tractors, bulldozers, cranes, and dump trucks. Environmental Sensitive Area (ESA) construction fencing will be installed at the upstream and downstream ends of the construction area to prevent encroachment into areas that are not part of this project. Soil removed from the excavation will be used to construct the earthen dam on the northeast side of the basin to impound flood waters from major storm events. Remaining soil will be hauled off-site or placed on adjacent parcel(s) for future use by interested parties (contingent on HCP/NCCP approval).

Topsoil from the project site is degraded by the presence of non-native invasive species and past grazing activities, but has some of the essential components that will be necessary for the creation of wetlands on site. Prior to site grading, topsoil will be salvaged from previously existing wetland and upland areas and stored on site or on adjacent parcels for the duration of construction. Topsoil will be replaced over the wetland mitigation area prior to site seeding.

2.6 Surface Stabilization and Sediment Control

Erosion and sediment control is an integral part of the project, and both permanent and temporary Best Management Practices (BMPs) will be the responsibility of the construction contractor. Temporary erosion and sediment control BMPs required by the project's SWPPP will be used for initial stabilization, while permanent erosion control in the form of vegetation will be established in all areas disturbed by construction that will not be paved or covered with structures. Sediment control is required where water from project activities will drain into sensitive areas or areas with existing vegetation. As mentioned above, a SWPPP will be prepared to address specific concerns regarding soil stabilization and runoff from the project site. A dewatering plan will also be prepared and approved by the Flood Control District and CDFG for the SAA.

2.7 Planting Plan

Project planting will occur in two phases: seeding and planting. Except as described in this section, no soil amendments are included in this Plan because soil amendments often favor invasive non-native species which require more nutrient-rich environments. Following final site grading and preparation, seasonal and perennial wetland and riparian areas will be seeded with a

native seed mix, and select areas will be planted with willow cuttings (Tables 5 and 6; Figure 6, Areas "A" and "B").

Table 5 Wetland Species Seed Mix

Common Name (*Scientific Name*)	Bulk lb/acre
Creeping wildrye *(Leymus triticoides)*[1]	10
Creek clover *(Trifolium obtusiflorum)*	10
Meadow barley *(Hordeum brachyantherum)*[1]	9
Baltic rush *(Juncus balticus)*[1]	2
Deer sedge *(Carex praegracilis)*	1
Water cress *(Nasturtium officinale)* (formerly *Rorippa nasturtium aquaticum*)[1]	1
Yellow monkeyflower (*Mimulus guttatus*)	0.1
Total	**33.1**

[1]Occurs on site

Riparian woodland/scrub species (willow cuttings) will be planted along the edges of the newly designed low-flow channel as well as outside the channel curves (Table 6; Figure 6, Area "B"). Willow cuttings will be obtained from the Sand and Marsh Creeks drainages, including from plants salvaged from the existing basin. If material from these locations is not available, cuttings will be collected or propagated from the next nearest available source. Installation will be planned for cooler, moister months (November through February). This will lessen stress to newly establishing plants. However, timing of planting will be adjusted as necessary to accommodate project schedules and natural storm events.

Table 6 Riparian Woodland/Scrub Species

Common Name (Scientific Name)	Number of Cuttings
Red willow (*Salix laevigata*) [1]	1,198
Arroyo willow (*Salix lasiolepis*)	1,198
Black willow (*Salix gooddingii*)	109

[1]Occurs on site

Along the edges of the channel and in the troughs, a mixture of herbaceous species including rushes and grasses were selected to provide complex vegetative structure in combination with the willow patches. Plant species and locations were selected to maximize likelihood of success and to enhance wildlife habitat diversity and provide shade for the aquatic environment.

The upland areas of the basin will also be seeded with a native grass and forbs mix (Table 7; Figure 6, Area "D") that are expected to establish well and provide surface soil stabilization. The mix will be applied with a slurry paper or wood mulch at the manufacturer's suggested rate.

Table 7 Upland Species Seed Mix

Common Name (*Botanical Name*)	lb PLS/acre
Blue wildrye (*Elymus glaucus* ssp.)	7
California brome (*Bromus carinatus*)	7
Small fescue (*Vulpia microstachys*)	8
Purple needlegrass (*Nassella pulchra*, *deawned*)	6
Common fiddleneck (*Amsinckia menziesii* var. *intermedia*)	3
California poppy (*Eschscholzia californica*)	2
Total	**33**

Characteristics of individual species in each mix were considered in selection based on known presence in the area, water availability requirements, slope, and aspect. Species that occur on site were preferentially selected because they are known to do well with existing site conditions and are considered most likely to succeed. If seed specie(s) are not available at the time of seed application or if the Restoration Biologist determines more appropriate seed species, the Restoration Biologist may make substitutions with other native seed specie(s) upon approval by the Flood Control District.

2.8 Herbivore Protection

The site is currently grazed by cattle. Prior to planting or hydroseeding, a fence to exclude cattle will be constructed upslope of the Restoration Area, as shown in Figure 6. The fence will be 5-strand barbed wire or equivalent to allow wildlife passage but prevent cattle from entering the Restoration Area. Gates in the fence will be installed at access points. Other herbivorous species (e.g. rabbits, deer, raccoons, ground squirrels) are not anticipated to be a problem to establishing vegetation given the anticipated rapid growth rate of desirable species and the extent of naturally occurring vegetation in the project vicinity. If herbivorous species become a problem during the establishment period, steps will be taken to reduce or control herbivores such as constructing additional fencing or caging.

2.9 Irrigation

Long-term irrigation will not be necessary to support vegetation for the proposed project because selected plant species are expected to be well-adapted to the project site and hydrological conditions. In addition, with the presence of continual water flow from the urban runoff and runoff from upland slopes, willows and other vegetation planted near the channel will receive subsurface moisture all year. However, to ensure plantings survive the establishment period, water may be supplied in the initial 1 to 2 years by pumping water from the local drainage channel or using a water truck to apply water on created wetlands.

2.10 Maintenance During the 5-Year Monitoring Period

The purpose of this Plan is to ensure restoration success. Maintenance of the habitat Restoration Area will be conducted over the monitoring period as described below, and additional basin maintenance will be as described in the Operation and Maintenance Manual prepared by the Flood Control District. As the weed eradication and plant installation is completed, the

Restoration Biologist will schedule a meeting with key members of the Restoration Contractor in order to identify proper maintenance procedures. The following tasks will be performed as general habitat restoration maintenance duties:

1. **Plant Replacement**: Dead or damaged plants will be replaced during the first year as necessary to ensure compliance with the success criteria. The Restoration Biologist will determine when replanting or reseeding is necessary and what species should be used.

2. **Non-native Invasive Species Removal:** Removal of non-native invasive species (weeds) will be conducted monthly during the first six (6) months and then every other month for the remainder of the first year of project completion, when determined necessary by monitoring activities. Weed control will be conducted at least quarterly during years two (2) through five (5), or as necessary and as directed by the Restoration Biologist. Because the habitat will support a predominance of species that are not commonly recognized by contractors, training will be provided to the Flood Control District maintenance staff and/or its contractors to ensure that target species are not inadvertently removed during weeding. Additional measures may be taken to control wildlife pests if they impact desired vegetation establishment as determined by the Restoration Biologist.

3. **Pruning and Staking**: None of the proposed plantings will require pruning or staking.

4. **Debris Removal**: Trash removal will be conducted during weeding and other maintenance visits.

2.10.1 Replacement Plants

Because the Restoration Area will occur in soils 2-10 feet below current grade, survivorship of the plantings is difficult to predict. For this reason, a diverse planting palette is provided in this Plan (e.g. spreading grasses and herbs). If survival and/or cover have not met minimum criteria by the third year, replacement plants will be installed, or other action will be taken to improve survivorship. Replacement plants may not be the same species that perished. Rather, the Restoration Biologist will determine which species are best suited at the locations needed, based on experience and observations in other parts of the Project site. Replacement plants are not limited to the existing plant palette, but will be native species that occur in the project vicinity. Replacement plants will be approved by the Flood Control District.

2.10.2 Removal of Non-Native Invasive Species

Following seeding and planting, any non-native invasive species as defined below that establish in the Restoration Area will be removed. The Restoration Area will be maintained relatively free of invasive species for the entire 5-year monitoring period. All perennial non-native invasive species will be pulled or dug out to remove the roots under the direction of the Restoration Biologist. This may require heavy equipment such as graders or backhoes, if the invasive vegetation to be removed is mature. For the purposes of this Plan, non-native invasive species are defined as species that may invade native habitats and inhibit or preclude the establishment of native plants in that area. Removal will focus on plants rated as a high threat by the California Invasive Plant Council (CalIPC), species being actively controlled by the Alameda/Contra Costa Weed Management Area, and other species identified as problematic by the Restoration

Biologist. Common and widespread non-native species, such as annual grasses, will not be targeted for removal.

A preliminary list of non-native invasive species is provided in Appendix B. This list includes non-native invasive species that currently occur at the project site or species actively managed by the Alameda/Contra Costa Weed Management Agency in Contra Costa County (Contra Costa County Agricultural Commissioner's Office 2009). Removal is not limited to the species in Appendix B, but this list will serve as a starting point for determining species for removal and will be augmented by the Restoration Biologist if other invasive species are found during monitoring.

Priority for weed removal will be placed on particularly problematic invaders of high importance (e.g., artichoke thistle [*Cynara cardunculus*]). This group includes mostly perennial species, but also includes certain annual species that can invade undisturbed native habitat (such as yellow star-thistle [*Centaurea solstitialis*]). Other lower priority removal species that are invasive, such as black mustard and milk thistle, will be removed as well.

Individual invasive exotic plants will be removed by a variety of methods, depending on the size of the problem, tools that are readily at hand, sensitivity of the site, and preference/experience of the Restoration Biologist. Preliminary methods for each species are provided in Appendix B but will be refined based on site conditions. Removal methods will include mechanical (weed whacker) or hand removal (pulling, hoeing, etc.) and treatment with approved herbicides, if necessary. However, most non-native invasive species can be removed by hand if the infestation is addressed early. For that reason, monitoring and maintenance will be conducted in a timely manner.

Generally, small infestations will be removed by hand by the Restoration Biologist during monitoring and larger infestations will be removed by Flood Control District maintenance staff or its Restoration Contractor. Herbicide use will be conducted under the direction of a Pest Control Advisor (PCA) and all restrictions on the product labeling will be strictly followed. Weeds containing material that would be expected to reestablish on site (e.g., seeds of yellow star-thistle) will be removed from the site in plastic bags and disposed of appropriately.

2.10.3 Removing and Disposing of Trash, Debris and Weeds

The site will be maintained in a generally clean and well-organized condition. Dead plants, weed clippings, and other trash and debris will be removed from the site during maintenance and monitoring activities. Other general trash deposited on-site by wind or littering will also be removed as encountered.

2.10.4 Responsible Parties

The Flood Control District will be responsible for financing and carrying out maintenance activities. The Flood Control District may assign the maintenance responsibilities to an appropriate contractor, but will retain ultimate responsibility for maintenance of the Restoration Area as further described in the Operations and Manual Plan.

Chapter 3

5-Year Monitoring and Management Plan

Monitoring will focus on characteristics of the wetland and riparian habitats. A preliminary monitoring schedule is provided in Table 8. This schedule is anticipated to capture the critical times for observations of problems and restoration success including periods of maximum growth, presence of invasive non-native species, and need for supplemental irrigation. It is anticipated that some of these monitoring visits will be combined where appropriate. In addition, timing and number of site visits may be adjusted by the Restoration Biologist as necessary and surveys would be combined as appropriate.

Table 8 Preliminary Monitoring Schedule

Task	Timing[1]
Complete a CRAM assessment	Prior to construction disturbance and at project completion
Brief survey of soil surface	Completion of fine grading
Initial inspection of planted areas	Within 1 week of completion of planting
Qualitative Monthly monitoring	Once per month for first 2 years during the growing season
Qualitative Quarterly monitoring	Once per quarter for years 3 to 5
Quantitative monitoring	September/October, years 3 to 5

[1]This schedule may be delayed one year, depending on timing of the permit process

3.1.1 Initial Monitoring Effort

Prior to any construction grading or removal of non-native invasive species, a California Rapid Assessment Method (CRAM) assessment will be conducted of the stream length that will be reconstructed. The CRAM will be scheduled for spring if possible, but if not, a post-project CRAM will be scheduled for the same time of year to ensure results are comparable. CRAM is a standardized methodology to determine wetland health that takes into consideration four attributes of the wetland environment: buffer and landscape context, hydrology, physical structure, and biotic structure. In this case, the purpose of this CRAM is to measure the pre-project wetland function to serve as a gauge against which the project success can be determined at project completion.

After fine grading of the Restoration Area is complete and prior to planting, the Restoration Biologist will conduct a brief survey of the Restoration Area to inspect the integrity of the soil surface to ensure that the site is ready for planting. In particular, the Restoration Biologist will identify areas requiring corrective action such as surface soils that are too compacted or smooth to effectively apply seed. Vegetation will be monitored within the first week following installation of the planting. The initial biological and ecological status of the Restoration Area will be established and the as-built condition will be documented. Long-term monitoring will begin following this initial assessment.

3.1.2 Success Criteria

The success of a Restoration Area is defined as the restoration of a functional ecosystem similar to or exceeding what was present prior to project construction. Success is usually measured by percent cover by target species or target vegetation types. While a fully successful restoration plan might be viewed as one that results in 100 percent cover, such results are unlikely. Natural habitats rarely exhibit 100 percent cover, but rather include a proportion of open space.

The means of determining successful restoration for this site will be through series of measurements for native cover and diversity and for non-native invasive species cover. All of these, except non-native invasive species cover, should increase over time. Cover by non-native invasive species should decrease with time, particularly because one of the primary goals of the project is to substantially reduce non-native invasive species from the site as described in Section 2.10. Native plants that establish naturally on site will not be removed and will be treated the same as native plants installed intentionally, except when removal is necessary for operations and maintenance, and such areas will be re-vegetated accordingly.

Notes regarding wildlife usage will also be collected during each visit. Based on current wildlife use of the site as well as the location of the site, it is expected that wildlife use will primarily consist of foraging by raptors and riparian species.

Quantitative data will be collected annually starting at year 3 using accepted vegetative sampling methods in order to evaluate survivorship, species cover, and species composition.

In the event that plantings should fail to meet the specified requirements, the Restoration Biologist will direct the Restoration Contractor to conduct the following remedial procedures on an as-needed basis:

1. Replacing unsuccessful plants with appropriate-sized stock and/or seed mixes to meet stated cover or survival requirements, and /or

2. Performing maintenance procedures to ensure the site conditions are appropriate (e.g., non-native invasive species removal, vector control). Remedial actions will be based on the best judgment of the Restoration Biologist.

If substantial non-compliance with the performance occurs, the Flood Control District will consult the East Contra Costa County Habitat Conservancy and USACE to determine whether corrective measures (adaptive management) and an extension of the 5-year monitoring period will be necessary. Alternately, and if feasible, the Flood Control District could purchase equivalent mitigation credits within the HCP/NCCP preserve system.

3.1.2.1 Performance Standards

Standards for perennial and ephemeral (seasonal) wetlands and riparian habitat only apply to areas seeded and planted with cuttings that are anticipated to support wetland and riparian habitats and excludes the channel. These standards were developed for the Restoration Area to determine if the site is performing as a natural plant community would under the established hydrologic regime.

First and Second Year Monitoring Goals

- an increase in percent cover of native species;
- no bare areas exceeding 5 feet in diameter;
- no more than 10 percent cover by non-native invasive plant species and a general decreasing trend of these species

Third-Year Monitoring Success Standard

- 30 percent cover of native species (<5 percent deviation allowed);
- at least 60 percent of the planted and seeded species will be represented in the Restoration Area;
- no more than 5 percent cover by non-native invasive plant species

Fourth-Year Monitoring Success Standard

- 45 percent cover of native species (<5 percent deviation allowed);
- at least 60 percent of the planted and seeded species will be represented in the Restoration Area;
- no more than 5 percent cover by non-native invasive plant species

Fifth-Year Monitoring Success Standard

- 50 percent cover of native species (<5 percent deviation allowed);
- at least 60 percent of the planted and seeded species will be represented in the Restoration Area;
- no more than 5 percent cover by non-native invasive plant species;
- meet or exceed the amount of wetlands (acres) initially planned to be restored and enhanced or purchase equivalent mitigation credits within the HCP/NCCP preserve system.

3.1.3 Monitoring Methods

Monitoring will assess the attainment of annual goals and trends toward meeting final success criteria and identify the need to implement weed control or other contingency measures in the event of failure. After the fine grading, site preparation, planting, and seeding efforts have been completed, the Restoration Area will be qualitatively monitored by the Restoration Biologist on a monthly basis for the first and second growing seasons and quarterly for the remainder of the 5-year monitoring period. Qualitative surveys, consisting of a general site walkthrough and habitat characterization, will be completed during each monitoring visit. General observations, such as the health of the planted species, pest problems, weed persistence/establishment, mortality, and drought stress, will be noted in each site walkthrough with data collection forms to ensure that appropriate data is collected (Appendix C, page C-1). The Restoration Biologist will determine remedial measures necessary to facilitate compliance with success criteria and all corrections necessitated as a result of the inspections will be put in writing ("punch-list") by the Restoration Biologist and submitted to Flood Control District. All maintenance determined at this time to be necessary will be corrected as soon as feasible by the Flood Control District staff or its contractor. Plants determined to be unacceptable at these inspections will be replaced if the minimum cover

values for native vegetation for that year have not been exceeded, or as determined necessary by the Restoration Biologist.

As mentioned above, a CRAM will be conducted of the length of restored channel during the final year of monitoring, during the same time of year as the initial pre-construction CRAM. Based on the final channel length, it is estimated that the CRAM will involve 11 assessment areas. The purpose of the final CRAM will be to determine if the wetland function of this section of Sand Creek has improved, worsened, or stayed the same, and which metrics of wetland function are drivers of that change.

3.1.3.1 Vegetation Monitoring

Qualitative vegetation monitoring will be conducted as described above. Notes on weeds, establishment of native plant species, cattle exclusion effectiveness, and other maintenance issues will be made during each monitoring visit. Quantitative vegetation monitoring will be conducted following the active growing season in the fall (September or October) of every year for years 3 to 5. Monitoring will be performed by or overseen by the Restoration Biologist. Continuity within the personnel and methodology of monitoring shall be maintained insofar as possible to ensure comparable assessments. In addition to information obtained from qualitative vegetation monitoring, quantitative vegetation monitoring will also include data from the line-intercept transect sampling method as described below (Appendix C, page C-2). Remedial measures undertaken will be referenced in the annual reports to regulatory agencies requiring monitoring reports.

3.1.3.2 Sampling Techniques

Quantitative vegetation sampling protocols for the Restoration Area are described below. Sampling is designed so that trends and cover can be estimated during the initial years (years 1 and 2) and more detailed sampling can be conducted at the time of performance assessment.

At the end of the final growing season (September or October), the Restoration Biologist will determine locations for 5 to 10 transects that will be placed across the Restoration Area. Transects will be placed at approximate regular intervals and will be perpendicular to the general direction of flow. Transect end points will be recorded using a Global Positioning System (GPS) for ease of relocating them if necessary. Sampling will consist of two parts, line-intercept sampling every 0.5 meter (1.6 feet) and a one-meter (3.3 feet) wide belt transect centered over the transect tape in which all native plants and invasive species will be tallied. Line-intercept transect sampling will measure vegetative cover, and belt transect sampling will measure density of native and non-native plants.

If transect data does not indicate that success criteria have been met, but visual observation indicates otherwise, an additional twenty (20) representative transects will be placed within the Restoration Area postulated to meet the performance criteria. This area need not cover the entire basin, but should cover sufficient area to meet mitigation requirements. Vegetation monitoring data will be recorded on standard data forms (see Appendix C).

3.1.3.3 Photo-Documentation

A minimum of five (5) permanent stations for photo-documentation of the Restoration Area will be established at locations providing an overview and, if appropriate, a near view of restoration areas. Photos will be taken during each quantitative monitoring visit from the same vantage point and in the same direction each year, and will reflect material discussed in the annual monitoring report. A subset of the photographs will be included in annual monitoring reports.

3.1.3.4 Final Success Criteria Resolution

If the project meets all success criteria at the end of the 5-year monitoring period, the habitat creation will be considered a success. If not, the maintenance and monitoring program will be extended one full year at a time and a specific set of remedial measures, approved by the applicable permitting agencies, will be implemented until the standards are met. Only those areas that fail to meet the success criteria will require additional work. This process will continue until all year 5 standards are met or until the USACE and Executive Director of the East Contra Costa County Habitat Conservancy determine that other measures are appropriate.

Final success criteria will not be considered to have been met until a minimum of 2 years after all human support (excluding routine weeding) has ceased. Should the re-vegetation effort meet all goals prior to the end of the 5-year monitoring period, the USACE and Executive Director of the East Contra Costa County Habitat Conservancy at his/her discretion, may terminate the monitoring effort. The Flood Control District recognizes that failure to meet success criteria may result in the requirement to replace that portion of failed restoration and/or pay mitigation fees to the East Contra Costa County Habitat Conservancy.

3.1.4 Annual Reports

At the end of each of the 5-year monitoring period following the “as-built” assessment, an annual report will be prepared for submittal to the Executive Director of the East Contra Costa County Habitat Conservancy and applicable regulatory agencies. These reports will assess both attainment of yearly target criteria and progress toward final success criteria. These reports will include the following:

- USACE permit/file number on cover and title page
- general project information including: project name; applicant name, address, and phone number; consultant name, address, and phone number; acres of impact and types of habitat impacted; date project construction commenced; date planting completed; indication of monitoring year, and amount and information on any required performance bond (if applicable).
- goals of the project,
- monitoring and maintenance dates with information about activities completed and personnel,
- an analysis of all quantitative and qualitative monitoring data,
- color copies of a subset of monitoring photographs,
- maps identifying monitoring areas, transects, planting zones, etc. as appropriate,

- a list of success criteria and progress towards meeting them, and
- planned remedial action for the coming monitoring period, which must address failures to meet annual performance goals.

A final report to cover the entire restoration project will be prepared when the site meets the performance criteria. The report will include data from all years including copies of all previous reports and a delineation of the reconstructed wetlands.

3.1.4.1 Schedule

As-built drawings consisting of a topographic survey of the as-built mitigation area will be submitted to the USACE within 6 weeks of completion of mitigation construction. The USACE will decide the appropriate scale of topographic survey on a case-by-case basis. Annual and final monitoring reports will be submitted by December 31 of each year to cover the preceding year in which quantitative sampling was performed.

Chapter 4

Completion of Restoration

4.1 Notification of Completion

When the initial monitoring period is complete, and if the Flood Control District believes final success criteria have been met, the USACE and Executive Director of the East Contra Costa County Habitat Conservancy will be notified by submitting a Final Monitoring Report that documents this completion. The final success monitoring will take place after the 5-year monitoring period is complete or after at least 2 years without remediation or maintenance other than removal of non-native invasive species, whichever is longer.

4.2 Agency Confirmation

Following receipt of the final report, the Flood Control District will, at the request of the USACE and/or Executive Director of the East Contra Costa County Habitat Conservancy, provide access and guidance through the project site to confirm the adequate completion of the habitat creation effort. Following the site visit if desired, USACE and/or Executive Director of the East Contra Costa County Habitat Conservancy will either confirm successful completion of mitigation or require additional years of monitoring. The Flood Control District will not be released from any mitigation obligation until written notice of completion is received from USACE and Executive Director of the East Contra Costa County Habitat Conservancy.

4.3 Contingency Plan

Should any portion of the Restoration Area fail to meet the final success criteria after the 5-year monitoring period, an alternate restoration plan will be developed to compensate for the failed areas. The alternate plan will be submitted to the USACE (if failed parts are part of USACE mitigation) and the East Contra Costa County Habitat Conservancy for approval within 90 days after submitting the Final Monitoring Report. Alternately, the Flood Control District may pay mitigation fees to the East Contra Costa County Habitat Conservancy for failure within the HCP mitigation portions of the site.

4.4 Funding Mechanism

The Flood Control District's Zone 1 (Marsh Creek) Watershed is earmarked for construction of infrastructure and associated improvements in the watershed. Zone 1 funds come from property assessment taxes and drainage area funds from development-related fees. USCB is a regional improvement in this watershed. The funding mechanism for implementing the USCB expansion is from a combination of California Department of Water Resources grant funds, Zone 1 funds, and Drainage Area 104 funds; Zone 1 funds will fund monitoring and long-term management.

4.5 Long-Term Management

The property is owned by the Contra Costa County Flood Control and Water Conservation District, a sole owner responsible for the operation and maintenance of the basin.

4.6 Management Plan

The Flood Control District will be the Resource Manager and will provide site management after completion of mitigation requirements including concurrence by the USACE and East Contra Costa County Habitat Conservancy. In general, the Restoration Area will not be accessible to the public as a chain-linked fence will be installed around the basin perimeter upon project completion. Cattle will continue to be permitted on upland areas outside the Restoration Area; a barbed-wire fence will be installed around the Restoration Area after seeding and planting have occurred to preclude cattle from entering the Restoration Area. The Operations and Maintenance manual describes other activities that are likely to occur as part the basin maintenance with consideration of the Restoration Area.

4.7 Site Protection

The Flood Control District will be responsible for the long-term protection of the USCB. USCB is a regional improvement for the Marsh Creek Watershed and therefore, will remain in perpetuity with the Flood Control District and will not be subject to future development. The regional drainage fees required for construction and maintenance of flood control infrastructure facilities in this watershed in support of future development will fund long-term management of the basin and Restoration Area.

Chapter 5

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Appendix A

USCB Frequency and Duration of Soil Saturation Assessment

Cardno ENTRIX
701 University Ave, Suite 200
Sacramento, CA 95825
916-923-1097 | Fax 916-923-6251
www.cardnoentrix.com

Draft Technical Memorandum

Date: December 7th, 2011

To: Claudia Gemberling, Carl Roner

cc: Cece Sellgren

From: Gary Palhegyi, P.E., D.WRE.
Restoration Engineering & Geomorphology

Re: **Upper Sand Creek Basin – Frequency & Duration of Soil Saturation**

This Technical Memorandum has been prepared to provide a summary of the flow frequency and wetland soil saturation results for the Upper Sand Creek Basin (USCB). The purpose for this memo is to solicit review and comment of the work completed to date, including our recommendations for modifying the Basin creek channel topography.

Cardno ENTRIX was tasked with evaluating long-term flows to the USCB, and evaluating the frequency and duration of flows such that the creek topography may be adjusted to achieve the necessary soil saturation to support seasonal wetland development.

Original Channel Dimensions & Concepts

Figure 1 below provides a sketch of the creek channel with dimensions illustrating the original channel concept. The Low Flow Channel is sized to carry the bankfull flow of 100 cfs, while the Base Flow Channel is designed to convey urban dry weather flows up to 3 cfs. The Low Flow Channel was sized according to fluvial geomorphic principals so that the channel will remain stable over time. The Base Flow Channel was designed to reduce the over-growth of perennial wetland plants, such as tule; and minimize siltation and the amount of sluggish water for vector control; and ultimately reduce the need for long-term maintenance.

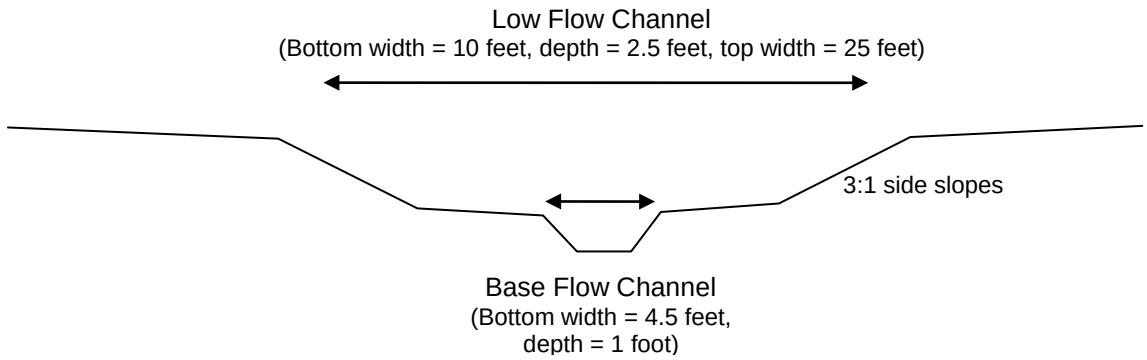


Figure 1 – Originally Proposed Channel Geometry

Sand Creek Flow Data

Cardno ENTRIX applied two sources of flow data: 1) the adjusted Marsh Creek gage data used for the geomorphic assessment, and 2) a hydrologic model of the USCB watershed.

Flow data from the USGS Marsh Creek flow gage (# 11337600, MARSH C A BRENTWOOD, CA) was used as a suitable surrogate for Sand Creek. The daily average flows were adjusted using an area ratio to convert the measured flows on Marsh Creek to those expected in Sand Creek at the basin location (i.e., Q_{Marsh} / 42.6 sq-mi * 11.3 sq-mi = $Q_{Sand)}$. Measured data exist for the periods from 1954 to 1983 and another block from 2000 to 2009.

As a second source of flow data, we applied a continuous hydrologic model developed using the HEC-HMS software. This model was originally developed by the County and adjusted by Cardno ENTRIX for this study. The Basin stage-discharge relationship was up-dated and the model was converted to the *soil moisture accounting* methodology. This model applies local rainfall data for a 34 year period of record from October 1972 to April 2007. Watershed parameters are selected to account for the expected future urban development.

Flow Frequency Analysis

Figures 2 and 3 below present flow frequency results for both flow data sets. Figure 2 shows the frequency distribution using annual peak flow data, and includes results published in the Sand Creek watershed study. Figure 3 adds a partial duration series curve and compares it to the annual series curve.

In Figure 2, the *peak hour* results from the HMS model agrees well with the Sand Creek watershed study, which were derived from the County's standard flood control methodology. The daily average flows from the HMS model also agrees well with the lower flow range of the adjusted Marsh Creek daily data, but deviates with higher flows. This should not be a problem because this analysis focuses more on the lower flow range.

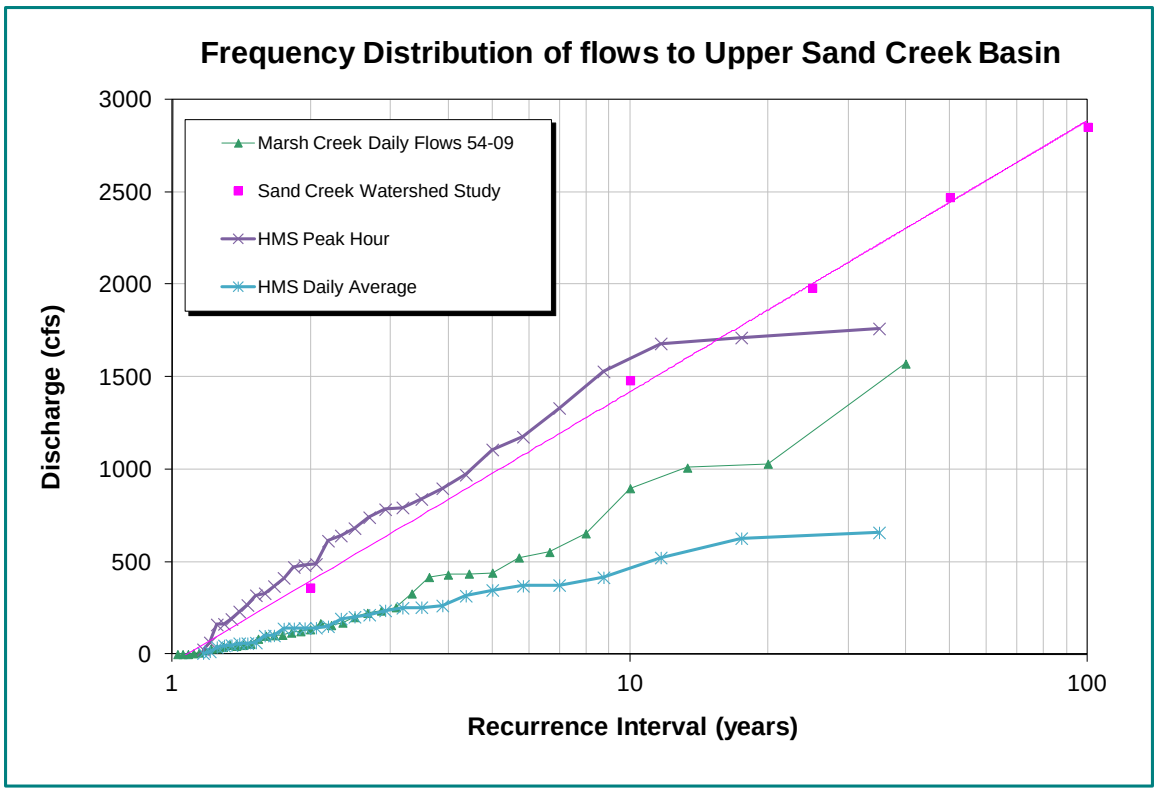


Figure 2

In Figure 3, a frequency distribution is presented using the partial duration series approach, which uses all the daily flows as opposed to just a single maximum value in each year. Although engineering hydrologist often use the annual series to estimate 1 and 2 year peak flows, the annual frequency approach is best used for recurrence intervals around the 5-year event and above; and the partial duration curve for storms below the 5-year recurrence interval. Figure 3 illustrates the deviation of the two curves below the 5-year event.

As an example, using the partial duration series, 100 cfs flow has a recurrence interval of 0.6 years, which means the flow occurs about 1.7 times per year (=1/0.6) on average.

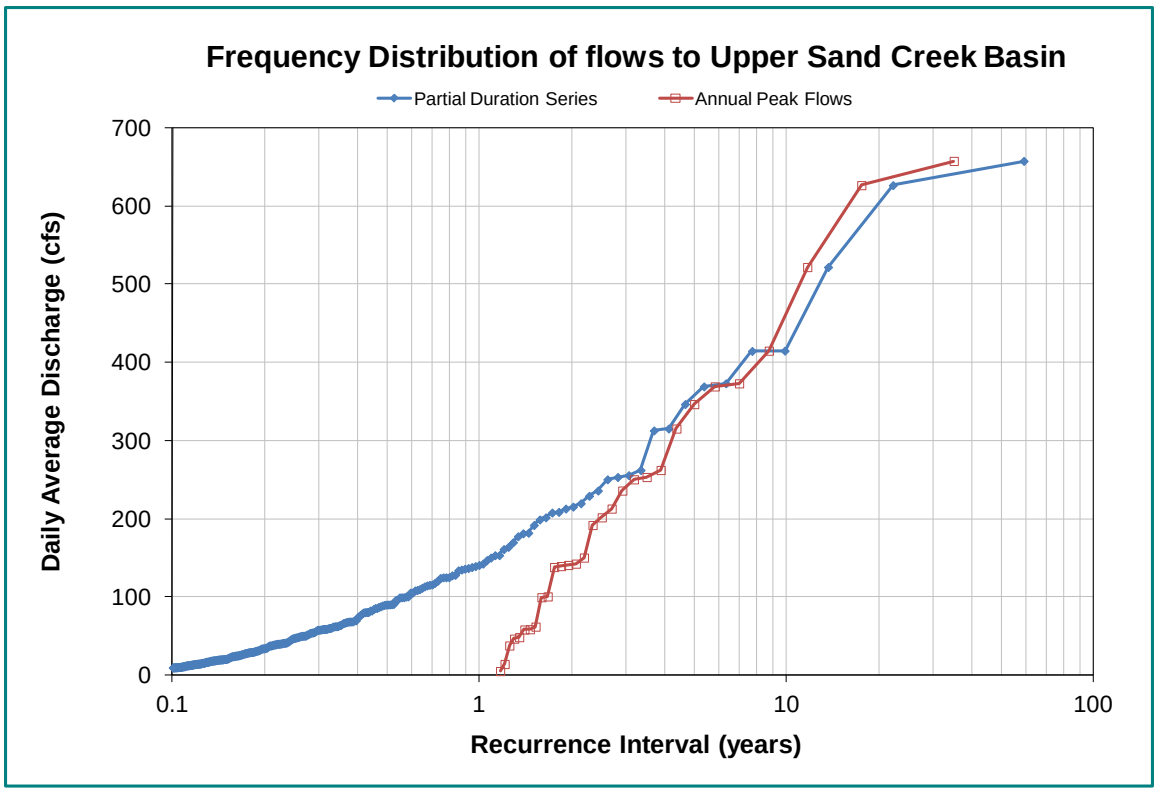


Figure 3

Flow Duration Analysis

Figure 4 presents the *flow-duration* results for our two data sets. As an example, the HMS model predicts that a 100 cfs flow or greater will occur for a duration 2.4 days.

The problem we have is that flows that occur for up to 20 days (our wetland criteria) is only around 10 cfs, a fairly small flow. Both flow data sets are in agreement with this result.

Because the water surface elevation is affected by the outlet structure we have routed the creek flows through the basin (within the HMS model). Therefore, Figure 5 presents *stage-duration* curves. The influence of the outlet structure is illustrated by the steep rise in the curves from an elevation of 157 to 171 feet MSL. The outlet culvert and creek bed invert elevation is 157 feet and the lower ball field begins around 171 feet. The results reveal that the stage (or desired elevation) is only a few inches above the creek bed (and above base flows).

Figure 6 presents a sketch illustrating the results in a manner more specific to our goal of defining the surface elevations to create the desired seasonal wetlands. According to the results, flows reach or exceed 6 inches in depth for 9 days per year, on average; flows reach or exceed 2 feet deep for about 6 days per year.

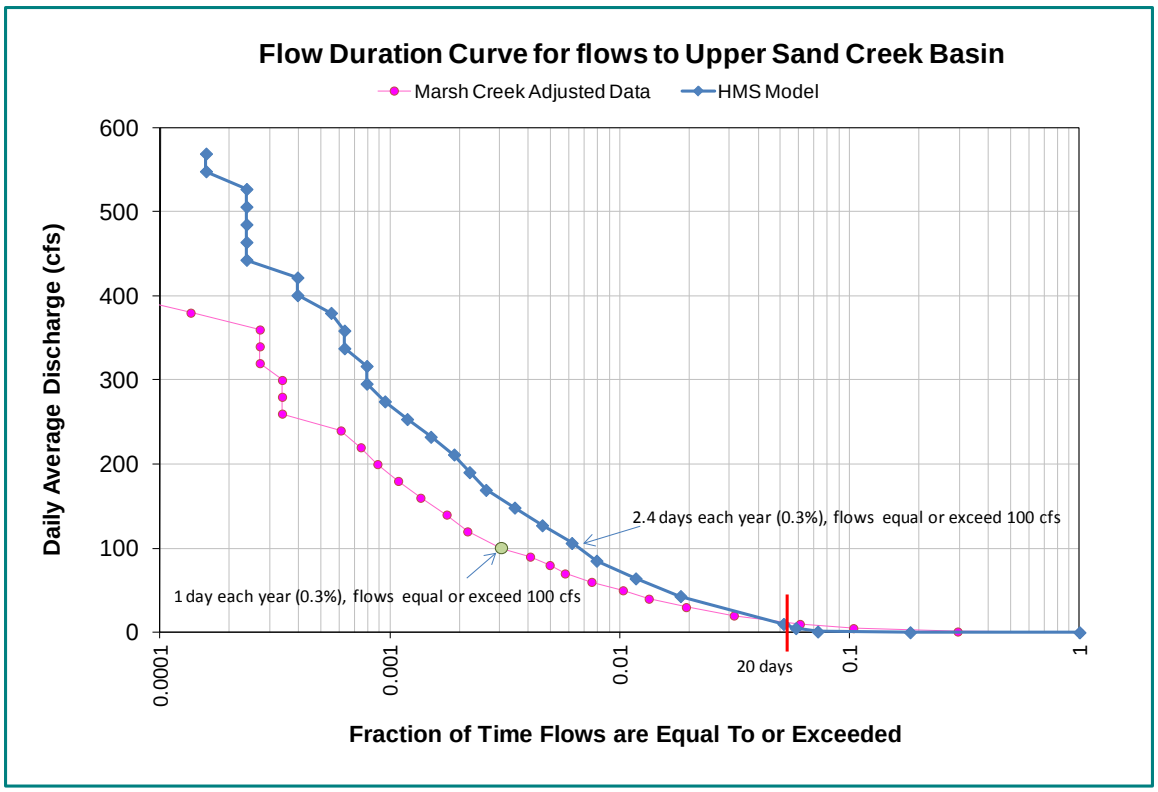


Figure 4

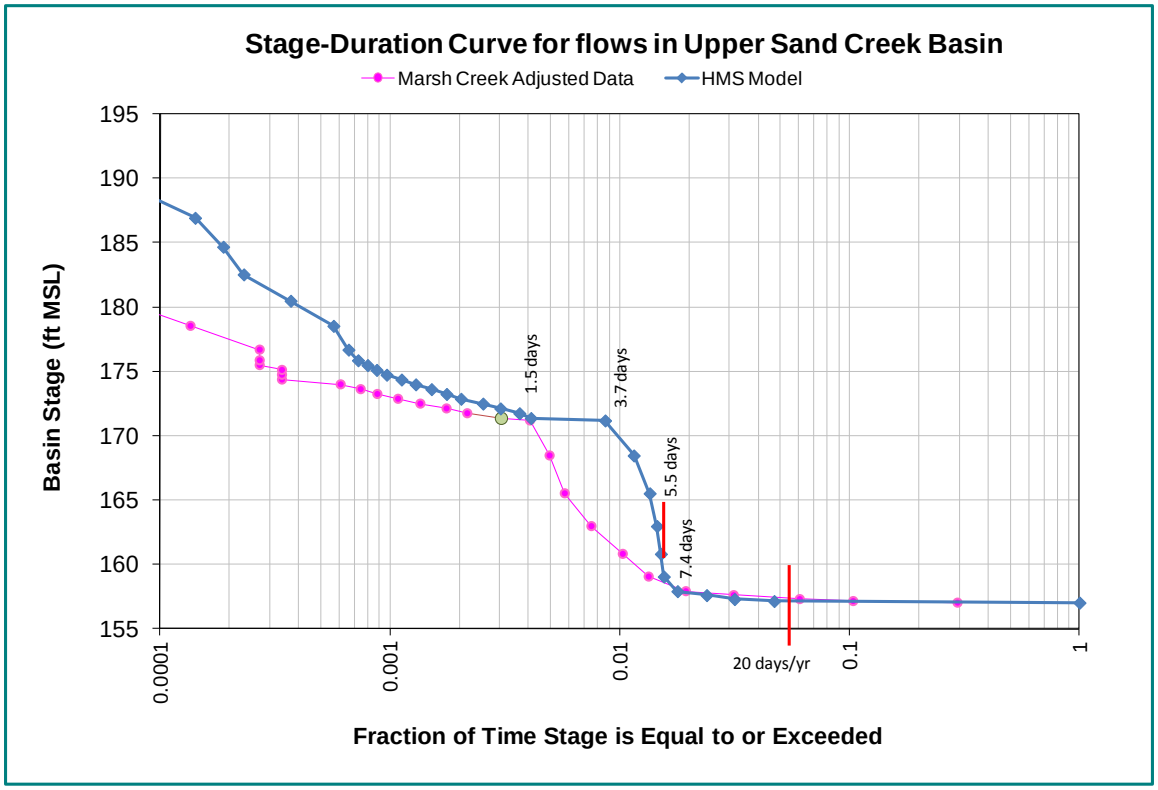


Figure 5

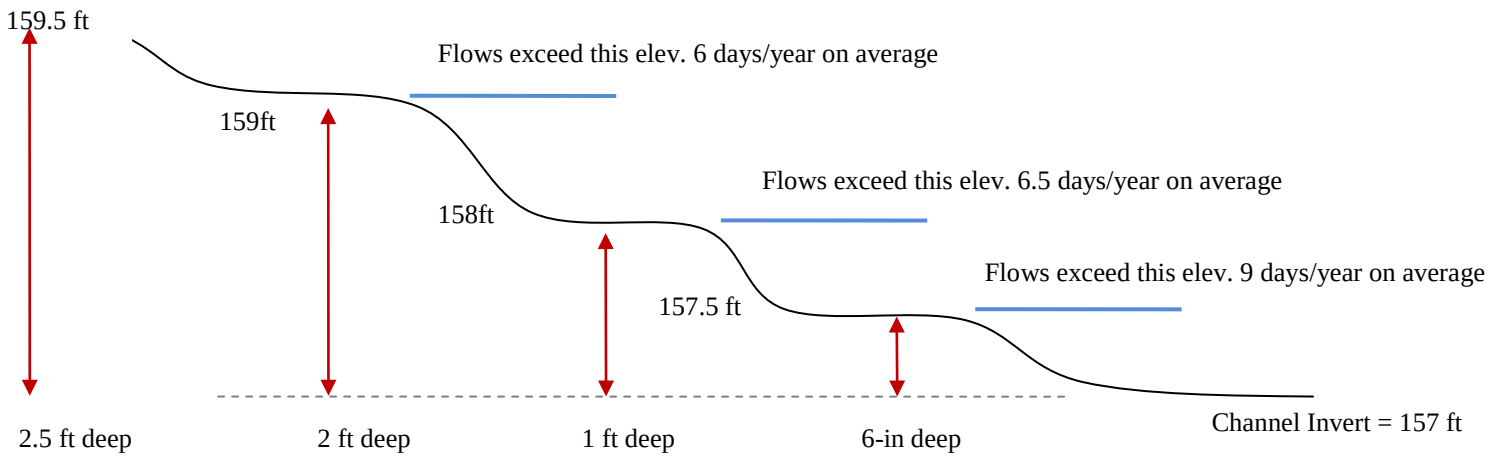


Figure 6 - Flood Frequency Duration Results (HMS Model)

Summary of Flow Frequency Results

Table 2 provides a summary of the Stage-Discharge-Frequency-Duration results using the HMS modeled flows and stages. These results focus on the lower flows of interest to wetland development. These results begin with the lowest flow producing our targeted 20 days duration up to and including the annual peak flow. These results indicate that we have from 5 to 7 days of flows that produce a water surface elevation suitable for flooding seasonal wetland. Therefore, in order to support seasonal wetlands, the Basin topography will need to be modified to retain flood waters in floodplain depressions rather than allowing it to drain back into the creek channel.

Table 2. Summary of Stage-Discharge-Frequency-Duration Results

Stage (feet)	**Discharge (cfs)**	**Frequency (no. times per year)** (a)	**Duration of Inundation (days per year)** (b)	**Notes**
157.2	10	10	**20**	Target duration
157.5	18	7.7	8.7	
158	34	5.0	6.5	
159	41	4.3	5.7	
160	46	4.1	5.6	
162	56	3.4	5.4	
164	64	2.9	5.2	
171.3	**100**	1.7	2.3	Low flow channel discharge
172.2	143	**1.0**	1.0	Annual peak flow

a) Based on Partial Duration Series
b) Duration is the length of time (cumulatively) where flow equals or exceeds the flow of interest. The number of days per year is an "average" condition over the 34 year flow record. One year may have more or less days of inundation.

Recommended Basin Modifications

Because Sand Creek does not provide high enough flows with the targeted duration of 20 days, Cardno ENTRIX is recommending that the Basin topography be modified such that the flooded wetland areas will retain a saturated soil condition for the required duration. Figure 7 below presents a sketch illustrating this concept.

Cardno ENTRIX has modified the Basin topography such that floodplain and wetland surfaces are flooded annually and flood water will be retain in bowl-shaped saturated soil media as illustrated in the figure. The reader should refer to the actual CAD drawing set for engineering details.

An important element of this concept is to retain water in the soils for a minimum of 20 days. However, the underlying soils permeability is not known with sufficient certainty to complete design these basins. A clay layer is proposed to slow deep percolation and maintain a longer period of soil saturation.

The clay layer would consist of a mixture of native soil and bentonite. The combination of the layers thickness, compaction and percent bentonite affect the rate at which water penetrates the clay layer. We can specify the layer thickness to be 6 inches, but the mixture of bentonite and the compaction ratio need to be determined. Cooper Labs, in Palo Alto, estimate the required set of tests to cost about $5,000. These tests can be performed at any time.

In order for the lab to determine the correct soil mixture, we must provide them with a target, or design permeability. The paragraphs that follow summarize our estimate.

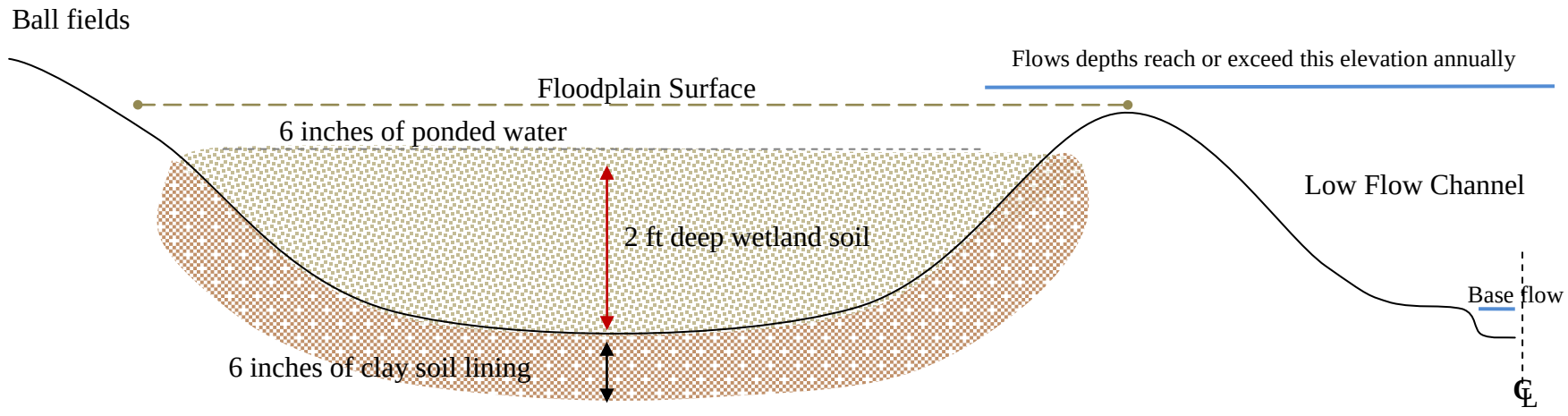


Figure 7 - Proposed Seasonal Wetland Cross Section & Concept Design

MODELING SOIL WATER RETENTION

This section presents our approach to determine the clay layers permeability. Cardno ENTRIX developed a computational model to simulate the wetlands soil water balance, including the vertical distribution of soil moisture and evapotranspiration from the soil layers. The model represents the soil filled wetland areas having a low permeable underlying layer of clay and bentonite mixture. The model has been programmed in both FORTRAN and EXCEL to provide an independent check on calculations. This approach has been tested and verified, and published under *Modeling & Sizing Bioretention Using Flow Duration Control, Journal of Hydrologic Engineering, Vol 15, No 6, 2010*.

The model consists of a surface reservoir, eight soil layers, and outlet controls (**Figure 8**). An optional gravel layer with an underdrain was not used. The surface reservoir is represented by a stage-storage-discharge relationship incorporating basin geometry and overflow weir hydraulics. The procedure follows the routing algorithm used in the U.S. Environmental Protection Agency (USEPA) Storm Water Management Model (SWMM4 2002). The soil moisture procedure follows algorithms used in the Soil Moisture Accounting module of the Hydrologic Engineering Center Hydrologic Modeling System (HEC-HMS) (USACE 2000).

The soil column is subdivided into eight layers; each layer is defined by a thickness, a *saturated hydraulic conductivity* (Ksat, or permeability), and volumetric properties (porosity). The model partitions water moving into each soil layer into retained and drainable fractions. The retained fraction represents the field capacity and can only be depleted by *evapotranspiration* (ET). The drainable fraction moves to lower layers by gravity and eventually percolates to underlying native soils (and is discharged via the underdrain if used). Because vegetated basins imply live healthy plants, the fraction of total void space representing a plants wilting point must remain full and thus is not available for water storage between storm events.

Wetland soil is assumed to have the following properties: 45 percent porosity, 30 percent field capacity, 15 percent wilting point, and a hydraulic conductivity of 1 inch per hour.

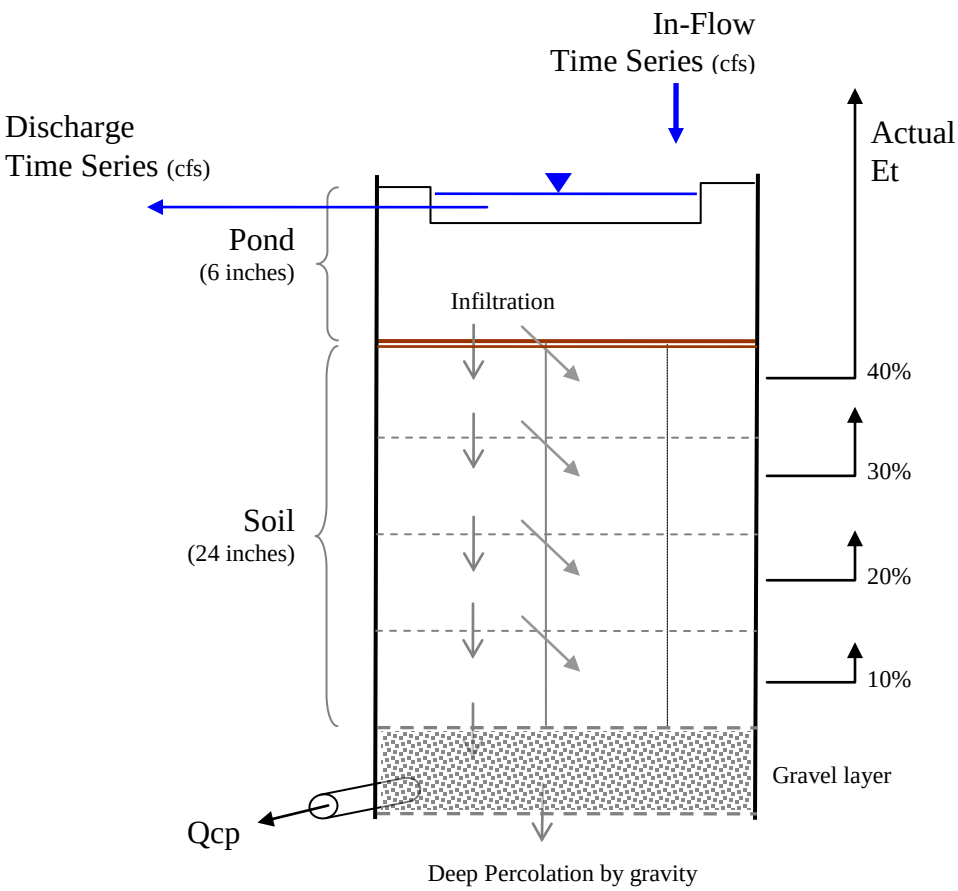
The drainable fraction moves to lower layers at rates based on hydraulic conductivity, the length of the time step, and the degree of soil moisture in the upper and lower layers. When a layer becomes saturated, flow is only allowed to enter at a rate equal to or less than the rate at which water is discharged from that layer. Percolation to the underlying soils is controlled by the permeability of the soil-bentonite layer and the degree of soil moisture in the overlying soil layers. The percolation rate is a design parameter being set to achieve 20 days soil saturation.

Average monthly ET rates for Brentwood are used, which is the same as that used for the previous hydrologic model. ET removes water from each soil layer as a function of available water. The model is programmed to remove a higher percentage of ET from the upper layers, decreasing proportionally for each lower layer. ET is assumed to be zero during storms.

The discharge from an *underdrain* (Qcp) is set to zero (0.00).

VERIFYING PERFORMANCE

To determine how well the model predicts real results, Palhegyi (2010) applied the model to a bioretention site studied by Dr. Robert Traver and his students at Villanova University, Department of Civil and Environmental Engineering in Villanova, Pennsylvania. These tests showed excellent performance of the model compared to measured data collected at Villanova University.



NOTES

1) Each soil layer is 6 inches deep; assigned total pore space, field capacity and wilting point by percent.
2) Field capacity fills first, followed by drainable portion.
3) Only the drainable portion percolates to the next layer. Percolation between layers assigned 1 in/hr, Ksat for amended soils. Deep percolation defined for parent material.
4) Et is subtracted from field capacity in proportion as shown. Plant root density and Et are greatest near the surface and decreases with depth. Actual Et is dependent on available soil moisture (Actual Et = min(PET, avail. soil moisture). Et occurs when between storms.
5) No precipitation added.

6) Soil column properties assigned:

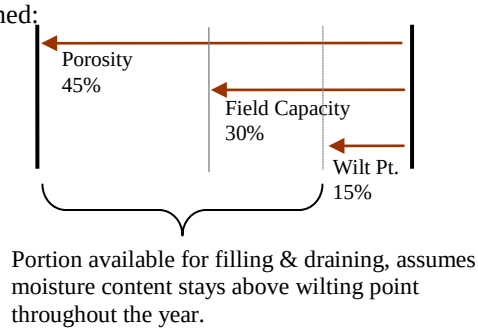


Figure 8

SOIL WATER BALANCE RESULTS

The design of the basin has 6 inches of surface ponding, 24 inches of amended wetland soil with a permeability of 1 in/hr, a rectangular overflow weir, and no gravel underdrain. The underlying soil-bentonite layer is a restricting layer defined by its saturated hydraulic conductivity. This value was adjusted iteratively until the targeted duration of saturation was achieved.

To fill the pond and soil water storage initially, a hypothetical storm is used as input to the model. A total of 96,300 cu-ft of stormwater runoff is delivered to the basin from a 5-acre catchment.

Figure 2 shows the total water stored in the wetland basin over time. The two curves show the FORTRAN and EXCEL results. FORTRAN more correctly simulates the dynamic nature of soil hydraulics. Total water stored includes 6 inches of ponding on the surface plus 7.2 inches of available water storage in the soil matrix (drainable and field capacity). The total rises up to 13.2 inches quickly from the applied storm event; a brief overflow occurs ensuring the total storage is full. The time to a full basin is 4 days.

At this point, the pond begins to drain at a rate controlled by the clay liner. Once total storage drops from 13.2 inches to 7.2 inches (day 19), the pond is empty and only soil water remains. Soil water continues to drain for eight (8) more days until reaching field capacity (day 27). At this point, the drainable soil water has percolated to underlying soils and the void space has become aerated.

As illustrated in the figure, 5 inches of soil water still remains in the soil column after 20 days from being filled. This means about half of the total drainable fraction still remains in the soil. The drainable fraction is totally gone by day 28 with 3.4 inches of field capacity remaining. The percolation rate of the clay liner is 0.017 in/hr. Percolation rates less than this value is acceptable.

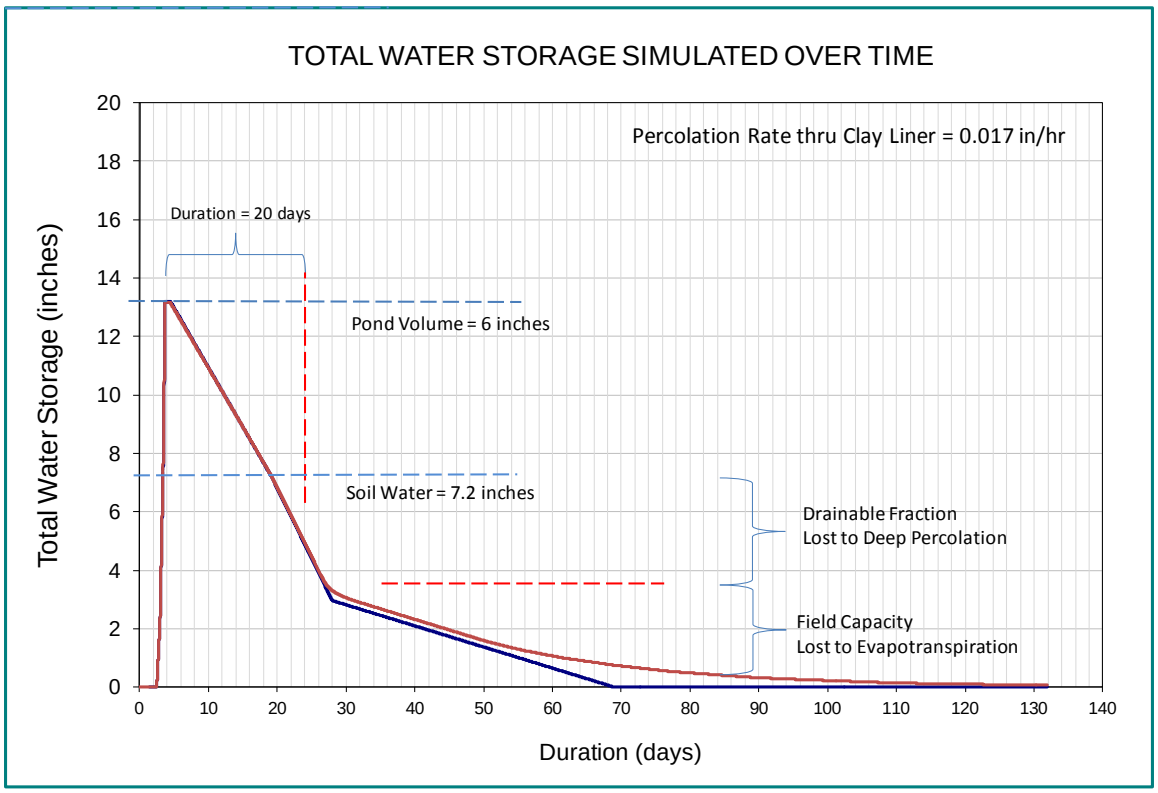


Figure 9

FINAL PERMEABILITY FOR SOIL-BENTONITE MIXTURE

This section summarizes our estimate of the clay layer permeability. Cardno Entrix applied Darcy's Law to estimate the permeability using our estimate of the percolation rate from above (0.05 in/hr). Darcy's Law is

$$V = k \times \frac{dh}{dl}$$

Where:

V = flow rate
k = hydraulic conductivity
dh = change in head
dl = clay layer thickness

Table 3 list the data used in Darcy's equation and the resulting hydraulic conductivity to be used in design of the clay layer. The target hydraulic conductivity for design purposes is 0.0043 in/hr with a 6 inch thick clay layer. If the layer was reduced to 3 inches, the hydraulic conductivity would also need to be reduced to 0.00213 in/hr to compensate for less clay. If the layer is increased to 9 inches, the permeability can be increased to 0.00638 in/hr.

Figure 10 illustrates the decrease in percolation rate as the depth of water decreases. Our design rate is set at the maximum head of 24 inches. If the permeability of the clay layer is held constant, reducing thickness of the clay layer increases the rate at which water can percolate through this layer. Therefore, smaller thickness requires a denser more compact clay layer.

Table 3 – Summary of Darcy's Law Parameters

Clay Layer Thickness	6	3	9	inches
Maximum Water Depth	24	24	24	inches
Flow Rate (i.e., perc rate)	0.017	0.017	0.017	in/hr
Hydraulic Conductivity (K)	0.00425	0.00213	0.00638	in/hr

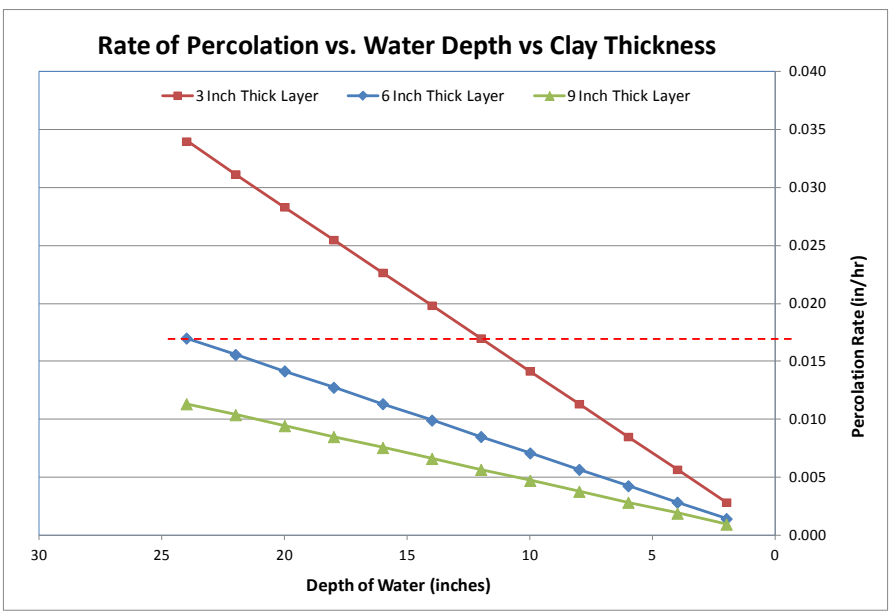


Figure 10

APPENDIX A - SOIL WATER BALANCE SUPPORTING FIGURES

Appendix A presents the remaining four water balance parameters that are part of the final results discussed above.

Figure A-1 illustrates the surface pond volume over the simulated event. The pond reaches its maximum storage at 21,780 cubic-feet; and is completely drained by day 19.

Figure A-2 illustrates the estimated amount of water penetrating the soil-bentonite layer. The units are in inches of depth per time step (10 minutes). Deep percolation continues at a constant of 0.0028 inches per 10 minutes, until day 30, when both pond water and drainable soil water are empty.

Figure A-3 is an illustration of evapotranspiration over time, in inches of depth per 10 minutes (0.0005 inches is equivalent to 2.42 inches per month). The current calculations use 2.42 inches per month from the average of the November thru March. Here the two models show their differences. The Excel model treats wetland soils as a single layer, once its empty, ET drops to zero. The FORTRAN model uses eight soils layers, and ET drops one layer at a time. THE FORTRAN model simulates a reduction in ET potential over time - as the field capacity dries out it becomes harder for plants to obtain that water. As a result, the tail end of soil moisture is drawn out more slowly.

Figure A-4 illustrates the fraction of soil moisture over time. It fills quickly to 7.2 inches and remains at 7.2 inches as long as the pond had water, for about 15 days. Once the pond is empty, the drainable portion of soil water begins to drop until day 28. At this point, 3.4 inches of soil water remains; the entire drainable portion is empty plus some field capacity is lost to ET.

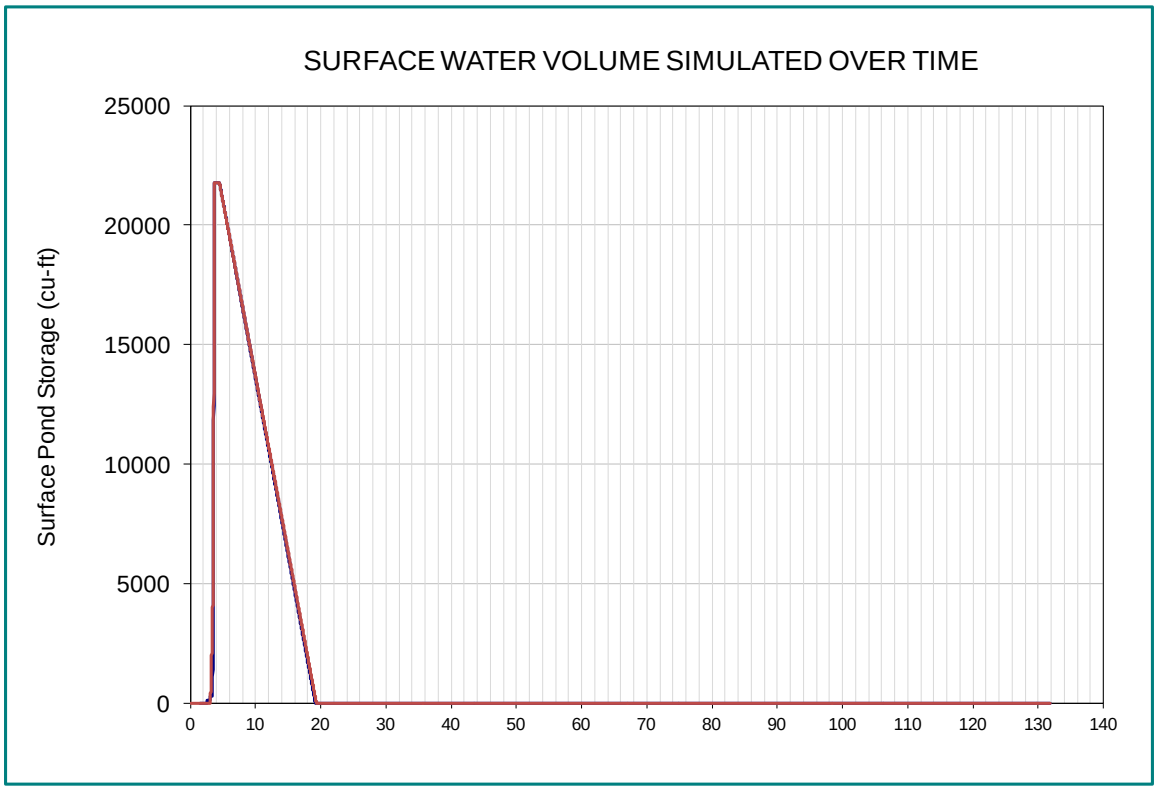


Figure A-1

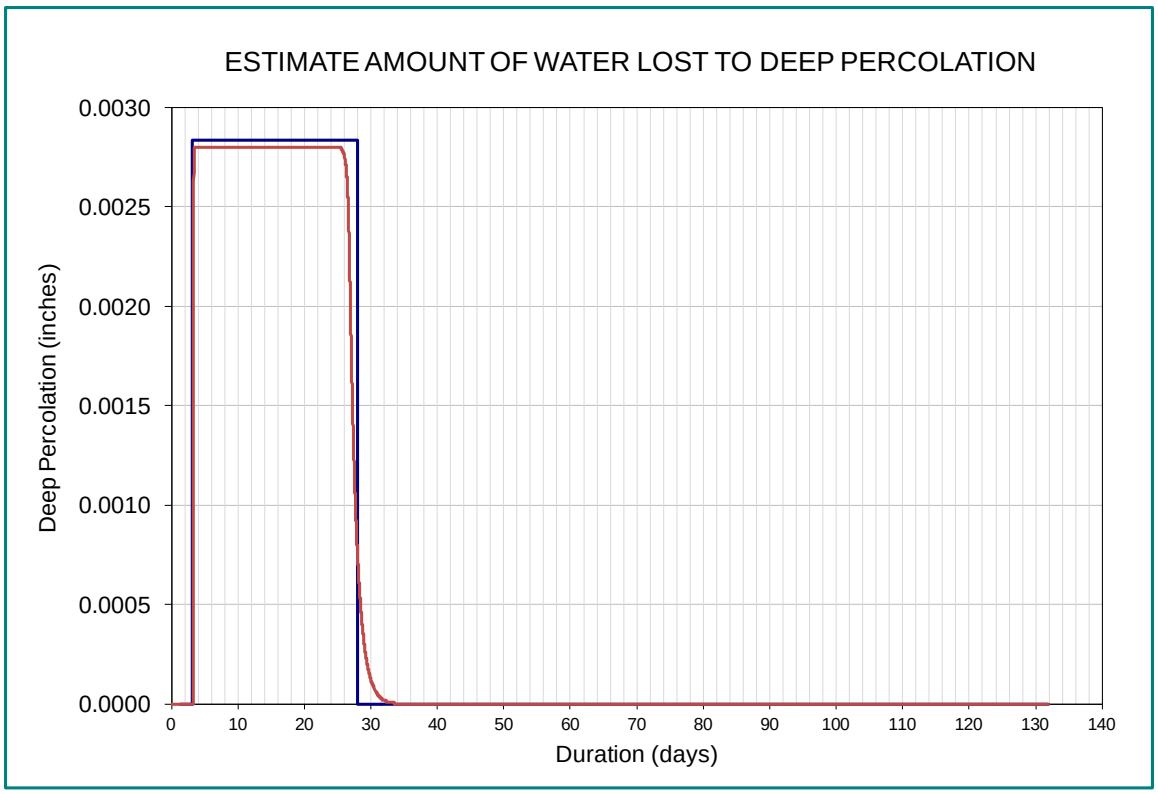


Figure A-2

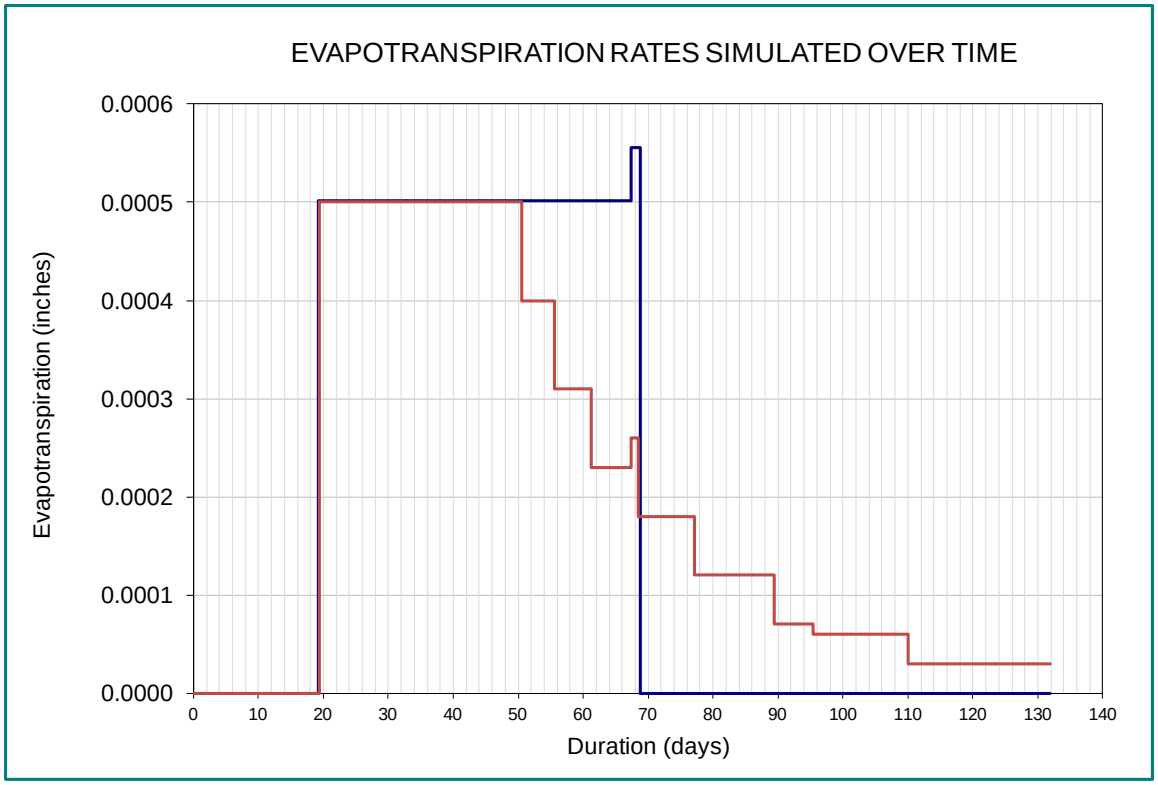


Figure A-3

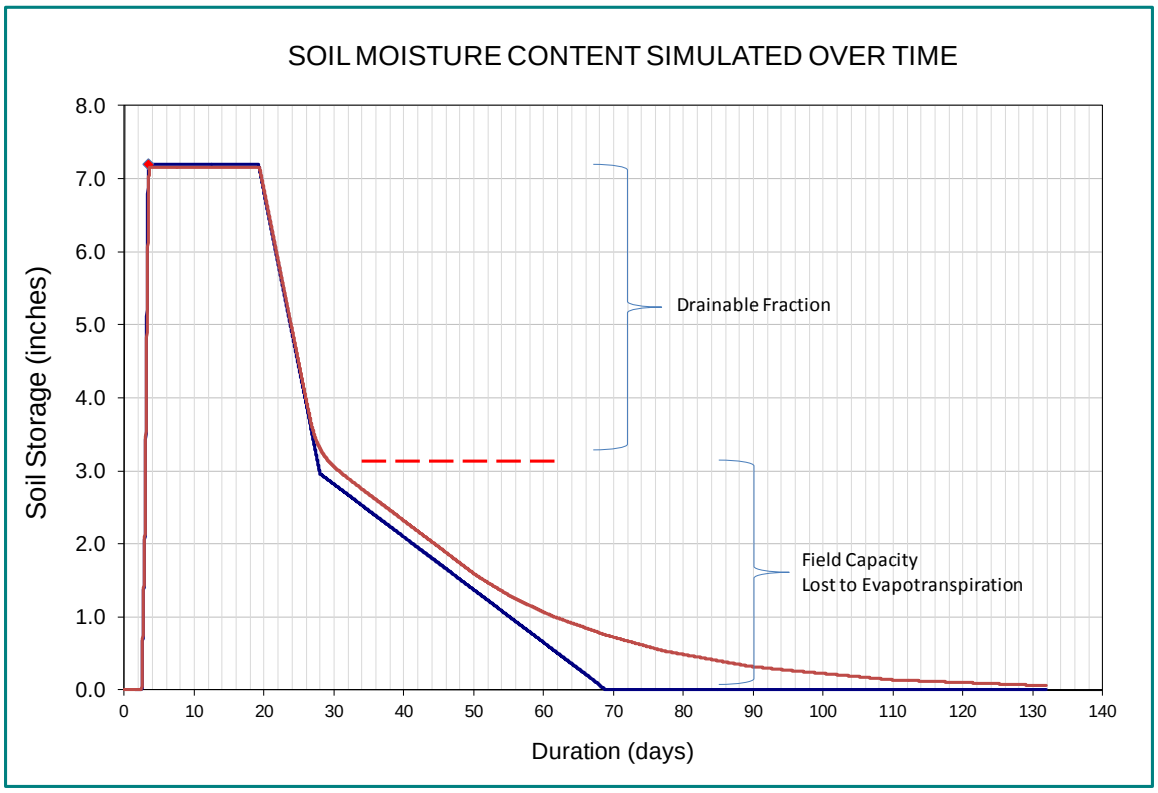

SOIL MOISTURE CONTENT SIMULATED OVER TIME
Soil Storage (inches)
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
Duration (days)
Drainable Fraction
Field Capacity
Lost to Evapotranspiration

Figure A-4

Appendix B

Preliminary List of Non-Native Invasive Species

Table B-1 Preliminary List of Non-Native Invasive Species for Control

Scientific Name/Common Name	Cal-IPC Rating	Present on or Near Site	Timing and Methods for Removal	Comments
Anthemis cotula/ Mayweed	Not Listed	Yes	Seedlings should be pulled in the early winter and rechecked for new growth every month Larger infestations can be mowed, but must be mowed very close to the ground and rechecked for new growth. Mowing is needed prior to flowering	This species is allelopathic and can prevent the establishment of native and other desirable species.
Brassica nigra/ Black mustard[1]	Moderate	Yes	Timing should be prior to seed maturation (March/April) ▪ Hand pull individual plants ▪ Cut plants to within three inches of the ground (may require several treatments in the spring)	Tends to establish in disturbed sites and spreads easily into open habitats.
Cardaria spp./ Hoary cress	Moderate	No	Timing should be prior to seed maturation: ▪ Dig up individual plants (only feasible for small infestation) ▪ Apply herbicide in type, amount, and manner suggested by PCA	This species creates large continuous mats of vegetation.
Carduus pycnocephalus/ Italian thistle[1]	Moderate	Yes	Timing should be prior to seed maturation (March/April) ▪ Hand pull individual plants ▪ Cut plants to within three inches of the ground (may require several treatments in the spring)	
Centaurea calcitrapa/ Purple starthistle	Moderate	Yes	Timing should be prior to flower production (Feb/March) ▪ Cut plants a minimum of 2 inches below the soil surface ▪ Spray larger infestations under the directions of a PCA	
Centaurea solstitialis/ Yellow star-thistle[1]	High	Yes	Remove plants at least 2 inches below the soil surface, prior to flower production (small infestations) Treat larger infestations with herbicide under the direction of a PCA. Herbicide use should be timed after seed production of annual grasses and forbs, but prior to flowering of this species (My/June)	

Table B-1 Preliminary List of Non-Native Invasive Species for Control

Scientific Name/Common Name	Cal-IPC Rating	Present on or Near Site	Timing and Methods for Removal	Comments
Cirsium vulgare/ Bull thistle	Moderate	Yes	Timing should be prior to flower production (Feb/March) ▪ Cut plants a minimum of 2 inches below the soil surface ▪ Spray larger infestations under the directions of a PCA	
Conium maculatum/ Poison hemlock	Moderate	Yes	Timing should be prior to seed maturation (March/April) ▪ Hand pull individual plants ▪ Cut plants to within three inches of the ground (may require several treatments in the spring)	
Convolvulus arvensis/ Field bindweed	Not Listed	Yes	Timing should be prior to seed maturation: ▪ Dig up individual plants (only feasible for small infestation) ▪ Apply herbicide in type, amount, and manner suggested by PCA	
Cuscuta japonica/ Japanese dodder	Not Listed	No	Remove infested vegetation and dispose of properly.	This is an extremely aggressive weed that is known from the Antioch area. The Alameda/Contra Costa Weed Management Area is aggressively combating this species throughout Contra Costa County (Contra Costa County Agricultural Commissioner's Office, 2009)
Cynara cardunculus/ Artichoke thistle	Moderate	Yes	Timing should be prior flower production: ▪ Dig up individual plants (only feasible for small infestation) ▪ Apply herbicide in type, amount, and manner suggested by PCA	The Alameda/Contra Costa Weed Management Area is aggressively combating this species throughout Contra Costa County (Contra Costa County Agricultural Commissioner's Office, 2009)
Foeniculum vulgare/ Sweet fennel	High	No	Anytime ▪ Pull seedlings (must get roots) ▪ Dig up larger plants	Highly persistent in a variety of habitats. May not respond well to herbicide. Hand removal recommended.
Hirschfeldia incana/ Mediterranean mustard	Moderate	Yes	Timing should be prior to seed maturation (March/April) ▪ Hand pull individual plants ▪ Cut plants to within three inches of the ground (may require several treatments in the spring)	Somewhat invasive species. Generally requires a disturbed area for establishment and will not invade undisturbed habitats.

Table B-1 Preliminary List of Non-Native Invasive Species for Control

Scientific Name/Common Name	Cal-IPC Rating	Present on or Near Site	Timing and Methods for Removal	Comments
Lepidium latifolium/ Perennial pepperweed	High	Yes	Herbicide treatment in type, amount, and manner suggested by PCA	The Alameda/Contra Costa Weed Management Area is aggressively combating this species throughout Contra Costa County (Contra Costa County Agricultural Commissioner's Office, 2009)
Nicotiana glauca/ Tree tobacco[1]	Moderate	Yes	Anytime ▪ Dig up plant. ▪ Spot spray with herbicide (glyphosate or similar)	Establishes well in disturbed areas and then spreads and takes hold in small disturbed areas, such as on eroding slopes.
Pennisetum setaceum/ Fountain grass	Moderate	No	Anytime ▪ Dig up plant and dispose offsite. ▪ Spot spray with herbicide (glyphosate or similar)	Establishes quickly along roadsides and once established, spreads into adjacent or nearby undisturbed areas. Can prevent establishment of native species.
Silybum marianum/ Milk thistle[1]	Limited	Yes	Timing should be prior to seed maturation (March/April) ▪ Hand pull individual plants ▪ Cut plants to within three inches of the ground (may require several treatments in the spring)	Tends to establish in disturbed sites and spreads easily into open habitats. Not likely to invade undisturbed habitat.
Sinapis arvensis/ Charlock[1]	Limited	Yes	Timing should be prior to seed maturation (March/April) ▪ Hand pull individual plants ▪ Cut plants to within three inches of the ground (may require several treatments in the spring)	

[1]Species present on-site

California Invasive Plant Council (Cal-IPC) Invasive Plant Inventory (February 2006)

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Appendix C

Monitoring Forms

Upper Sand Creek Basin Restoration Monitoring Form

Date: _____ Personnel: _____

Non-native Invasive Species Observed:

Species	Percent Cover

Recommended Actions Control of Non-native Invasive Species:

Notes on General Health of Plantings:

Remedial Measures needed (erosion control, changing watering cycle, etc):

Photographs taken:

Upper Sand Creek Basin Line-Intercept Transect Form

Date:_____ Personnel:_____
_____

Transect Number:_____ GPS Coordinates: _____

Location (meters)	Species Present
0.5	
1.0	
1.5	
2.0	
2.5	
3.0	
3.5	
4.0	
4.5	
5.0	
5.5	
6.0	
6.5	
7.5	
8.0	
8.5	
9.0	
9.5	
10.0	
10.5	
11	
11.5	
12.0	
12.5	
13.0	
13.5	
14.0	
14.5	
15.0	

Location (meters)	Species Present
15.5	
16.0	
16.5	
17.0	
17.5	
18.0	
18.5	
19.0	
19.5	
20.0	
20.5	
21.5	
22.0	
22.5	
23.0	
23.5	
24.0	
24.5	
25.0	
25.5	
26.0	
26.5	
27.0	
27.5	
28.0	
28.5	
29.0	
29.5	

Upper Sand Creek Basin Belt Transect Form

Date:____________________ Personnel:____

____

Transect Number:_____ GPS Coordinates:______________________________

Species	Tally Number Present

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East Contra Costa County
Habitat Conservation Plan
Natural Community
Conservation Plan

City of Brentwood
City of Clayton
City of Oakley
City of Pittsburg
Contra Costa County
ECCC Habitat Conservancy

County of Contra Costa
Application Form and Planning Survey Report to Comply with and Receive Permit Coverage under the East Contra Costa County Habitat Conservation Plan and Natural Community Conservation Plan

Project Applicant Information:

Project Name: Upper Sand Creek Basin Expansion

Project Applicant's Company/Organization: Contra Costa County Flood Control and Water Conservation District

Contact's Name: Claudia Gemberling

Contact's Phone: (925) 313-2192 Fax: (925) 313-2333

Contact's Email: cgemb@pw.cccounty.us

Mailing Address: 255 Glacier Drive
Martinez, California 94553

Project Description:

Lead Planner: Claudia Gemberling, Environmental Analyst II

Project Location: East of Deer Valley Road, south of Lone Tree Way (just south of Kaiser Hospital), Antioch.

Project APN(s) #: See table below and figure at end of document.

Number of Parcels/Units: See table below and figure at end of document.

Size of Parcel(s): 61.51 acres + 3.03 acres temporary staging area

Parcel Number	Parcel Size (acres)	Owner
057-050-008	5.1	Flood Control District
057-050-010	20.0	Flood Control District
057-050-012	16.0	Flood Control District
057-050-019	3.5	Flood Control District
057-050-020	6.9	Flood Control District
057-050-023	1.2	Flood Control District
057-050-009	0.1*	Antioch School District for access easement
057-050-021	3.3*	Hillside Group/Albers for

Template prepared by the
ECCC Habitat Conservancy

651 Pine Street, North Wing, 4th Floor
Martinez, CA 94533-0095
Phone: 925/335-1290
Fax: 925/335-1299
www.cocohcp.org

Parcel Number	Parcel Size (acres)	Owner
		slope easement
057-030-005	0.2*	Williamson for slope easement
057-050-022	5.2*	Williamson for drainage easement (4.0 acres) and slope easement (1.2 acres)
Total	61.5	

* Indicates only a portion of the larger parcel.

Project Description/Purpose (Brief):

The USCB project will expand the existing 49-acre basin to approximately 61.5 acres, a capacity increase from approximately 123-acre feet to 900-acre feet. The project will consist of excavating soil from the existing basin floor and expanding the area to create a deeper basin where water will be held and slowly released downstream during major storm events. The purpose of the basin expansion is to attenuate flows from the upper Marsh Creek watershed to provide improved flood protection for the downstream communities.

Biologist Information:

Biological/Environmental Firm: Nomad Ecology

Lead Contact: Erin McDermott

Contact's Phone: (925) 228-1027 Fax: (925) 228-1006

Contact's Email: emcdermott@nomadecology.com

Mailing Address: 832 Escobar Street
Martinez, CA 94553

East Contra Costa County HCP/NCCP Planning Survey Report for Upper Sand Creek Basin Expansion Project Contra Costa County Flood Control and Water Conservation District

I. Project Overview

Project proponent:	Contra Costa County Flood Control and Water Conservation District
Project Name:	Upper Sand Creek Basin Expansion Project
Application Submittal Date:	July 9, 2012; Revised August 15, 2012
Jurisdiction:	☒ Contra Costa County ☐ Participating Special Entity[1] ☐ City of Oakley ☐ City of Pittsburg ☐ City of Clayton ☐ City of Brentwood
Check appropriate Development Fee Zone(s):	☐ Zone I ☐ Zone IV ☒ Zone II (Figure 9-1; p. 9-21) ☐ Zone III See Figure 9-1 of the Final HCP/NCCP for a generalized development fee zone map. Detailed development fee zone maps by jurisdiction are available from the jurisdiction or at www.cocohcp.org.
Total Parcel Acreage:	64.53 total (includes 0.18 urban)
Acreage of land to be permanently disturbed[2]:	6.72 (Development Fee is based on 6.89 acres perm impact, however 0.17 acres of wetland impacts will be mitigated on site)

[1] *Participating Special Entities* are organizations not subject to the authority of a local jurisdiction. Such organizations may include school districts, water districts, irrigation districts, transportation agencies, local park districts, geologic hazard abatement districts, or other utilities or special districts that own land or provide public services.

[2] *Acreage of land permanently disturbed* is broadly defined in the HCP/NCCP to include all areas removed from an undeveloped or habitat-providing state and includes land in the same parcel or project that is not developed, graded, physically altered, or directly affected in any way but is isolated from natural areas by the covered activity. Unless such undeveloped land is dedicated to the Preserve System or is a deed-restricted creek setback, the development fee will apply. The development fees were calculated with the assumption that all undeveloped areas within a parcel (e.g., fragments of undisturbed open space within a residential development) would be charged a fee; the fee per acre would have been higher had this assumption not been made. See Chapter 9 of the HCP/NCCP for details.

Acreage of land to be temporarily disturbed[3]: 57.63

Project Description

Concisely and completely describe the project and location. Reference and attach a project vicinity map **(Figure 1)** and the project site plans **(Figure 2)** for the proposed project. Include all activities proposed for site, including those disturbing ground (roads, bridges, outfalls, runoff treatment facilities, parks, trails, etc.) to ensure the entire project is covered by the HCP/NCCP permit. Also include proposed construction dates. Reference a City/County application number for the project where additional project details can be found.

City/County Application Number: N/A; Flood Control District Project #: 7562-6D8518

Anticipated Construction Date: Spring 2013

Project Location

The USCB is located approximately 2,000 feet east of Deer Valley Road, south of Lone Tree Way in Antioch. The project area is geographically situated nine miles northeast of Mount Diablo, and 5 miles south of the Sacramento-San Joaquin River Delta (Figure 1).

Existing Setting

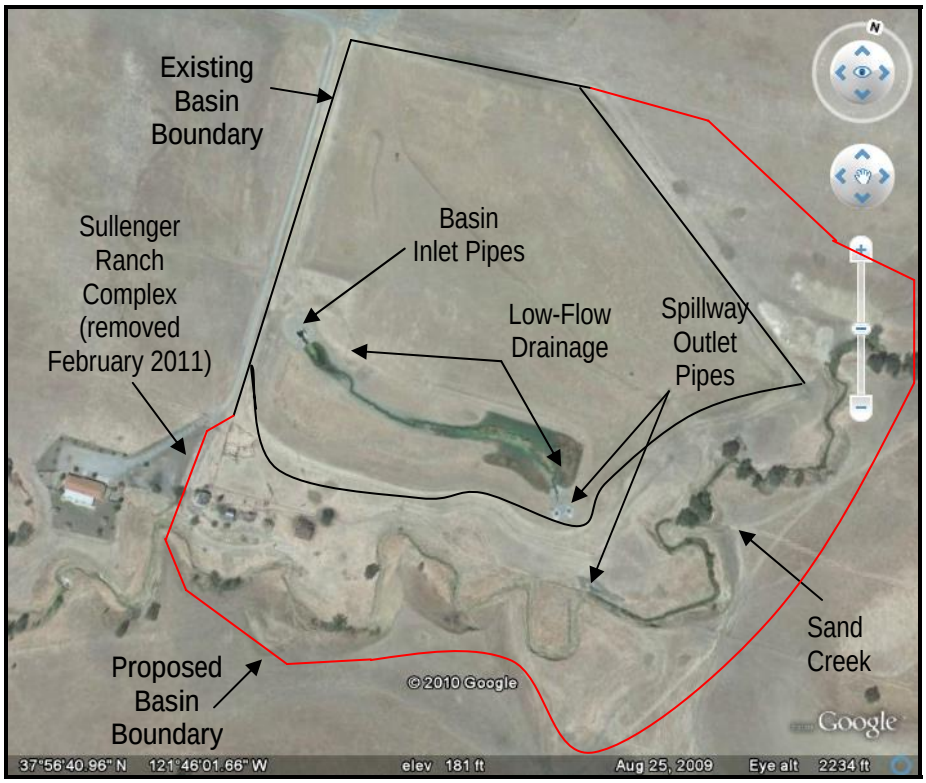
The existing basin, constructed in 1994, contains a man-made depression with elevated berms, associated basin inlet and outlet pipes, and an access road around its perimeter. The basin ranges from approximately 175 feet elevation at the bottom of the basin to steeply sloping gradients at an approximate elevation of approximately 190 feet elevation above mean sea level. Approximately 3,900 feet of Sand Creek borders the basin's southern boundary; this portion of Sand Creek is a narrow, incised channel with steep, eroded banks (Figure 3B, Photo 1). Sand Creek merges with Marsh Creek approximately 4 miles downstream of the basin; Marsh Creek flows northeast for about 6 miles until it joins the San Joaquin River at Big Break in Oakley.

The basin has a flood storage capacity of 123-acre feet. Two 84-inch diameter basin inlet pipes on the northwest side of the basin receive stormwater runoff from nearby developments to the north. The runoff flows through the bottom of the basin (low-flow channel) and drains into two 36-inch diameter spillway outlet pipes at the southeast side of the basin that outfall into Sand Creek.

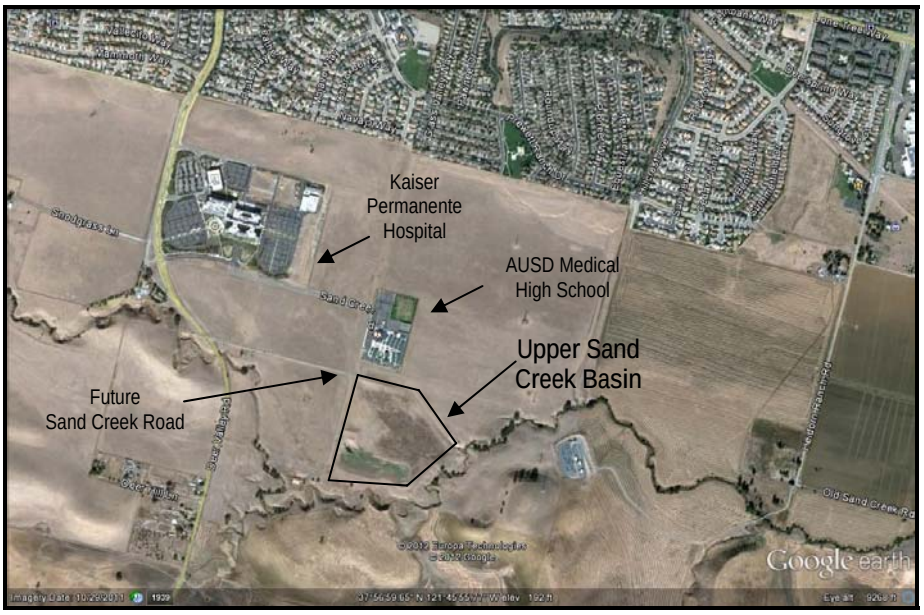
The existing basin is primarily undeveloped and contains primarily non-native annual grassland and ruderal vegetation; the low-flow channel contains permanent and seasonal wetland vegetation. Riparian woodland/scrub trees and shrubs along Sand Creek are sparse south of the basin, and are more present downstream of the existing pipe outfall.

The basin is maintained as necessary by the Flood Control District. The upland area north of the man-made drainage is used as a borrow pit for soil reclamation. The basin is grazed by cattle year-round.

[3] *Acreage of land temporarily disturbed* is broadly defined in the HCP/NCCP as any impact on vegetation or habitat that does not result in permanent habitat removal (i.e. vegetation can eventually recover).



The immediate area surrounding the basin is primarily undeveloped with the exception of the Antioch Unified School District (AUSD) Dozier-Libby Medical High School to the north and AUSD conference center in a former single-family home to the southwest. Parcels to the east and south consist of agricultural land; the parcel to the west is used for grazing. Kaiser Permanente maintains a hospital northwest of the basin. Areas to the north and east have been re-zoned for residential development. As part of this development, an extension of Sand Creek Road is planned along the northern border of the basin.



Background
Upper Sand Creek Basin is located in the lower Marsh Creek watershed in east Contra Costa County which encompasses portions of the cities of Antioch, Brentwood, and Oakley. Historically, the land use in the watershed has been predominantly cattle ranching and farming. The floods of 1955 and 1958 spurred public support for flood control infrastructure throughout the county. In the 1950s and 1960s, the Flood Control District partnered with the U.S. Army Corps of Engineers and the U.S. Department of Agriculture Soil Conservation Service to construct flood improvement projects to provide a 50-year level of protection for the watershed's predominantly agricultural land use. The flood control projects included channelization of Marsh Creek from the mouth to the confluence with Dry Creek; channelization of portions of Sand, Deer and Dry creeks and the construction of flood impounding reservoirs on Marsh Creek, Deer Creek and Dry Creek. In the mid-1970s, this system was expanded with construction of earthen channels in the area between Antioch, Brentwood, and Oakley. Since then these communities have been experiencing rapid urbanization which has resulted in the need for a 100-year level of flood protection.

The Flood Control District has been collaborating with the cities on infrastructure needs associated with urbanization to assure flood protection to the residents and businesses. In order to address the deficient capacity in Marsh Creek, the Contra Costa County Board of Supervisors approved an Environmental Impact Report (EIR) in 1990 that analyzed the environmental effects of establishing five (5) drainage areas in the Marsh Creek watershed. One of the drainage areas established is the Sand Creek drainage area. Sand Creek is the largest tributary in the lower Marsh Creek watershed as it contributes approximately 15 square miles to Marsh Creek and therefore is the primary location for regional detention facilities. The Board of Supervisors directed the Flood Control District to consider alternative flood sites for the Sand Creek drainage area. It was determined that two basins would be needed; Upper Sand Creek Basin (USCB) in Antioch and Lower Sand Creek Basin (LSCB) in Brentwood. Both basins were initially constructed by home builders in the mid-1990s to mitigate the increase in urban stormwater runoff from their development.

Analysis of the Sand Creek drainage area indicate that 900-acre feet and 300-acre feet of storage are ultimately required at the USCB and LSCB sites, respectively, to provide sufficient flood protection. Both basin expansions are intended to reduce the 100-year peak discharge from Sand Creek to Marsh Creek from 3,400 cubic feet per second (cfs) to less than 1,000 cfs by containing peak storm water flows in the basin and slowly releasing flows. It was determined that Sand Creek would need to flow through the basins. USCB will be the first of the two basins to be expanded to the proposed capacity.

Purpose and Need
The proposed basin expansions will provide regional flood protection benefits for existing and planned communities in the lower Marsh Creek watershed.

Project Description
The USCB project will expand the existing 49-acre basin to 61.5 acres, a capacity increase from approximately 123-acre feet to 900-acre feet. The project will consist of excavating soil from the existing basin floor and expanding the area to create a deeper basin where water will be held and slowly released downstream during major storm events. The expansion will include 3,934 linear feet of Sand Creek, which will be lowered

between 2-10 feet below the existing creek bottom and re-constructed with a geomorphic creek design that will be restored and enhanced (Figure 2).

Two hydraulic inlet structures will receive incoming water flows; one will be constructed within Sand Creek in the southwest portion of the project area that will direct upstream flows from Sand Creek, and the existing one in the northwest portion of the basin that receives urban stormwater runoff from developed areas north of the basin will be modified. The basin inlets will consist of concrete box structures with an energy dissipater. The inlet within the Sand Creek channel will have a bridge to allow vehicle access over the channel. Rock slope protection will be placed upstream and downstream of the inlet structures to protect against erosion. The inlet structure for the urban runoff channel will include a trash capture device which will include a mesh screen to remove debris that exceeds 5 millimeters in size.

Water flows received by the basin inlet structures will be directed into the re-constructed Sand Creek channel and drained into a primary spillway outlet structure and outfall into Sand Creek downstream. The primary spillway will consist of a headwall, an outlet and piping that will extend underneath the dam and discharge into Sand Creek releasing a maximum peak flow of 131 cubic feet per second (cfs). A secondary spillway, with a slide gate, will also be constructed to allow the rapid drawdown of the basin in the event that large back-to-back storms are expected. The outfall to the creek will also have an energy dissipater and rock slope protection located on the downstream toe of the dam.

An earthen dam will be constructed along the easterly (downstream) side of the basin, which will temporarily impound flood water. An emergency spillway east of the dam would direct flows greater than the 100-year storm event down a 225-foot wide broad crested weir constructed of concrete. The emergency spillway will be constructed of concrete block and filled in with sand and vegetation. The spillway will discharge into the creek approximately 600 to 800 feet below the toe of the dam. Rock slope protection will be placed at the toe of the spillway.

A 20-foot wide maintenance gravel access road will be placed around the basin perimeter. Five access ramps lead from the maintenance access road down into the basin for maintenance activities. Three of these ramps are located on the west side of the basin to provide access to both inlet structures and one is located near the primary outlet structure. A sixth access ramp follows the emergency spillway along the downstream face of the dam. These ramps are constructed of aggregate base or concrete depending on their slope and maintenance access requirements.

Fencing will be installed around the basin perimeter. A six-foot high chain-link fence will be installed on the north, northeast (along the emergency spillway), and west sides of the basin. These portions of the basin will have the most exposure to the public as the future Sand Creek Road and other roadways will be built along them. A five-foot high barbed wire fence will be installed on the east and south sides of the basin, which are adjoined by agricultural lands. In addition, a five-foot-high barbed wire fencing will also be installed to separate the Restoration Area from the rest of the basin. “No Trespassing” signs will be posted on the perimeter fencing.

The upland portion of the basin expansion has been designed to be compatible with proposed future sports complex Park for the City of Antioch however, the sports complex

is not a component of this project. The Restoration Area will be fenced as noted above to keep the public and cattle from entering it.

The area that immediately adjoins the basin on the north side (approximately 3 acres) will be designated as a staging and storage area for the topsoil that will be salvaged from the basin and treated with approved methods to remove weed species for use in the Restoration Area.

II. Existing Conditions and Impacts

Land Cover Types

In completing the checklist in Table 1, click in the appropriate fields and type the relevant information. Please calculate acres of terrestrial land cover types to nearest tenth of an acre. Calculate the areas of all jurisdictional wetlands and waters land cover types to the nearest hundredth of an acre. If the field is not applicable, please enter N/A. The sum of the acreages in the *Acreage of land to be "permanently disturbed" and "temporarily disturbed" by project* column should equal the total impact acreage listed above.

Land cover types and habitat elements identified with an ([a]) in Table 1 require identification and mapping of habitat elements for selected covered wildlife species. In Table 2a and 2b below, check the land cover types and habitat elements found in the project area and describe the results. Insert a map of all land cover types present on-site and other relevant features overlaid on an aerial photo below as Figure 3A.

Table 1. Land Cover Types on the Project Site as Determined in the Field and Shown in Figure 3A.

Land Cover Type (acres, except where noted)	Acreage of Land to be "Permanently Disturbed" by Project		Acreage of Land to be "Temporarily Disturbed" by Project		Acreage of Land Proposed for HCP/NCCP Dedication on the Parcel[c]	
					Stream Setback	Preserve System Dedication
Grassland[a]						
☒ Annual grassland (1.45 acres occurs within stream)	5.84	(0.11)	32.61	(1.34)	N/A	N/A
	5.95		**33.95**			
☐ Alkali grassland	N/A		N/A		N/A	N/A
☒ Ruderal (0.09 acre occurs within stream)	0.77	(0.0)	20.21	(0.09)	N/A	N/A
	0.77		**20.30**			
☐ **Chaparral and scrub**	N/A		N/A		N/A	N/A
☐ **Oak savanna[a]**	N/A		N/A		N/A	N/A
☐ **Oak woodland**	N/A		N/A		N/A	N/A
Jurisdictional wetlands and waters						
☒ Riparian woodland/scrub	**N/A**		**0.73** (0.31 of this occurs within stream)		N/A	N/A

Land Cover Type (acres, except where noted)	Acreage of Land to be "Permanently Disturbed" by Project	Acreage of Land to be "Temporarily Disturbed" by Project	Acreage of Land Proposed for HCP/NCCP Dedication on the Parcel[c]	
			Stream Setback	Preserve System Dedication
☒ Permanent wetland[a]	**N/A**	**0.47** (0.02 of this occurs within stream) (0.04 acre within existing basin will be impacted from expanded drainage inlet; to be paid under development fee)	N/A	N/A
☒ Seasonal wetland[a]	**N/A**	**2.18** (0.02 acre within existing basin will be impacted from expanded drainage inlet; to be paid under development fee)	N/A	N/A
☐ Alkali wetland[a]	N/A	N/A	N/A	N/A
☐ Aquatic (Reservoir/Open Water)[a]	N/A	N/A	N/A	N/A
☐ Slough/Channel[a]	N/A	N/A	N/A	N/A
☐ Pond[a]	N/A	N/A	N/A	N/A
☒ Stream (acres) [a, d] (1.87 acres)	(0.16) Includes 0.11 Annual Grassland, 0.05 Riparian woodland/scrub (which are included under these land cover types above)	(1.71) Includes 1.34 Annual Grassland, 0.09 Ruderal, 0.02 Permanent Wetland, 0.26 Riparian Woodland/ Scrub (which are included under these land cover types above)	N/A	N/A
☒ Total stream length (feet) [a, d]	**292**	**3,642**	N/A	N/A
Stream length by width category				
☒ ≤ 25 feet wide	N/A	N/A	N/A	N/A
☐ > 25 feet wide	N/A	N/A	N/A	N/A
Stream length by type and order[e]				

Land Cover Type (acres, except where noted)	Acreage of Land to be "Permanently Disturbed" by Project	Acreage of Land to be "Temporarily Disturbed" by Project	Acreage of Land Proposed for HCP/NCCP Dedication on the Parcel[c]	
			Stream Setback	Preserve System Dedication
☐ Perennial	N/A	N/A	N/A	N/A
☒ Intermittent	N/A	N/A	N/A	N/A
☐ Ephemeral, 3rd or higher order	N/A	N/A	N/A	N/A
☐ Ephemeral, 1st or 2nd order	N/A	N/A	N/A	N/A
Irrigated agriculture[a]				
☐ Cropland	N/A	N/A	N/A	N/A
☐ Pasture	N/A	N/A	N/A	N/A
☐ Orchard	N/A	N/A	N/A	N/A
☐ Vineyard	N/A	N/A	N/A	N/A
Other				
☐ Nonnative woodland	N/A	N/A	N/A	N/A
☐ Wind turbines	N/A	N/A	N/A	N/A
Developed				
☒ Urban (0.18)	N/A (0.01)	N/A (0.17)	N/A	N/A
☐ Aqueduct	N/A	N/A	N/A	N/A
☐ Turf	N/A	N/A	N/A	N/A
☐ Landfill	N/A	N/A	N/A	N/A
Uncommon Vegetation Types (subtypes of above land cover types)				
☐ Purple needlegrass grassland	N/A	N/A	N/A	N/A
☐ Wildrye grassland	N/A	N/A	N/A	N/A
☐ Wildflower fields	N/A	N/A	N/A	N/A
☐ Squirreltail grassland	N/A	N/A	N/A	N/A
☐ One-sided bluegrass grassland	N/A	N/A	N/A	N/A
☐ Serpentine grassland	N/A	N/A	N/A	N/A
☐ Saltgrass grassland (= alkali grassland)	N/A	N/A	N/A	N/A
☐ Alkali sacaton bunchgrass grassland	N/A	N/A	N/A	N/A
☐ Other uncommon vegetation types (please describe)	[describe additional uncommon vegetation types here]			
Uncommon Landscape Features or Habitat Elements				
☐ Rock outcrop	N/A	N/A	N/A	N/A

Land Cover Type (acres, except where noted)	Acreage of Land to be "Permanently Disturbed" by Project	Acreage of Land to be "Temporarily Disturbed" by Project	Acreage of Land Proposed for HCP/NCCP Dedication on the Parcel[c]	
			Stream Setback	Preserve System Dedication
☐ Cave[a]	N/A	N/A	N/A	N/A
☐ Springs/seeps	N/A	N/A	N/A	N/A
☐ Scalds	N/A	N/A	N/A	N/A
☐ Sand deposits	N/A	N/A	N/A	N/A
☐ Mines[a]	—	—		—
☐ Buildings (bat roosts) [a]	—	—		—
☐ Potential nest sites (trees or cliffs) [a]	—	—		—
Total (Impacted Acres Subject to Fees)	**6.72** (6.89 to calculate development fee includes impacts to riparian, permanent, and seasonal wetlands to be mitigated on site) (0.01 additional urban)	**57.63** (0.17 additional urban)	N/A	N/A

[a] Designates habitat elements that may trigger specific survey requirements and/or best management practices for key covered wildlife species. See Chapter 6 in the HCP/NCCP for details.

[b] See Section 9.3.1 of the HCP/NCCP for a definition of "permanently disturbed" and "temporarily disturbed." In nearly all cases, all land in the subject parcel is considered permanently disturbed.

[c] Dedication of land in lieu of fees must be approved by the local agency and the Implementing Entity before they can be credited toward HCP/NCCP fees. See Section 8.6.7 on page 8-32 of the Plan for details on this provision. Stream setback requirements are described in Conservation Measure 1.7 in Section 6.4.1 and in Table 6-2.

[d] Specific requirements on streams are discussed in detail in the HCP/NCCP. Stream setback requirements pertaining to stream type and order can be found in Table 6-2. Impact fees and boundary determination methods pertaining to stream width can be found in Table 9-5. Restoration/creation requirements in lieu of fees depend on stream type and can be found in Tables 5-16 and 5-17.

[e] See glossary (Appendix A) for definition of stream type and order.

Nomad Ecology (Nomad) conducted the planning surveys in 2008 of the project area with the exception of a portion of the eastern adjacent property (Aviano-Williamson property). Numerous biological studies were conducted on the Aviano-Williamson property in the 1990's because the property was included in the larger Sand Creek Specific Plan Area. More recent biological studies were conducted on the Aviano-Williamson Property in 2002, 2005, and 2007. Nomad mapped HCP/NCCP land cover types in the field as shown in Figure 3A and as described below; land cover types for the Aviano-Williamson Property were mapped using observation from the project area and aerial photography interpretation. Permanent and temporary impacts will be mitigated on site as detailed in the Habitat Mitigation and Monitoring Plan (June 2012) as well as with HCP/NCCP fees as described in the Mitigation Measures section.

Annual Grassland

Approximately **39.90 acres** of the non-native annual grassland type is present in the project area (1.45 acres occurs within Sand Creek) (Table 1, Figure 3A). As described in the HCP/NCCP, annual grassland is characterized by grass and forb species dominating the land cover and where trees and shrubs comprise less than 5 percent canopy cover. The HCP/NCCP defines dominant grasses that generally consist of introduced annual grasses, including wild oats *(Avena spp.)*, brome grasses *(Bromus spp.)*, and annual fescues *(Vulpia spp.)*. The associated herbaceous cover includes native and nonnative forbs and native wildflowers. This community occurs on fine-textured, usually clay soils, moist or even waterlogged during the winter rainy season and very dry during the summer and fall. Germination occurs with the onset of the late fall rains while growth, flowering, and seed-set occur from winter through spring. With a few exceptions, the plants are dead through the summer and fall dry season, persisting as seeds (Chapter 3, page 3-8).

In the project area, annual grassland occupies the slopes and terraces adjacent to Sand Creek (Figure 3A; Figure 3B, Photos 2, 13 and 14). South of Sand Creek, grasses and other vegetation were not grazed and averaged 1-2 feet in in height at the time of the April surveys. Within the study area, annual grassland occupies the slopes and terraces adjacent to Sand Creek (Photos 13 and 14 in Appendix F). To the south of Sand Creek, grasses and other vegetation were not grazed and averaged 1-2 feet in height at the time of the April surveys. This plant community is dominated by non-native annual grasses including wild oats*, soft chess*, hare barley*, ripgut brome*, Spanish brome (*Bromus madritensis* ssp. *madritensis**), brome fescue (*Vulpia bromoides**), Italian ryegrass (*Lolium multiflorum**), and Mediterranean barley (*Hordeum marinum* ssp. *gussoneanum**). Non-native herbaceous species present in annual grassland on site include rose clover*, red-stemmed filaree*, burclover*, prickly lettuce (*Lactuca serriola**), shepherd's purse (*Capsella bursa-pastoris**), cut-leaved geranium*, hedge parsley (*Torilis nodosa**), purple star-thistle (*Centaurea calcitrapa**), mouse-ear chickweed (*Cerastium glomeratum**), cheeseweed (*Malva parviflora**), cocklebur (*Xanthium strumarium**), Bermuda buttercup (*Oxalis pes-caprae**), scarlet pimpernel (*Anagallis arvensis**), poison hemlock (*Conium maculatum**), bellardia*, mayweed (*Anthemis cotula**), turkey mullein (*Croton setigerus*), spearscale (*Atriplex triangularis*), pineapple weed (*Matricaria matricariodes**), prickly sow thistle (*Sonchus asper* ssp*. asper**), charlock*, and bull thistle*, in part. Indiscrete stands of black mustard* and charlock* were scattered throughout the grassland on site.

Native herbs are present in this community including common fiddleneck (*Amsinckia menziesii* var. *intermedia*), dense-flowered lupine (*Lupinus microcarpus* var. *densiflorus*), purple owl's clover (*Castilleja exserta* ssp. *exserta*), sordid phacelia (*Phacelia distans*), Great Valley phacelia (*Phacelia ciliata*), succulent lupine (*Lupinus succulentus*), blow-wives (*Achyrachaena mollis*), Great Valley gumplant (*Grindelia camporum* var. *camporum*), wild licorice (*Glycyrrhiza lepidota*), blue dicks (*Dichelostemma capitatum* ssp. *capitatum*), Oregon woolly-marbles (*Psilocarphus oregonus*), Ithuriel's spear (*Triteleia laxa*), chaparral clarkia (*Clarkia affinis*), elegant clarkia (*Clarkia unguiculata*), foothill larkspur (*Delphinium hesperium* ssp. *pallescens*), Great Valley buttercup (*Ranunculus canus*), dove lupine (*Lupinus bicolor*), red maids (*Calandrinia ciliata*), common blennosperma (*Blennosperma nanum* var. *nanum*), mugwort (*Artemisia douglasiana*), silver puffs (*Microseris douglasii* ssp. *douglasii*), autumn willowherb (*Epilobium brachycarpum*), wind poppy (*Stylomecon heterophylla*), and California poppy (*Eschscholzia californica*), in part. Diffuse stands of creeping wildrye (*Leymus triticoides*)

were scattered in the annual grassland. Small patches of saltgrass (*Distichlis spicata*) were present along the banks of Sand Creek.

Within the annual grassland on site, scattered shrubs and trees are present that comprise less than 5 percent canopy cover. Tree and shrub species include valley oak (*Quercus lobata*), almond tree waifs (*Prunus dulcis**), Northern California black walnut (*Juglans californica* var. *hindsii*[+]), and California sagebrush (*Artemisia californica*). Ornamental trees planted around the historic homestead include mulberry (*Morus alba**), California fan palm (*Washingtonia filifera*[+]), and almond trees.

Project Impacts

The project will permanently impact approximately **5.95 acres** of annual grassland for the emergency spillway and maintenance access roads and ramp, and basin inlet structure and associated rock slope protection within the Sand Creek. Approximately **33.95 acres** will be temporarily impacted from construction activities (Table 1, Figure 3A).

Ruderal

Approximately **21.07 acres** of the ruderal land cover type is present in the project area (Table 1, Figure 3A). As described in the HCP/NCCP ruderal vegetation is characterized by sparse nonnative, typically weedy vegetation occupying vacant parcels surrounded by developed areas such as black mustard, thistles *(Cirsium spp.)*, and wild radish *(Raphanus sativa)* that tend to colonize quickly after disturbance (Chapter 3, page 3-11).

Within the study area, ruderal vegetation is located in the basin north of the manmade drainage channel in areas that have been subjected to ground disturbance or grading and in other scattered locations on site, particularly along Sand Creek (Figure 3A; Figure 3B, Photos 11 and 12). In some ruderal stands on site vegetation patterns are expressed as mosaics of near monocultures of invasive species including black mustard (*Brassica nigra*[*]), charlock (*Sinapis arvensis**), yellow star thistle (*Centaurea solstitialis**), burclover (*Medicago polymorpha**), and sour clover (*Melilotus indica**). Outside of these stands other annual grass and forb species are present such as milk thistle (*Silybum marianum**), Italian thistle (*Carduus pycnocephalus**), wild oats (*Avena fatua**), soft chess (*Bromus hordeaceus**), hare barley (*Hordeum murinum* ssp. *leporinum**), ripgut brome (*Bromus diandrus**), red-stemmed filaree (*Erodium cicutarium**), vetch (*Vicia villosa**), field bindweed (*Convolvulus arvensis**), rose clover (*Trifolium hirtum**), shining peppergrass (*Lepidium nitidum* var. *nitidum*), cut-leaved geranium (*Geranium dissectum*), bull thistle (Cirsium vulgare*),* cardoon *(Cynara cardunculus*),* and bellardia *(Bellardia trixago*).*

Project Impacts

The project will permanently impact approximately **0.77 acre** for the maintenance access roads and ramps. Approximately **20.30 acres** will be temporarily impacted from construction activities (Table 1, Figure 3A).

Riparian Woodland/Scrub

Approximately **0.73 acre** of the riparian woodland/scrub land cover type is present in the project area (Table 1, Figure 3A). As described in the HCP/NCCP riparian

[+] Denotes a species of native origin but not indigenous to the site

[*] Denotes a non-native species that has an origin other than that of California

woodland/scrub is characterized by phreatophytic woody vegetation associated with streams and permanent water sources. Riparian woodland is dominated by trees and contains an understory of shrubs and forbs. Riparian scrub is dominated by young trees and shrubs, typically representing an early successional stage of riparian woodland (Chapter 3, page 3-15).

Within the project area, Riparian Woodland/Scrub land cover type occurs along Sand Creek, at the downstream end of the project area (Figure 3A; Figure 3B, Photos 15 and 16). The riparian woodland/scrub that occurs on site is characterized by an open canopy overstory of red willow (*Salix laevigata*). Further downstream, the overstory is composed of valley oak (*Quercus lobata*) and blue oak (*Quercus douglasii)*. Other tree and shrub species present in riparian woodland/scrub within the project area include California rose (*Rosa californica*), blue elderberry (*Sambucus mexicana*), blue witch (*Solanum umbelliferum*), and tree tobacco (*Nicotiana glauca**), in part. The understory includes herbaceous species such as California man-root (*Marah fabaceus*), broad-leaved pepperweed (*Lepidium latifolium**), Bermuda buttercup*, white fiesta flower (*Pholistoma membranaceum*), miner's lettuce (*Claytonia perfoliata*), and common chickweed (*Stellaria media**).

Project Impacts
Approximately **0.73 acre** will be temporarily impacted from construction activities (Table 1, Figure 3A).

Permanent (Perennial) Wetland
Approximately **0.47 acre** of the permanent (perennial) wetland land cover type is present in the project area (Table 1, Figure 3A). As described by the HCP/NCCP, permanent wetlands are characterized by a year-round water source. They are typically dominated by erect, rooted, herbaceous hydrophytic plant species adapted to growing in conditions of prolonged inundation (Chapter 3, page 3-16).

Within the project area, permanent wetland is located in the manmade drainage channel north of Sand Creek, and along the banks and within the channel of Sand Creek (Figure 3A; Figure 3B, Photos 4, 8, 9, 11, 17 and 18). This vegetation type is dominated by a narrow-leafed cattail (*Typha angustifolia*) and water cress (*Rorippa nasturtium-aquaticum*). Other plant species present in this vegetation type include spiny buttercup (*Ranunculus muricatus**), cursed crowsfoot (*Ranunculus sceleratus**), whorled marsh pennywort (*Hydrocotyle verticillata*), brass-buttons (*Cotula coronopifolia**), American tule (*Scirpus americanus*), salt rush (*Juncus lesueurii*), Baltic rush (*Juncus balticus*), water bentgrass (*Agrostis viridis**), and rabbitsfoot grass (*Polypogon monspeliensis**).

Project Impacts
The project will temporarily impact approximately **0.47 acre** from expansion of the existing basin inlet and construction activities which will be replaced after construction. The impacts from the basin inlet expansion (0.04 acre) will be subject to the development fee but not the wetland impact fees (Table 1, Figure 3A).

Seasonal Wetlands
Approximately **2.18 acres** of the seasonal wetland land cover type is present in the project area (Table 1, Figure 3A). As described by the HCP/NCCP, seasonal wetlands are freshwater wetlands that support ponded or saturated soil conditions during winter

and spring and are dry through the summer and fall until the first substantial rainfall (Chapter 3, page 3-17).

Within the project area, a small circular seasonal wetland is located near the western boundary of the study area (Figure 3A; Figure B, Photo 10). Seasonal wetland species present in this wetland include stalked popcorn flower (*Plagiobothrys stipitatus* var. *stipitatus*), dwarf allocarya (*Plagiobothrys humistratus*), green dock (*Rumex conglomeratus*), and toad rush (*Juncus bufonius*). Seasonal wetlands are also present along the margins of the manmade drainage channel, where it floods seasonally (Figure 3A; Figure 3B, Photos 8, 9, 11, 18, and 19). Plant species found in the seasonal wetland adjacent to the permanent wetland include California semaphore grass (*Pleuropogon californicus*), rabbitsfoot grass*, brass-buttons*, water cress, green dock, spiny buttercup*, cursed crowsfoot*, Italian ryegrass*, meadow barley (*Hordeum brachyantherum*), hyssop loosestrife (*Lythrum hyssopifolium**), and strawberry clover (*Trifolium fragiferum**).

Project Impacts

The project will temporarily impact approximately **2.18 acres** of the seasonal wetland within the existing drainage basin from construction activities which will be replaced after construction. The impacts from the basin inlet expansion (0.02 acre) will be subject to the development fee but not the wetland impact fees (Table 1, Figure 3A).

Stream

Approximately **3,934 feet (1.87 acres)** is present in the project area (Sand Creek) which includes approximately 110 feet of permanent wetland (PW-1) and 50 feet of concrete piped culverts (3A-3C) (Figure 3A; Attachment A, Figure 5). The HCP/NCCP defines a stream as a long, narrow body of flowing water that occupies a channel with a defined bed and bank and moves to lower elevations under the force of gravity (Chapter 3, page 3-19).

Sand Creek is shown as a “blue-line stream” on the Antioch South 7.5 minute USGS quadrangle and is considered an intermittent stream. The average width of the stream from top of bank to top of bank is approximately 21 feet. Land cover types that occur within the stream include 0.02 acre permanent wetland, 0.31 acre riparian woodland/scrub, 1.45 acres annual grassland, and 0.09 acre ruderal, which total 1.87 acre. Annual grassland and ruderal primarily occur upstream of the existing basin outfall pipes; open water, riparian woodland/scrub, annual grassland, and ruderal land cover types occur downstream of the outfall pipes (Figure 3A; Figure 3B). Sand Creek exhibits an ordinary high water mark, evidence of scour, and is mostly unvegetated; the average width of the ordinary high water mark is 8 feet.

Project Impacts

Basin inlet and outlet structures will be constructed within Sand Creek with associated rock slope protection. After re-alignment of the creek, the project will permanently impact **292 linear feet (0.16 acre)**. Approximately **3,642 feet (1.71 acre)** will be temporarily removed during construction (Table 1, Figure 3A).

Urban

The HCP/NCCP defines urban sites as areas where the native vegetation has been cleared for residential, commercial, industrial, transportation, or recreational structures.

Developed areas include areas that have structures, paved surfaces, horticultural plantings, and lawns smaller than 10 acres (Chapter 3, page 3-25).

Approximately 0.18 acre of the project area is developed with the basin inlet and outlet structures at the beginning and end of the drainage within the basin (Table 1; Figure 3A; Figure 3B, Photos 4, 5, 11, 12, 22, and 23). A ranch complex that formerly occupied the southwest portion of the project area was removed in February 2011 (Figure 3A).

The total permanent impact acreage subject to the HCP/NCCP development mitigation fee is 6.89 acres (6.72 acres permanent acres as detailed in Table 1 above plus 0.17 acre of riparian, permanent wetland and seasonal wetland that will be impacted but mitigated on site) and 292 linear feet for the wetland mitigation fee.

The total temporary impact acreage subject to the HCP/NCCP development fee is 57.63 acres; temporary impact to wetland land cover types (riparian, permanent, and seasonal wetland) is 3.38 acres and the stream is 3,642 feet. However, based on discussions with the Conservancy, the temporary impact fees may be waived due to on-site mitigation.

Field-Verified Land Cover Map

Insert field-verified land cover map. The map should contain all land cover types present on-site. The map should be representative of an aerial photo. Identify all pages of the field-verified land cover map as **(Figure 3a). Please attach representative photos of the project site (Figure 3b).**

Jurisdictional Wetlands and Waters

Jurisdictional wetlands and waters are defined on pages 1-18 and 1-19 of the Final HCP/NCCP as the following land cover types: permanent wetland, seasonal wetland, alkali wetland, aquatic, pond, slough/channel, and stream. (It should be noted that definitions of these features differ for state and federal jurisdictions.) If you have identified any of these land cover types to be present on the project site in Table 1, complete the section below.

Indicate agency that certified the wetland delineation:

☒ USACE, ☐ RWQCB, or ☐ the ECCC Habitat Conservancy.

☒ Wetland delineation is attached (Jurisdictional Determination) (Attachment A)

Provide any additional information on Impacts to Jurisdictional Wetland and Waters below.

A routine wetland delineation was performed by Nomad Ecology (Nomad) wetland specialists Heath Bartosh and Erin McDermott on April 10 and April 11, 2008. The field studies were conducted in accordance with the U.S. Army Corps of Engineers' (USACE) Wetlands Delineation Manual (Environmental Laboratory 1987) and the Interim Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region. In addition, Mr. Bartosh and Ms. McDermott conducted planning survey visits on March 26 and May 16, 2008.

The wetland delineation included the project area with the exception of a portion of eastern adjacent property (Aviano-Williamson Property) due to property access restrictions. As previously mentioned, numerous biological studies were conducted on the Aviano-Williamson Property in the 1990's because the property was included in the larger Sand Creek Specific Plan Area. More recent biological studies were conducted in 2002, 2005, and 2007. Monk & Associates conducted a wetland delineation of the Aviano-Williamson Property in April 2005 which was verified by the USACE in July 2006. A portion of Sand Creek is present in this portion of the property; no wetlands are present.

Nomad issued the final wetland delineation report in June 2009 which was verified by the USACE in May 2010. After the Flood Control District officially acquired the portion of the adjacent Aviano-Williamson Property needed for the project, the wetland delineation map was revised to include that portion of the adjacent property which was re-verified by the USACE in April 2012 (Attachment A).

The following federal and state jurisdictional waters and wetlands occur within the project area:

Stream

According to the wetland delineation, the expansion area includes 3,934 linear feet (0.72 acre) of Sand Creek. Sand Creek is both a federal and state jurisdiction feature. The ordinary high water mark (OHWM) averages approximately 8 feet wide. Approximately 3,642 feet (0.67 acre) will be temporarily impacted during construction of the project and will be mitigated on site in-kind at a 1:1 ratio with a re-constructed and restored geomorphic creek design. The remaining 292 feet (0.03 acre) will be permanently lost

and will be mitigated on site in-kind at a 1:1 ratio by widening the restored channel to include an additional 0.03 acre of stream habitat.

Permanent (Perennial) Wetland
Sand Creek also contains 0.02 acre of permanent wetlands (which are included in 0.72 acre Sand Creek) (Attachment A, Figure 5, PW-2) that will also be temporarily impacted during construction of the project which will be mitigated on site at a 1:1 ratio.

Seasonal Wetland
The project will temporarily impact the 0.01 acre of USACE-jurisdictional seasonal wetland above the basin inlet (Attachment A, Figure 5, SW-1) during construction of the project which will be mitigated on site in-kind at a 1:1 ratio.

An application for authorization under the USACE Regional General Permit 1 has been submitted to the USACE in June 2012. The RGP states that the loss of waters of the U.S. (including wetlands) may not exceed 1.5 acres or 300 linear feet of waters of the U.S. The project will result in a total impact of 0.70 acre to USACE-jurisdictional features; proposed on-site mitigation to offset the impacts total 0.70 acre. Therefore, the project will have no net loss of waters of the U.S., including wetlands. In addition to the on-site mitigation for impacts to USACE jurisdictional areas, the Flood Control District will mitigate the impacts to state-jurisdictional wetland and stream habitats by on-site mitigation and fees as described further in the Mitigation Measures section.

Species-Specific Planning Survey Requirements

Based on the land cover types found on-site and identified in Table 1, check the applicable boxes in Table 2a then provide the results of the planning surveys below. In Table 3 check corresponding preconstruction survey or notification requirements that are triggered by the presence of particular landcover types or species habitat elements as identified in Table 2a. The species-specific planning survey requirements are described in more detail in Section 6.4.3 of the HCP/NCCP.

Table 2a. Species-Specific Planning Survey Requirements Triggered by Land Cover Types and Habitat Elements in the project area based on Chapter 6 of the Final HCP/NCCP.

Land Cover Type in the project area?	Species	Habitat Element in the project area?	**Planning Survey Requirement**
☒ Grasslands, oak savanna, agriculture, ruderal	San Joaquin kit fox	Assumed if within modeled range of species	Identify and map potential breeding and denning habitat and potential dens if within modeled range of species (see Appendix D of HCP/NCCP).
	Western burrowing owl	Assumed	Identify and map potential breeding habitat.

Land Cover Type in the project area?	Species	Habitat Element in the project area?	**Planning Survey Requirement**
☒ Aquatic (ponds, wetlands, streams, slough, channels, & marshes)	Giant garter snake	☐ Aquatic habitat accessible from San Joaquin River	Identify and map potential habitat.
	California tiger salamander	☒ Ponds and wetlands in grassland, oak savanna, oak woodland ☐ Vernal pools ☐ Reservoirs ☐ Small lakes	Identify and map potential breeding habitat. Document habitat quality and features. Provide Implementing Entity with photo-documentation and report.
	California red-legged frog	☒ Slow-moving streams, ponds, and wetlands	Identify and map potential breeding habitat. Document habitat quality and features. Provide Implementing Entity with photo-documentation and report.
☒ Seasonal wetlands	Covered shrimp	☒ Vernal pools ☐ Sandstone rock outcrops ☐ Sandstone depressions	Identify and map potential breeding habitat.
Any	Townsend's big-eared bat	☐ Rock formations with caves ☐ Mines ☐ Abandoned buildings outside urban areas	Map and document potential breeding or roosting habitat.
	Swainson's hawk	☒ Potential nest sites (trees within species' range usually below 200')	Inspect large trees for presence of nest sites.
	Golden eagle	☒ Potential nest sites (secluded cliffs with overhanging ledges; large trees)	Document and map potential nests.

[a] Vernal pool fairy shrimp, vernal pool tadpole shrimp, longhorn fairy shrimp, and midvalley fairy shrimp.

Results of Species-Specific Planning Surveys Required in Table 2a

1. Describe the results of the planning survey conducted as required in Table 2a. Planning surveys will assess the location, quantity, and quality of suitable habitat for specified covered wildlife species on the project site. Covered species are assumed to occupy suitable habitat in impact areas and mitigation is based on assumption of take.

The study area is located on the Antioch South, California U.S. Geological Survey 7.5-minute topographic quadrangle map in the southwest quarter of Section 9 of Township 1N, Range 2E, at a latitude of 37.94505 decimal degrees and a longitude of -121.76882 decimal degrees (WGS84 datum) (Figure 1).

Background information for listed and special-status plant and wildlife species, and sensitive natural communities was compiled through a review of the following resources as reported in the Biological Resource Assessment (Nomad Ecology 2010):

U.S. Fish and Wildlife Service (USFWS):

- Endangered and Threatened Wildlife and Plants
- Federal Endangered and Threatened Species that Occur in or may be Affected by Projects in Contra Costa County
- Federal Endangered and Threatened Species that Occur in or may be Affected by Projects in the, Antioch North, Antioch South, Brentwood, Byron Hot Springs, Clayton, Diablo, Honker Bay, Jersey Island, and Tassajara USGS 7 ½ Minute Quads
- National Wetland Inventory for the Antioch South Quadrangle

National Oceanic and Atmospheric Administration Fisheries (NOAA Fisheries):

- Endangered and Threatened Species; Establishment of Species of Concern List, Addition of Species to Species of Concern List, Description of Factors for Identifying Species of Concern, and Revision of Candidate Species List Under the Endangered Species Act
- Endangered and Threatened Species; Revision of Species of Concern List, Candidate Species Definition, and Candidate Species List

California Department of Fish and Game (CDFG):

- List of California Terrestrial Natural Communities Recognized by the California Natural Diversity Database
- List of California Vegetation Alliances. The Vegetation Classification and Mapping Program
- Complete List of Amphibian, Reptile, Bird and Mammal Species in California
- State and Federally Listed Endangered, Threatened and Rare Plants of California
- State and Federally Listed Endangered and Threatened Animals of California
- Special Vascular Plants, Bryophytes, Lichens List
- Special Animals
- California Natural Diversity Database (CNDDB) Query for the Antioch North, Antioch South, Brentwood, Byron Hot Springs, Clayton, Diablo, Honker Bay, Jersey Island, and Tassajara USGS 7 ½ Minute Quad

Other Sources:

- East Contra Costa County Habitat Conservation Plan and Natural Community Conservation Plan
- The Jepson Manual: Higher Plants of California
- The California Native Plant Society's Inventory of Rare and Endangered Plants of California
- Specimen Management System for California Herbaria
- Contra Costa County Breeding Bird Atlas
- Contra Costa County Watershed Atlas
- Annotated Checklist of the East Bay Flora
- Unusual and Significant Plants of Alameda and Contra Costa Counties. Seventh Edition
- City of Antioch Code of Ordinances: Section 9.5.12 Tree Preservation and Regulation

Nomad Ecology (Nomad) conducted the planning surveys of the project area in 2008 with the exception of a portion of the eastern adjacent property (Aviano-Williamson property). As previously mentioned, numerous biological studies were conducted on the Aviano-Williamson Property in the 1990's because the property was included in the larger Sand Creek Specific Plan Area. More recent biological studies were conducted in 2002, 2005, and 2007. Live Oak Associates conducted surveys for biotic communities on February 6, 2007. Live Oak Associates conducted surveys for amphibians and reptiles on April 13, May 15, and June 6, 2002 and February 3, 2007. Live Oak Associates conducted a habitat evaluation for the San Joaquin kit fox and burrowing owl on June 6, 7, 13, and 16, and July 9 and 11, 2002.

Nomad botanists Heath Bartosh and Erin McDermott conducted site visits and planning surveys on March 26, April 10, April 11, May 16, and September 26, 2008. Nomad wildlife ecologists Jerry Roe, Deanna Dawn, Greg Yost, and Patrick Kobernus conducted site visits and planning surveys on March 26, and April 11, May 19, and June 20, 2008. All proposed impact areas and vegetation communities within the accessible project area were visited and evaluated for their potential to support sensitive biological resources. All wildlife species observed or recognized by diagnostic sign (*e.g.* tracks, scat, burrow activity, carcasses, castings, prey remains, *etc*.) were recorded and identified. Survey results were reported in Nomad's Biological Resource Assessment report.

Nomad conducted a CNDDB query search in December 2011 and follow-up wildlife species surveys in March 2012 for the interim basin excavation as reported in the final Planning Survey Report dated May 24, 2012 and as described below and shown on Figure 4 (Nomad Ecology 2011, 2012).

<u>San Joaquin Kit Fox (SJKF)</u>

HCP/NCCP land cover types providing suitable SJKF breeding habitat include annual and alkali grasslands, ruderal, oak savannah; foraging and movement habitats include annual and alkali grasslands, ruderal, oak savannah, seasonal wetlands, and cultivated agriculture (HCP/NCCP Table 3-9). Figure 02c in Appendix D of the HCP/NCCP shows the basin within suitable core habitat. Core habitat is defined as annual grassland, alkali grassland, and oak savannah contiguous with grassland (Chapter 4, p. 4-15). Twenty-

four (24) sightings of SJKF have been reported in Contra Costa County between 1973 and 2002; the most recent sighting was located approximately 12 miles to the south. The nearest sightings are located approximately 3.5 miles to the south in Briones Valley in 1975 and to the west near Contra Loma Reservoir and Black Diamond Mines in 1991 and 1992. The Mount Diablo foothills are an important movement and dispersal corridor for this species and comprise the northernmost portion of their range.

Planning surveys confirmed that the project area contains suitable breeding, foraging and dispersal habitat. On-going monitoring of on-site burrows from March to June 2012 has not indicated use by SJKF (Nomad Ecology 2012).

Western Burrowing Owl

HCP/NCCP land cover types providing suitable breeding and foraging habitat include annual and alkali grasslands, ruderal, seasonal wetlands, and cultivated agriculture (HCP/NCCP Table 3-9). Figure 05c in Appendix D of the HCP/NCCP shows the basin located within suitable habitat. Thirteen (13) occurrences have been reported within a two-mile radius of the project area; the nearest reported occurrence is located on the adjacent property to the east dating from 2007 when two adults were observed.

Planning surveys confirmed that the basin contains suitable breeding and foraging habitat due to numerous ground squirrel burrows. Surveys conducted in March 2012 confirmed the presence of at least 8 burrowing owls with 6 exhibiting pair formation (PSR, May 2012). Monitoring of on-site burrows showed a decrease of owl occupation and no active burrow nests by end of June 2012 (Nomad Ecology 2012).

California Tiger Salamander (CTS)

HCP/NCCP land cover types providing suitable breeding habitats include perennial, seasonal, aquatic/pond and stream; aestivation, movement, foraging habitats include annual grassland, alkali grassland, chaparral/scrub, oak savannah, oak woodland, riparian woodland, perennial, seasonal, alkali wetlands, aquatic ponds and streams; aquatic stream and cultivated agriculture land cover types also provide movement habitat (HCP/NCCP Table 3-9). Figure 11c in Appendix D of the HCP/NCCP shows the basin located within suitable migration and aestivation habitat. CTS have been reported to breed in a stock pond approximately 1,000 feet south of Sand Creek; egg masses and larvae were observed in 2001, 2002 and 2005. An additional stock pond supported breeding east of Deer Valley Road identified by surveys conducted in 1996, 1998, 2001 and 2006. Several other sightings were reported in the vicinity of the basin.

Planning surveys confirmed that the basin contains suitable upland habitat. Seasonal wetlands on site provide marginal quality breeding habitat; the seasonal wetland located above the drainage inlet (SW-1) does not pond water for sufficient duration to support breeding. The seasonal wetlands located along the drainage within the basin are subject to rapid fluctuations in depth and water flow. Given the proximity of CTS to the basin, it is possible that individuals of this species could attempt to breed in these wetlands; however, eggs or larvae would likely get flushed into Sand Creek and these wetlands may ultimately function as an attractive nuisance (Attachment A, Figure 5, SW-1 through SW-4); All non-aquatic areas within basin area provide suitable upland aestivation habitat, primarily due to the abundance of ground squirrel burrows. This area serves as an important movement corridor for individuals travelling to the east, south and west.

California Red-Legged Frog (CRLF)

HCP/NCCP land cover types providing suitable breeding habitats include perennial and seasonal wetlands, aquatic/pond and stream; aestivation, movement, and foraging habitats include annual grassland, alkali grassland, ruderal, chaparral/scrub, oak savannah, oak woodland, riparian woodland, aquatic ponds and streams; cultivated agriculture also provides movement habitat (HCP/NCCP Table 3-9). Figure 12c in Appendix D of the HCP/NCCP shows the basin located within potential migration and aestivation habitat; potential breeding habitat has been identified within Sand Creek. Six (6) individuals were reported in Sand Creek approximately 1,400 feet upstream of the basin in 2005. CRLF were reported breeding in a large perennial pond approximately ½ mile to the southwest in 2001 and 2002. A single adult CRLF was observed during the April 2008 site visit approximately 1,000 feet downstream of the basin outfall pipes.

Planning surveys confirmed that the non-aquatic area within the basin contains suitable upland aestivation, foraging, migration habitat; suitable breeding habitat is present within deeper portions of Sand Creek, in particular those areas downstream from the basin outfall pipes (Figure B, Photo 7). Although the permanent and seasonal wetlands within the basin (PW-1, SW-2 – SW-4) may provide suitable breeding conditions at various times of the year, the rapid fluctuations in water flow and depth significantly diminish its utility for breeding and may subject egg masses and tadpoles to desiccation, predation, etc.

Swainson's Hawk

HCP/NCCP land cover types providing suitable breeding habitat include riparian woodland; suitable foraging habitats include annual and alkali grasslands, cultivated agriculture, and at times ruderal and urban/developed areas (HCP/NCCP Table 3-9). Figure 06c in Appendix D of the HCP/NCCP does not show the basin located within an area as potential breeding or foraging habitat. An active nest was reported in 2007 approximately one mile to the east in a valley oak along Sand Creek with similar riparian characteristics as the easternmost portion of the creek within the project area. Two additional nests were reported in 2007 approximately 4 miles to the southeast along Marsh Creek.

Planning surveys confirmed that the basin contains suitable foraging and nesting habitat; nesting habitat is present within the trees along Sand Creek (upstream and downstream of the basin) (Figures 3A, 3B, 4). Swainson's hawks were observed soaring over the basin during the surveys in 2008 and in April 2012. No active nests have been observed within 1,000 feet of the basin during any of the surveys to date, including the 2012 surveys.

Golden Eagle

HCP/NCCP land cover types providing suitable breeding habitat include oak savannah, oak woodland, riparian woodland, and rock outcrops; suitable foraging habitats include annual grassland, alkali grassland, ruderal, chapparal/scrub, oak savannah, perennial, seasonal, and alkali wetlands, aquatic pond/slough/stream, cultivated agriculture, and at times urban/developed (HCP/NCCP Table 3-9). Figure 04c in Appendix D of the HCP/NCCP shows the basin located within suitable habitat. There are eight (8) reported occurrences of golden eagles nesting in eastern Contra Costa County all located from 6 to 14 miles to the south.

Planning surveys confirmed that the basin contains suitable foraging habitat (Figures 3A, 3B, 4). A pair of golden eagles was observed flying over the basin to the northeast during the April 2008 and March 2012 surveys. Marginal nesting habitat is present within several scattered oak trees; however, golden eagles generally prefer taller, mature trees, cliffs, or tall manmade structures for nesting and are not likely to nest in the vicinity of the basin. No active golden eagle nest sites were observed within a ½-mile of the basin during any of the surveys to date.

Tri-Colored Blackbird

HCP/NCCP land cover types providing suitable breeding and foraging habitats include riparian woodland, perennial wetland, and at times ruderal; cultivated agriculture lands provide foraging habitat (HCP/NCCP Table 3-9). Figure 03c in Appendix D of the HCP/NCCP shows the basin located within primary foraging habitat; suitable core habitat occurs within Sand Creek downstream. Tricolored blackbird primarily inhabit and nest in freshwater marshes dominated by cattails (*Typha* spp.) and bulrushes (*Schoenoplectus* spp.); breeding occurs from late March to early August and may be double-brooded. A colony of over 1,000 tricolored blackbirds was observed at Marsh Creek Reservoir in 1989 (CNDDB EONDX #7175) located 5 miles to the southeast and the species is a confirmed breeder in Contra Costa County.

Planning surveys confirmed that the basin contains suitable nesting and foraging habitat. Scattered tule/bulrush stands along the drainage within the basin and Sand Creek provide nesting habitat and the annual grasslands and seasonal wetlands provide foraging habitat (Figure 3B, Photos 17 and 18). Several tricolored blackbirds were observed within a flock of red-winged blackbirds in a dense stand of emergent vegetation within the basin in April 2008, and one was observed within a flock of red-winged blackbirds in April 2012.

Vernal Pool Fairy Shrimp

HCP/NCCP land cover types for vernal pool fairy shrimp include seasonal wetlands (SW-1) (year-round) (HCP/NCCP Table 3-9). This species has been reported less than one mile to the west in Lone Tree Valley between Deer Valley Road and Empire Mine Road in 2003, and three miles south at Cowell Ranch between 1993 and 1997. This species has been reported in a large number of pools centered from the Ginochio property approximately one mile to the southeast in 2002.

Planning surveys confirmed that the seasonal wetland located above the basin inlet contains suitable habitat (Figures 3A, 4; Attachment A, Figure 5, SW-1). Seasonal wetland SW-1 is formed by a small, shallow depression that likely holds water for sufficient duration during the rainy season to support a full life cycle for vernal pool fairy shrimp. Seasonal wetlands SW-2, SW-3 and SW-4 located within the basin exhibit characteristics of freshwater marsh as they are located along the main perennial channel within the detention basin and are subject to continuous water flow ranging from 1-5 cubic feet per second during summer months, and stochastic inundation and high flows during the rainy season.

Based on the presence of shrimp species on neighboring properties, it is feasible that vernal pool fairy shrimp could be transported to the study area by waterfowl and/or mammals (from their feet, feathers, or fur). While seasonal wetland SW-1 does not support habitat features characteristic of vernal pools inhabited by this species, it likely holds water for sufficient duration during the rainy season to support a full life cycle.

Seasonal wetlands SW-2 through SW-4 do not provide suitable vernal pool fairy shrimp habitat because they would not be able to support a full life cycle of fairy shrimp due to water flows.

2. Reference and attach the Planning Survey Species Habitat Maps as required in Table 2a (Figure 4).

Covered and No-Take Plants

On suitable land cover types, surveys for covered and no-take plants must be conducted using approved CDFG/USFWS methods during the appropriate season to identify any covered or no-take plant species that may occur on the site (see page 6-9 of the Final HCP/NCCP). Based on the land cover types found in the project area and identified in Table 1, check the applicable boxes in Table 2b and provide a summary of survey results as required below. If any no-take plants are found in the project area, the provisions of Conservation Measure 1.11 must be followed (see *Avoidance and Minimization Measures* below).

Table 2b. Covered and No-Take Plant Species, Typical Habitat Conditions, and Typical Blooming Periods

Land Cover Type in the project area?	Plant Species	Covered (C) or No-Take (N)?	Typical Habitat or Physical Conditions, if Known	Typical Blooming Period[a]
☐ Oak savanna	Diablo Helianthella (*Helianthella castanea*)	C	Elevation above 650 feet[b]	Mar–Jun
	Mount Diablo fairy-lantern (*Calochortus pulchellus*)	C	Elevation between 650 and 2,600 feet[b]	Apr–Jun
☐ Oak woodland	Brewer's dwarf flax (*Hesperolinon breweri*)	C		May–Jul
	Diablo Helianthella (*Helianthella castanea*)	C	Elevation above 650 feet[b]	Mar–Jun
	Mount Diablo fairy-lantern (*Calochortus pulchellus*)	C	Elevation between 650 and 2,600 feet[b]	Apr–Jun
	Showy madia (*Madia radiata*)	C		Mar–May
☐ Chaparral and scrub	Brewer's dwarf flax (*Hesperolinon breweri*)	C		May–Jul
	Diablo Helianthella (*Helianthella castanea*)	C	Elevation above 650 feet[b]	Mar–Jun
	Mount Diablo buckwheat (*Eriogonum truncatum*)	N		Apr–Sep; uncommonly Nov–Dec.

Land Cover Type in the project area?	Plant Species	Covered (C) or No-Take (N)?	Typical Habitat or Physical Conditions, if Known	Typical Blooming Period[a]
	Mount Diablo fairy-lantern (*Calochortus pulchellus*)	C	Elevation between 650 and 2,600 feet[b]	Apr–Jun
	Mount Diablo Manzanita (*Arctostaphylos auriculata*)	C	Elevation between 700 and 1,860 feet; restricted to the eastern and northern flanks of Mt. Diablo[b]	Jan–Mar
☐ Alkali grassland	Brittlescale (*Atriplex depressa*)	C	Restricted to soils of the Pescadero or Solano soil series; generally found in southeastern region of plan area[b]	May–Oct
	Caper-fruited tropidocarpum (*Tropidocarpum capparideum)*	N		Mar-Apr
	Contra Costa goldfields (*Lasthenia conjugens*)	N	Generally found in vernal pools	Mar–Jun
	Recurved larkspur (*Delphinium recurvatum*)	C		Mar–Jun
	San Joaquin spearscale (*Atriplex joaquiniana*)	C		Apr-Oct
☐ Alkali wetland	Alkali milkvetch (*Astragalus tener* ssp. *tener*)	N		Mar–Jun
	Brittlescale (*Atriplex depressa*)	C	Restricted to soils of the Pescadero or Solano soil series; generally found in southeastern region of plan area[b]	May–Oct
	San Joaquin spearscale (*Atriplex joaquiniana*)	C		Apr–Oct
☒ Annual grassland	Alkali milkvetch (*Astragalus tener* ssp. *tener*)	N		Mar–Jun
	Big tarplant (*Blepharizonia plumosa*)	C	Elevation below 1500 feet[b]	Jul–Oct

Land Cover Type in the project area?	Plant Species	Covered (C) or No-Take (N)?	Typical Habitat or Physical Conditions, if Known	Typical Blooming Period[a]
	Brewer's dwarf flax (*Hesperolinon breweri*)	C	Restricted to grassland areas within a 500+ buffer from oak woodland and chaparral/scrub[b]	May–Jul
	Contra Costa goldfields (*Lasthenia conjugens*)	N	Generally found in vernal pools	Mar–Jun
	Diamond-petaled poppy (*Eschscholzia rhombipetala*)	N		Mar–Apr
	Large-flowered fiddleneck (*Amsinckia grandiflora*)	N		Apr–May
	Mount Diablo buckwheat (*Eriogonum truncatum*)	N		Apr–Sep; uncommonl y Nov–Dec
	Mount Diablo fairy-lantern (*Calochortus pulchellus*)	C	Elevation between 650 and 2,600[b]	Apr–Jun
	Round-leaved filaree (*California macrophylla*)[1]	C		Mar–May
	Showy madia (*Madia radiata*)	C		Mar–May
☒ Seasonal wetland	Adobe navarretia (*Navarretia nigelliformis* ssp. *nigelliformis*)	C	Generally found in vernal pools[b]	Apr–Jun
	Alkali milkvetch (*Astragalus tener* sp. *tener*)	N		Mar–Jun
	Contra Costa goldfields (*Lasthenia conjugens*)	N	Generally found in vernal pools	Mar–Jun

[a] From California Native Plant Society. 2007. *Inventory of Rare and Endangered Plants* (online edition, v7-07d). Sacramento, CA. Species may be identifiable outside of the typical blooming period; a professional botanist shall determine if a covered or no take plant occurs on the project site.

[b] See Species Profiles in Appendix D of the Final HCP/NCCP.

Results of Covered and No-Take Plant Species Planning Surveys Required in Table 2b

Describe the results of the planning survey conducted as required in Table 2b. Describe the methods used to survey the site for all covered and no-take plants, including the dates and times of all survey's conducted (see Tables 3-8 and 6-5 of the HCP/NCCP for covered and no-take plants). In order to complete all the necessary covered and no-take plant surveys, both spring and fall surveys are required, check species survey requirements below.

<u>If any covered or no-take plants were found, include the following information in the results summary:</u>

- Description and number of occurrences and their rough population size.
- Description of the "health" of each occurrence, as defined on pages 5-49 and 5-50 of the HCP/NCCP.
- A map of all the occurrences.
- Justification of surveying time window, if outside of the plant's blooming period.
- The CNDDB form(s) submitted to CDFG (if this is a new occurrence).
- A description of the anticipated impacts that the covered activity will have on the occurrence and/or how the project will avoid impacts to all covered and no-take plant species. All projects must demonstrate avoidance of all six no-take plants (see table 6-5 of the HCP/NCCP).

There are seventeen (17) covered and no-take plant species listed in the HCP/NCCP. Nomad botanists Heath Bartosh and Erin McDermott conducted focused botanical/planning surveys in March, April, May, and September 2008 with the exception of the adjacent Aviano-Williamson Property. All proposed impact areas and vegetation communities were visited and evaluated for their potential to support sensitive botanical resources. All plant species in bloom or otherwise recognizable were identified to a level necessary to determine their regulatory status. During these surveys an inventory of plant species observed was recorded.

Focused botanical surveys were conducted for special-status plant species (including HCP/NCCP covered plants) in accordance with California Native Plant Society's Botanical Survey Guidelines (CNPS 2001), California Department of Fish and Game's *Guidelines for Assessing the Effects of Proposed Projects on Rare, Threatened, and Endangered Plants and Natural Communities* (CDFG 2000), and U.S. Fish and Wildlife's *Guidelines for Conducting and Reporting Botanical Inventories for Federally Listed, Proposed and Candidate Plants* (USFWS 2000). Surveys for target species were conducted by walking transects up to 10 meters apart depending on the topography or subject plant community.

No HCP/NCCP-covered plant species or no-take species occur within the project area (refer to Table 4 of Nomad's Biological Resources Assessment Report on the following page). Monk & Associates focused botanical surveys of the adjacent Aviano-Williamson Property in 2005 reported the presence of approximately 200 round-leaved filaree plants south of Sand Creek, approximately 1,000 feet east of the project area (Figure 4). This taxon was determined to be absent in the project area. No federal and/or state listed and California rare plant species, and no additional CNPS listed plant species are considered to have the potential to occur within the project area.

The Flood Control District has since determined that an approximate 3-acre area just north of the basin will be used for a staging area and storage area. This area consists of ruderal land cover type in the western portion and annual grassland in the remaining area. According to Nomad, two covered plant species have the potential to occur in this area: round-leaved filaree (*California macrophylla*) and showy golden madia (*Madia radiata*). One survey will be conducted for both of these species in April 2013.

III. Species-Specific Monitoring and Avoidance Requirements

This section discusses subsequent actions that are necessary to ensure project compliance with Plan requirements. Survey requirements and Best Management Practices pertaining to selected covered wildlife species are detailed in Section 6.4.3, *Species-Level Measures*, beginning on page 6-36 of the Final HCP/NCCP.

Preconstruction Surveys for Selected Covered Wildlife

If habitat for selected covered wildlife species identified in Table 2a was found to be present in the project area. In Table 3, identify the species for which preconstruction surveys or notifications are required based on the results of the planning surveys. Identify whether a condition of approval has been inserted into the development contract to address this requirement.

Table 3. Applicable Preconstruction Survey and Notification Requirements based on Land Cover Types and Habitat Elements Identified in Table 2a.

Species	Preconstruction Survey and Notification Requirements
☐ None	
☒ San Joaquin kit fox (p. 6-38)	Map all dens (>5 in. diameter) and determine status. Determine if breeding or denning foxes are in the project area. Provide written preconstruction survey results to FWS within 5 working days after surveying.
☒ Western burrowing owl (p. 6-40)	Map all burrows and determine status. Document use of habitat (e.g. breeding, foraging) in/near disturbance area (within 500 ft.)
☐ Giant garter snake (p. 6-44)	Delineate aquatic habitat up to 200 ft. from water's edge. Document any sightings of garter snake.
☐ California tiger salamander (p. 6-46) (notification only)	Provide written notification to USFWS and CDFG regarding timing of construction and likelihood of occurrence in the project area.
☐ California red-legged frog (p. 6-47) (notification only)	Provide written notification to USFWS and CDFG regarding timing of construction and likelihood of occurrence in the project area.
☒ Covered shrimp species (p. 6-47)	Document and evaluate use of all habitat features (e.g., vernal pools, rock outcrops). Document occurrences of covered shrimp.
☐ Townsend's big-eared bat (p. 6-37)	Determine if site is occupied or shows signs of recent occupation (guano).
☐ Swainson's hawk (p. 6-42)	Determine whether nests are occupied.
☐ Golden eagle (p. 6-39)	Determine whether nests are occupied.
Note: Page numbers refer to the HCP/NCCP.	

Preconstruction Surveys as Required for Selected Covered Wildlife in Table 3

Describe the preconstruction survey's or notification conditions applicable to any species checked in Table 3. All preconstruction surveys shall be conducted in accordance with the requirements set forth in Section 6.4.3, *Species-Level Measures*, and Table 6-1 of the HCP/NCCP.

The project will have unavoidable impacts to covered species habitats. Based on planning survey results and recent on-going monitoring and surveys of the wildlife species at the site, the project area contains suitable breeding/nesting habitat for California red-legged frog, burrowing owl, San Joaquin kit fox, Swainson's hawk, tricolored blackbird, and white-tailed kite. On-site burrows provide potential breeding habitat for San Joaquin kit fox and have been occupied by burrowing owls. The riparian woodland/scrub within Sand Creek provides suitable nesting habitat for Swainson's hawk and white-tailed kite. The cattails, tules and bulrush within the basin drainage and Sand Creek provide suitable nesting habitat for tricolored blackbird.

Since project construction is scheduled to begin in spring 2013, or spring of any construction year, the following measures will be implemented during the non-nesting season:

San Joaquin Kit Fox

- Prior to any ground disturbance related to covered activities, a USFWS-approved biologist will conduct a preconstruction survey of areas identified in the planning surveys as supporting suitable breeding or denning habitat for SJKF. The surveys will establish the presence or absence of SJKF and/or suitable dens and evaluate use by SJKF in accordance with USFWS survey guidelines (U.S. Fish and Wildlife Service 1999).

- In accordance with the ECCC HCP/NCCP, preconstruction surveys will be conducted no more than 30 days before ground disturbance.

- The biologist will survey the proposed disturbance footprint and a 250-foot radius from the perimeter of the proposed footprint to identify SJKF and/or suitable dens.

- Adjacent parcels under different land ownership will not be surveyed.

- The status of all dens will be determined and mapped.

- Written results of preconstruction surveys will be submitted to USFWS within five working days after survey completion and before the start of ground disturbance.

- Concurrence is not required prior to initiation of covered activities.

- If SJKF and/or suitable dens are identified in the survey area, the measures described in the following section (Construction Monitoring & Avoidance and Minimization Measures) will be implemented.

Western Burrowing Owl

- Prior to any ground disturbance related to covered activities, a USFWS/CDFG-approved biologist will conduct a preconstruction survey in areas identified in the planning surveys as having potential burrowing owl habitat. The surveys will establish the presence or absence of western burrowing owl and/or habitat features and evaluate use by owls in accordance with CDFG survey guidelines.

- On the parcel where the activity is proposed, the biologist will survey the proposed disturbance footprint and a 500-foot radius from the perimeter of the proposed footprint to identify burrows and owls. Adjacent parcels under different land ownership will not be surveyed.

- Surveys will take place near sunrise or sunset in accordance with CDFG guidelines.

- All burrows or burrowing owls will be identified and mapped.

- Surveys will take place no more than 30 days prior to construction.

- During the breeding season (February 1 – August 31), surveys will document whether burrowing owls are nesting in or directly adjacent to disturbance areas. During the nonbreeding season (September 1 – January 31), surveys will document whether burrowing owls are using habitat in or directly adjacent to any disturbance area. Survey results will be valid only for the season (breeding or nonbreeding) during which the survey is conducted.

Based on on-going monitoring of on-site burrows from March to June 2012, burrowing owls occupy the site. Therefore, between September 2012 and January 2013, on-site burrows will be managed (i.e., collapsed, disked, etc.) by a qualified wildlife biologist to preclude burrowing owls and San Joaquin kit from occupying the site.

California Tiger Salamander, California Red-Legged Frog

No preconstruction surveys or construction monitoring are required by the HCP/NCCP. Since breeding habitat for CRLF is present within Sand Creek, written notification including photos and breeding habitat assessment will be submitted to the USFWS, CDFG, and Habitat Conservancy at least 30 days prior to removal of the breeding habitat to allow USFWS and/or CDFG staff to translocate individuals if requested.

USFWS or CDFG must notify the Flood Control District of their intent to translocate CRLF within 14 days of receiving notice from the Flood Control District. The Flood Control District must allow the USFWS or CDFG access to the site prior to construction if they request it.

There are no restrictions under the HCP on the nature of the disturbance or the date of the disturbance unless CDFG or USFWS notify the Flood Control District of their intent to translocate individuals within the required time period. In this case, the Flood Control District must coordinate the timing of disturbance of the breeding habitat to allow USFWS or CDFG to translocate individuals.

USFWs and CDFG shall be allowed 45 days to translocate individuals from the date the first written notification was submitted by the Flood Control District (or a longer period agreed to by the Flood Control District, USFWS, and CDFG).

Golden Eagle (no-take)

Trees within the project area that are proposed to be removed during construction will be removed between September 2012 and January 2013 to prevent potential nesting from occurring.

Prior to start of construction activities, a qualified biologist will conduct a preconstruction survey no more than 30 days prior to construction to establish whether or not nests of golden eagles are occupied. Nest occupancy will be determined by observation from the project area and public roads. If nests are occupied, minimization requirements and construction monitoring will be implemented.

Swainson's Hawk

Trees within the project area that are proposed to be removed during construction will be removed between September 2012 and January 2013 to prevent potential nesting from occurring.

Prior to any ground disturbance related to covered activities that occurs during the nesting season (March 15–September 15), a qualified biologist will conduct a preconstruction survey no more than 30 days prior to construction to establish whether Swainson's hawk nests within 1,000 feet of the project site are occupied. If potentially occupied nests within 1,000 feet are off the project site, then their occupancy will be determined by observation from public roads or by observations of Swainson's hawk activity (*e.g.*, foraging) near the project site. If nests are occupied, the measures described in the following section (Construction Monitoring & Avoidance and Minimization Measures) will be implemented.

Tricolored Blackbird

Based on on-going monitoring of on-site burrows conducted from March to June 2012, tricolored blackbird occupy the site. The HCP/NCCP identifies April 1 – August 1 as the nesting season. Therefore, between August 2012 and March 2013, suitable on-site nesting habitat (i.e., cattails, tules, bulrush) will be removed and managed as necessary to preclude tricolored blackbird and other birds from nesting on site.

Vernal Pool Fairy Shrimp

Wet season surveys of the seasonal wetland above the basin drainage inlet were conducted in 2010. Condor Country Consulting, Inc. (CCCI) (Wendy Dexter) conducted U.S. Fish and Wildlife Service (USFWS) guideline surveys, following the HCP/NCCP preconstruction survey modified requirements of the "Interim Survey Guidelines to Permittees for Recovery Permits under Section 10(a)(1)(A) of the Endangered Species Act for the Listed Vernal Pool Branchiopods" (Guidelines) (USFWS 1996) (CCCI 2010).

All observed characteristics of the pool suggested that the pool was suitable habitat for large branchiopods. The pool remained ponded for a sufficient duration to support large branchiopods and listed large branchiopods are known from the area. While invertebrates occupying the pool were typical of those in pools occupied by large branchiopods (i.e., fairy shrimp, tadpole shrimp, clam shrimp), no covered shrimp were found.

Upon request from the U.S. Fish and Wildlife Service (Stephanie Jentsch), the wet season survey report was provided to the Service in September 2010 via email by the Conservancy to supplement the U.S. Army Corps of Engineers request for Section 7 consultation.

Construction Monitoring & Avoidance and Minimization Measures for Selected Covered Species

If preconstruction surveys for key covered wildlife species establish the presence of any such species, construction monitoring will be necessary. In Table 4, check the boxes for the species that will be assessed during the preconstruction surveys (see Table 3). A summary of the construction monitoring requirements for each species is provided in Table 4 and these measures must be implemented in the event that preconstruction surveys described in Table 3 detect the covered species. A summary of avoidance measures is also provided in Table 4 and these measures must be implemented if construction monitoring detects the species or its sign. These construction monitoring and avoidance requirements are described in detail in Section 6.4.3, Species-Level Measures, of the Final HCP/NCCP.

Construction Monitoring Plan Requirements in Section 6.3.3, Construction Monitoring, of the Final HCP/NCCP:

☒ **Before implementing a covered activity, the applicant will develop and submit a construction-monitoring plan to the Implementing Entity[4] for approval.**

Table 4. Applicable Construction Monitoring Requirements

Species Assessed by Preconstruction Surveys	Monitoring Action Required if Species Detected
☐ None	N/A
☒ San Joaquin kit fox (p. 6-38)	Establish exclusion zones (>50 ft) for potential dens. Establish exclusion zones (>100 ft) for known dens. Notify USFWS of occupied natal dens.
☒ Western burrowing owl (p. 6-40)	Establish buffer zones (250 ft) around nests. Establish buffer zones (160 ft) around burrows.
☐ Giant garter snake (p. 6-44)	Delineate 200-ft buffer around potential habitat. Provide field report on monitoring efforts. Stop construction activities if snake is encountered; allow snake to passively relocate. Remove temporary fill or debris from construction site. Mandatory training for construction personnel.
☐ Covered shrimp species (p. 6-47)	Establish buffer around outer edge of all hydric vegetation associated with habitat (50 feet of limit of immediate watershed supporting the wetland, whichever is larger). Mandatory training for construction personnel.
☒ Swainson's hawk (p. 6-42)	Establish 1,000-ft buffer around active nest and monitor compliance.
☒ Golden eagle (p. 6-39)	Establish 0.5-mile buffer around active nest and monitor compliance.

[4] The East Contra Costa County Habitat Conservancy and the local land use Jurisdiction must review and approve the plan **prior** to the commencement of all covered activities (i.e. construction).

Construction Monitoring & Avoidance and Minimization Measures as Required for Selected Covered Wildlife in Table 4

Describe the construction monitoring and avoidance and minimization measures applicable to any species checked in Table 4. A summary of avoidance measures is provided in Table 4, these measures must be implemented if construction monitoring detects the presence of the species. The construction monitoring & avoidance and minimization measures requirements are described in detail in Section 6.4.3, Species-Level Measures, of the HCP/NCCP.

The project will have unavoidable impacts to covered species habitats. The project area contains suitable breeding/nesting habitat for California red-legged frog, burrowing owl, San Joaquin kit fox, Swainson's hawk, tricolored blackbird, and white-tailed kite (no-take species). As noted in the previous section, suitable habitats that occur within the project area that will be impacted during construction will be removed during the non-nesting season upon clearance from a qualified biologist.

San Joaquin Kit Fox

If a SJKF and/or suitable den are identified during preconstruction surveys, the measures described below will be implemented:

- If a SJKF den is discovered in the proposed development footprint, the den will be monitored for three days by a USFWS/CDFG-approved biologist using a tracking medium or an infrared beam camera to determine if the den is currently being used.
- Unoccupied dens will be destroyed immediately to prevent subsequent use.
- If a natal or pupping den is found, USFWS and CDFG will be notified immediately. The den will not be destroyed until the pups and adults have vacated and then only after further consultation with USFWS and CDFG.
- If SJKF activity is observed at the den during the initial monitoring period, the den will be monitored for an additional five consecutive days from the time of the first observation to allow any resident animals to move to another den while den use is actively discouraged. For dens other than natal or pupping dens, use of the den can be discouraged by partially plugging the entrance with soil such that any resident animal can easily escape. Once the den is determined to be unoccupied it may be excavated under the direction of the biologist. Alternatively, if the animal is still present after five or more consecutive days of plugging and monitoring, the den may have to be excavated when, in the judgment of a biologist, it is temporarily vacant (*e.g.*, during the animal's normal foraging activities).
- If dens are identified in the survey area outside the proposed disturbance footprint, exclusion zones around each den entrance or cluster of entrances will be demarcated. The configuration of exclusion zones should be circular, with a radius measured outward from the den entrance(s). No activities will occur within the exclusion zones. Exclusion zone radii for potential dens will be at least 50 feet and will be demarcated with four to five flagged stakes. Exclusion zone radii for known dens will be at least 100 feet and will be demarcated with staking and flagging that encircles each den or cluster of dens but does not prevent access to the den by SJKF.

Based on on-going monitoring of on-site burrows from March to June 2012, burrowing owls occupy the site; there has been no evidence of San Joaquin kit fox occupation. Construction is anticipated to start in spring 2013. Therefore, between September 2012 and January 2013, on-site burrows will be managed (i.e., collapsed, disked, etc.) by a qualified wildlife biologist to preclude burrowing owls and San Joaquin kit fox from occupying the site.

Western Burrowing Owl

- If burrowing owls are found during the breeding season (February 1 – August 31), all active nests that could be disturbed by the project will be avoided while the nest is occupied by young or adults. Avoidance will include establishment of a non-disturbance buffer zone. Construction may occur during the breeding season if a qualified biologist monitors the nest and determines that the birds have not begun egg-laying and incubation or that the juveniles from the occupied burrows have fledged. During the nonbreeding season (September 1 – January 31), the project proponent will avoid the owls and the burrows they are using, if possible. Avoidance will include the establishment of a buffer zone.
- If occupied burrows cannot be avoided, passive relocation will be implemented if it is outside the breeding season (September 1 – January 31), if a qualified biologist has determined that the birds have not begun egg-laying and incubation, or once the young have fledged. Owls will be passively relocated from burrows in the immediate impact zone and within a 160-foot buffer zone by installing one-way doors in burrow entrances. These doors will be in place for 48 hours prior to excavation. The project area will be monitored daily for one week to confirm that the owl has abandoned the burrow. Whenever possible, burrows will be excavated using hand tools and refilled to prevent reoccupation. Plastic tubing or a similar structure will be inserted in the tunnels during excavation to maintain an escape route for any owls inside the burrow. If no burrowing owls are observed, burrows will be filled in or the area will be disked to prevent owls from occupying the area.

Based on on-going monitoring of on-site burrows from March to June 2012, burrowing owls occupy the site; there has been no evidence of San Joaquin kit fox occupation. Construction is anticipated to start in spring 2013. Therefore, between September 2012 and January 2013, on-site burrows will be managed (i.e., collapsed, disked, etc.) by a qualified wildlife biologist to preclude burrowing owls and San Joaquin kit fox from occupying the site.

Golden Eagle

As noted in the previous section, all trees within the project area will be removed during the non-nesting season between September 2012 and January 2013 to prevent potential nesting from occurring.

Construction activities will be prohibited within 0.5 mile of active nests. Construction monitoring will focus on ensuring that no covered activities occur within the buffer zone established around an active nest. However, if site-specific conditions or the nature of the covered activity (e.g., steep topography, dense vegetation, limited activities) indicate that a smaller buffer could be appropriate or that a larger buffer should be implemented, CCCPWD will notify the Implementing Entity who will then coordinate with CDFG/USFWS to determine the appropriate buffer size.

Swainson's Hawk

As noted in the previous section, all trees within the project area will be removed during the non-nesting season between September 2012 and January 2013 to prevent potential nesting from occurring.

- During the nesting season (March 15–September 15), covered activities within 1,000 feet of occupied nests or nests under construction will be prohibited to prevent nest abandonment. If site-specific conditions or the nature of the covered activity (*e.g.*, steep topography, dense vegetation, limited activities) indicate that a smaller buffer could be used, the East Contra Costa County Habitat Conservancy will coordinate with CDFG/USFWS to determine the appropriate buffer size.
- If young fledge prior to September 15, covered activities can proceed normally. If the active nest site is shielded from view and noise from the project site by other development, topography, or other features, the project applicant can apply to the Implementing Entity for a waiver of this avoidance measure. Any waiver must also be approved by USFWS and CDFG. While the nest is occupied, activities outside the buffer can take place.

Tricolored Blackbird

If active tricolored blackbird nests are found in the immediate area, an appropriate buffer zone will be determined by the biologist and concurred by the USFWS, CDFG, and/or Implementing Entity. If site-specific conditions or the nature of the covered activity (*e.g.*, steep topography, dense vegetation, limited activities) indicate that a smaller buffer could be used, the Habitat Conservancy will coordinate with CDFG/USFWS to determine the appropriate buffer size.

IV. Landscape and Natural Community-Level Avoidance and Minimization Measures

Describe relevant avoidance and minimization measures required to address the conservation measures listed below. <u>If a conservation measure is not relevant to the project, explain why.</u>

<u>For All Projects</u>

HCP/NCCP Conservation Measure 1.10. Maintain Hydrologic Conditions and Minimize Erosion

Briefly describe how the project complies with this measure. See page 6-21 of the Final HCP/NCCP for details.

The purpose of this measure is to avoid or minimize direct and indirect impacts of new development on local hydrological conditions and erosion by incorporating the applicable C.3 Amendments of the Contra Costa County Clean Water Program's amended National Pollution Discharge Elimination System (NPDES) permit (C.3 Provision) or the current NPDES permit. The overall goal of this measure is to ensure that new development has

no or minimal adverse effects on downstream fisheries to avoid take of fish listed under ESA or CESA.

This measure is not applicable to this project as it is not considered a new development as intended by the HCP/NCCP. Further, the project is exempt from the C.3 Provision (pers. comm. Flood Control District 2012). While the purpose of the project is to provide improved flood protection, the basin will also improve water quality downstream of the basin as debris and impurities from the urban stormwater runoff received will be filtered out by the trash capture device at the basin inlet and on-site vegetation in the basin prior to draining into Sand Creek.

This project is subject to the State Water Resources Control Board, National Pollutant Discharge Elimination System (NPDES) program Construction General Permit (CGP) (Order No. 2009-009-DWQ). Since the activity will result in more than five (5) acres of ground disturbance, a Stormwater Pollution Prevention Plan will be prepared which will identify applicable best management practices (BMPs) that will minimize impacts to surrounding habitats and downstream waterways.

In addition, applicable avoidance and minimization measures for water quality and erosion control will be implemented during construction as outlined in the Conservation Measure 1.13 (Best Management Practices for Flood Control Facility Maintenance) and Conservation Measure 2.12 (Wetland, Pond, and Stream Avoidance and Minimization) of the HCP/NCCP as identified in the following applicable sections.

HCP/NCCP Conservation Measure 1.11. Avoid Direct Impacts on Extremely Rare Plants, Fully Protected Wildlife Species, or Covered Migratory Birds

Briefly describe how the project complies with this measure. See page 6-23 of the Final HCP/NCCP for details.

No-take species include extremely rare plants (large-flowered fiddleneck, alkali milkvetch, Mount Diablo buckwheat, diamond-petaled poppy, Contra Costa goldfields, caper-fruited tropidocarpum) and fully protected wildlife species (white-tailed kite, peregrine falcon, golden eagle, and ringtail). Planning surveys have not identified any of these fully protected species with the exception of golden eagle, which have been observed soaring over the area in 2008 and 2012; no nest golden eagle active nest sites were observed within a ½-mile of the basin.

All birds covered by the HCP (burrowing owl, golden eagle [no-take], Swainson's hawk, tricolored blackbird) and non-HCP-covered fully protected species (peregrine falcon, white-tailed kite) are also considered migratory birds and subject to the prohibitions of the Migratory Bird Treaty Act (MBTA) which also protects most birds in the U.S., including non-status species. The riparian woodland/scrub areas that occur along Sand Creek upstream and downstream of the project area provide suitable nesting habitat for these covered species and other MBTA-protected birds and raptors, with the exception of golden eagle. As noted in the Construction Monitoring and Avoidance section, all trees within the project area will be removed during the non-nesting season between September 2012 and January 2013 to prevent potential nesting from occurring.

For Projects on or adjacent to Streams or Wetlands

HCP/NCCP Conservation Measure 1.7. Establish Stream Setbacks

Briefly describe how the project complies with this measure. See page 6-15 and Table 6-2 of the Final HCP/NCCP for details. For questions on the stream setback requirements, please contact the Conservancy.

While Upper Sand Creek Basin is located inside the UDA, it is not subject to the stream setback requirements as it is not considered a development as intended by the HCP/NCCP and as confirmed by the Conservancy. However, the basin perimeter will be enclosed with a chain-linked fence to keep the public from entering the basin; the restoration area including Sand Creek within the basin will be enclosed by a barbed-wire fence to keep cattle from entering the restoration area. Applicable BMPs will be implemented to ensure that indirect impacts do not occur to Sand Creek downstream of the basin as described below in conservation measure 2.12.

HCP/NCCP Conservation Measure 2.12. Wetland, Pond, and Stream Avoidance and Minimization

Briefly describe how the project complies with this measure. See page 6-33 of the Final HCP/NCCP for details.

In order to minimize impacts to the adjacent wetlands and Sand Creek, the following HCCP/NCCP avoidance and minimization measures will be implemented:

- Temporary highly visible environmental sensitive area (ESA) fence along with a tightly-woven material (i.e., silt fence) will be installed along the downstream end of the basin to avoid unanticipated encroachment into Sand Creek downstream of the project area. A qualified biologist will stake the ESA boundaries.
- Construction personnel conducting ground-disturbing activities within or adjacent to Sand Creek will be trained by a qualified biologist on avoidance measures.
- Vehicles will be parked on pavement, existing roads, and previously disturbed areas.
- Trash generated by the covered activities will be promptly and properly removed from the project site.
- No construction or maintenance vehicles will be refueled within 200 feet of wetlands and Sand Creek unless a bermed and lined refueling area is constructed and hazardous material absorbent pads are available in the event of a spill.
- Appropriate erosion control BMPs will be used to reduce siltation and runoff of contaminants. Filter fences and mesh will be of material that will not entrap reptiles or amphibians. Erosion control blankets will be used as a last resort because they tend to biodegrade slowly and trap wildlife. Erosion control measures will be placed between the outer edge of the buffer and the work area.
- Soil stockpiles will be stored on upland areas away from waterways and applicable BMPs will be applied to contain potential runoff in anticipation of forecasted rain events.

- Erosion control products will be free of noxious weed seed.
- Seed mixes applied for erosion control will not contain invasive non-native species, and will be composed of native species or sterile non-native species.
- The temporary ESA fence will be removed upon completion of the project.

For Projects adjacent to Protected Natural Lands (existing and projected)

Covered activities adjacent to permanently protected natural lands will require a variety of special considerations to address issues associated with characteristics of the urban-wildland interface. These considerations are intended to minimize the impacts of development on the integrity of habitat preserved and protected under the terms of the Plan. Permanently protected natural lands are defined as any of the following (see the latest Preserve System map on the Conservancy web site, www.cocohcp.org).

- Publicly owned open space with substantial natural land cover types including but not limited to state and regional parks and preserves and public watershed lands (local and urban neighborhood parks are excluded).
- Deed-restricted private conservation easements.
- HCP/NCCP Preserve System lands.
- Potential HCP/NCCP Preserve System lands (see Figure 5-3 in the HCP/NCCP).

HCP/NCCP Conservation Measure 1.6. Minimize Development Footprint Adjacent to Open Space

Briefly describe how the project complies with this measure. See page 6-14 of the Final HCP/NCCP for details.

The purpose of this measure is to meet the overall objective of providing an adequate buffer between new development and existing or new open space. The proposed activity is not considered new development. Further, the basin is not located adjacent to HCP/NCCP preserve areas, a likely high or moderate priority HCP/NCCP acquisition site, or existing public open space that is or will be linked to an HCP/NCCP preserve. The basin is located within a lower acquisition priority zone, subzone 2i, which is part of the City of Antioch Sand Creek Focus Area that includes planned development.

HCP/NCCP Conservation Measure 1.8. Establish Fuel Management Buffer to Protect Preserves and Property

Briefly describe how the project complies with this measure. See page 6-18 of the Final HCP/NCCP for details.

The purpose of this measure is to provide a buffer between development and wildlands that allows adequate fuel management to minimize the risk of wildfire damage to property or to an HCP/NCCP preserve area. The basin is not located adjacent to an HCP/NCCP preserve area, a likely high or moderate priority HCP/NCCP acquisition site,

or existing public open space that is or will be linked to an HCP/NCCP preserve. The basin is located within a lower acquisition priority zone, subzone 2i. While this measure does not specifically pertain to this site, protocols for fuel management control during construction will be implemented.

HCP/NCCP Conservation Measure 1.9. Incorporate Urban-Wildland Interface Design Elements

Briefly describe how the project complies with this measure. See page 6-20 of the Final HCP/NCCP for details.

The purpose of this measure is to ensure that new land uses adjacent to existing and planned future preserves incorporate design elements at the urban-wildland interface to minimize direct and indirect impacts of development onto the adjacent preserve which contains natural communities and covered species. The basin is not located adjacent to an HCP/NCCP preserve area, a likely high or moderate priority HCP/NCCP acquisition site, or existing public open space that is or will be linked to an HCP/NCCP preserve. The basin is located within a lower acquisition priority zone, subzone 2i. Further, the proposed activity will not result in new development.

For Rural Infrastructure Projects

Rural infrastructure projects provide infrastructure that supports urban development within the urban development area. Such projects are divided into three categories: transportation projects, flood protection projects, and utility projects. Most rural road projects covered by the Plan will be led by Contra Costa County. All flood protection projects covered by the Plan will be led by the County Flood Control District. Utility projects will likely be led by the private companies that own the utility lines. A complete discussion of rural infrastructure projects is presented in Section 2.3.2 of the Final HCP/NCCP beginning on page 2-18.

HCP/NCCP Conservation Measure 1.12. Implement Best Management Practices for Rural Road Maintenance

Briefly describe how the project complies with this measure. See page 6-25 of the Final HCP/NCCP for details.

The project is not a rural road maintenance activity therefore this conservation measure does not apply.

HCP/NCCP Conservation Measure 1.13. Implement Best Management Practices for Flood Control Facility Maintenance

Briefly describe how the project complies with this measure. See page 6-26 of the Final HCP/NCCP for details.

Flood control maintenance activities have the potential to affect covered species by introducing sediment and other pollutants into downstream waterways and disturb breeding wildlife. While the project is not considered a flood control maintenance activity,

the applicable measures provided in this conservation measure is described above in Conservation Measure 2.12.

HCP/NCCP Conservation Measure 1.14. Design Requirements for Covered Roads outside the Urban Development Area

Briefly describe how the project complies with this measure. See page 6-27 of the Final HCP/NCCP for details.

The project is not a covered road project therefore this conservation measure does not apply.

V. Mitigation Measures

Complete and Attach Exhibit 1 (Permanent Impact Fees) and/or Exhibit 2 (Temporary Impact Fees) Fee Calculator(s) for Permanent and Temporary Impacts.

- Briefly describe the amount of fees to be paid and when.
- See Section 9.3.1 of the HCP/NCCP for details. If land is to be dedicated in lieu of fees or if restoration or creation of jurisdictional wetlands or waters is to be performed in lieu of fees, summarize these actions here and attach written evidence that the Conservancy has approved these actions in lieu of fees.

The Flood Control District proposes on-site mitigation as summarized below and as described in the Habitat Mitigation and Monitoring Plan (HMMP) (Cardno ENTRIX 2012) provided to the Habitat Conservancy on June 13, 2012. The HMMP is consistent with the HCP/NCCP restoration guidelines and USACE mitigation rule 33 CFR Part 332.4[c][10]. The acreage of stream impacts below is based on the USACE verified wetland delineation and are consistent with those reflected in the Habitat Mitigation and Monitoring Plan.

HCP/NCCP mitigation:

- On-site, in-kind replacement of 0.70 acre (3,642 linear feet) of Sand Creek (channel) for temporary impacts to 0.70 acre of Sand Creek (1:1 ratio);
- On-site, in kind replacement of 0.08 acre of drainage culverts at the basin inlet structures to replace 0.08 acre that will be permanently removed during construction of the project (1:1 ratio);
- On-site, in-kind replacement of 0.45 acre of state-jurisdictional perennial wetland in addition to 0.02 acre of USACE-jurisdictional perennial wetland replacement to replace a total of 0.47 acre that will be temporarily impacted during construction of the project (1:1 ratio);
- On-site, in-kind replacement of 4.36 acres of state-jurisdictional seasonal wetland in addition to 0.01 acre of USACE-jurisdictional seasonal wetland replacement to

replace a total of 2.18 acres that will be temporarily impacted during construction of the project (2:1 ratio);

- On-site, in-kind replacement of 0.73 acre of riparian woodland/scrub habitat to replace 0.73 acre that will be temporarily impacted during construction of the project (1:1 ratio).

The Flood Control District engineering and environmental staff have consulted with the Habitat Conservancy regarding the proposed on-site mitigation and mitigation fees. The Habitat Conservancy has indicated a willingness to waive the temporary impact fees given adequate justification. The Flood Control District requests that the Conservancy waive the temporary impact fees for the following reasons:

- The Restoration Area will be owned, protected and maintained in perpetuity by the Flood Control District. The basin inlet structure includes a concrete stilling basin to capture silt and sediment material transported down the main stem of Sand Creek. Frequency of dredging within the stream of the Restoration Area is expected to be minimal and occur only as necessary (once every 5 to 10 years).
- The Restoration Area will be physically protected from the public and grazing livestock with the installation of a chain-linked fence around the ultimate basin and a barbed-wire fence around the Restoration Area.
- Continuous water flow from urban runoff will support the proposed habitat restoration and enhancement.
- Water quality within the Restoration Area and downstream within Sand Creek will be improved with the installation of a trash capture device at the basin inlet structure for urban water flows and a stilling basin at the basin inlet structure within Sand Creek that will capture silt and sediment. The improvement will benefit the aquatic environment in the basin and Sand Creek downstream.
- The restored creek and wetland habitats will be stabilized and enhanced with native plants and riparian shrubs and trees that will provide habitat cover for aquatic and terrestrial species and will be monitored for 5 years to determine success as proposed in the HMMP. Invasive plants will also be removed during the 5-year monitoring period.
- The upland areas will be re-vegetated with a native annual grassland seed mix as proposed in the HMMP.

Temporary impact fees would total **$231,984.05** (Exhibit 2). The Conservancy has previously indicated that it would be less effective for stream restoration within the Preserve System as mitigation for this impact due to the complicated nature of this type of stream restoration. The Conservancy indicated support of on-site mitigation as this site has been proven to be conducive to wetland establishment and therefore will result in improved wetland functions and values (pers. comm. Kopchik 2011).

Therefore, the Flood Control District will pay development and wetland fees for permanent impacts for a total amount of **$268,178.09** (Exhibit 1). Fees will be paid to the Habitat Conservancy at project contract award.

References:

Jones & Stokes. 2006. *East Contra Costa County Habitat Conservation Plan and Natural Community Conservation Plan* (ECCC HCP/NCCP). October. (J&S 01478.01) San Jose, CA.

Cardno ENTRIX. 2012. *Habitat Mitigation and Monitoring Plan, Upper Sand Creek Basin Project, Antioch, CA*. June 12. Sacramento, CA.

Condor Country Consulting, Inc. (CCCI). 2010. *2009-2010 Wet Season Branchiopod Survey Report, Upper Sand Creek Basin Expansion, Antioch, Contra Costa County, California*. August 26. Martinez, CA.

Contra Costa County Flood Control District and Water Conservation District (Flood Control District). 2012. Project description information. Martinez, CA.

Kopchik, John. 2011. Meeting with USACE regarding proposed on-site mitigation. June 21. Sacramento, CA.

Nomad Ecology. 2009. *Wetland Delineation Report, Upper Sand Creek Basin Project, Antioch, CA*. June. Martinez, CA.

Nomad Ecology. 2010. *Biological Resources Assessment, Upper Sand Creek Basin, Antioch, CA*. August. Martinez, CA.

Nomad Ecology. 2011. *California Natural Diversity Database Update, Upper Sand Creek Basin, Antioch, CA*. August. Martinez, CA.

Nomad Ecology. 2012. Email and phone correspondences regarding monitoring and survey results of wildlife species at Upper Sand Creek Basin, Antioch, CA. March – June. Martinez, CA.

United States Army Corps of Engineers (USACE). 2012. Wetland Delineation Verification Letter, Upper Sand Creek Basin. April 19, 2012. Sacramento, CA.

Exhibit 1: HCP/NCCP FEE CALCULATOR WORKSHEET

PROJECT APPLICANT INFO:

Project Applicant: **Contra Costa County Flood Control and Water Conservation District**

Project Name: Upper Sand Creek Basin Expansion

APN (s): See Parcels and Easement Map

Date: July 12, 2012 Jurisdiction:

DEVELOPMENT FEE (see appropriate ordinance or HCP/NCCP Figure 9-1 to determine Fee Zone)

	Acreage of land to be permanently disturbed (from Table 1)[1] Full Development Fee		**Fee per Acre** (subject to change on 3/15/13)		
Fee Zone 1		x	$10,584.32	=	$0.00
Fee Zone 2	**6.89**	x	$21,168.64	=	$145,851.96
Fee Zone 3		x	$5,292.61	=	$0.00
Fee Zone 4[2]		x	$15,876.48	=	$0.00
			Development Fee Total	**=**	**$145,851.96**

****WETLAND MITIGATION FEE**	**Acreage of wetland**		**Fee per Acre** (subject to change on 3/15/13)		
Riparian woodland / scrub		x	$69,992.40	=	$0.00
Perennial Wetland		x	$120,428.10	=	$0.00
Seasonal Wetland		x	$252,178.50	=	$0.00
Alkali Wetland		x	$234,680.40	=	$0.00
Ponds		x	$120,428.10	=	$0.00
Aquatic (open water)		x	$59,699.40	=	$0.00
Slough / Channel		x	$127,633.20	=	$0.00
Streams	**Linear Feet**				
Streams 25 Feet wide or less (Fee is per Linear Foot)	**292.00**	x	$418.93	=	$122,326.13
Streams greater than 25 feet wide (Fee is per Linear Foot)		x	$630.96	=	$0.00
			Wetland Mitigation Fee Total	**=**	**$122,326.13**

FEE REDUCTION

Development Fee reduction (authorized by Implementing Entity) for land in lieu of fee	
Development Fee reduction (up to 33%, but must be approved by Conservancy) for permanent assessments	
Wetland Mitigation Fee reduction (authorized by Implementing Entity) for wetland restoration/creation performed by applicant	
Reduction Total =	**$0.00**

CALCULATE FINAL FEE

Development Fee Total	$145,851.96
Wetland Mitigation Fee Total +	$122,326.13
Fee Subtotal	$268,178.09
Contribution to Recovery +	
TOTAL AMOUNT TO BE PAID =	**$268,178.09**

1 City/County Planning Staff will consult the land cover map in the Final HCP/NCCP and will reduce the acreage subject to the Development Fee by the acreage of the subject property that was identified in the Final HCP/NCCP as urban, turf, landfill or aqueduct land cover.

2 "Fee Zone 4" is not shown on Figure 9.1 of the HCP/NCCP but refers to the fee applicable to those few covered acitivities located in northeastern Antioch (see page 9-21 of the HCP).

Template date: March 15, 2012

Exhibit 2: TEMPORARY IMPACT FEE CALCULATOR WORKSHEET

PROJECT APPLICANT INFO:

Project Applicant: **Contra Costa County Flood Control and Water Conservation District**

Project Name: Upper Sand Creek Basin Expansion

APN (s): See Parcels and Easement Map

Date: July 12, 2012 Jurisdiction: Contra Costa County

TEMPORARY DEVELOPMENT IMPACT FEE (see appropriate ordinance or HCP/NCCP Figure 9-1 to determine Fee Zone)

	Acreage of land to be temporarily disturbed (from Table 1)[1]		Years of Disturbance (2 years is the minimum for ground-disturbing)			Fee per Acre (subject to change on 3/15/13)		
Fee Zone 1		x		/30	x	$10,584.32	=	$0.00
Fee Zone 2	**57.63**	x	2	/30	x	$21,168.64	=	$81,329.93
Fee Zone 3		x		/30	x	$5,292.61	=	$0.00
Fee Zone 4[2]		x		/30	x	$15,876.48	=	$0.00
						Temporary Impact Fee Total =		**$81,329.93**

****TEMPORARY WETLAND MITIGATION FEE**	Acreage of wetland	Yrs. Of Disturbance (minimum shown)		Fee per Acre (subject to change on 3/15/13)		
Riparian woodland / scrub	**0.73**	5.00	x	$69,992.40	=	$ 8,515.74
Perennial Wetland	**0.47**	2.00	x	$120,428.10	=	$ 3,773.41
Seasonal Wetland	**2.18**	2.00	x	$252,178.50	=	$ 36,649.94
Alkali Wetland		2.00	x	$234,680.40	=	$ -
Ponds		2.00	x	$120,428.10	=	$ -
Aquatic (open water)		2.00	x	$59,699.40	=	$ -
Slough / Channel		2.00	x	$127,633.20	=	$ -

Streams	Linear Feet					
Streams 25 Feet wide or less (Fee is per Linear Foot)	**3642.00**	2.00	x	$418.93	=	$101,715.01
Streams greater than 25 feet wide (Fee is per Linear Foot)		2.00	x	$630.96	=	$0.00
				Wetland Mitigation Fee Total =		**$ 150,654.11**

FEE REDUCTION

Development Fee reduction (authorized by Implementing Entity) for land in lieu of fee	
Development Fee reduction (up to 33%, but must be approved by Conservancy) for permanent assessments	
Wetland Mitigation Fee reduction (authorized by Implementing Entity) for wetland restoration/creation performed by applicant	
Reduction Total =	**$0.00**

CALCULATE FINAL TEMPORARY IMPACT FEES

Development Fee Total		$81,329.93
Wetland Mitigation Fee Total	+	$150,654.11
Fee Subtotal	=	$231,984.05
TOTAL TEMPORARY IMPACT FEES TO BE PAID	=	**$231,984.05**

1 City/County Planning Staff will consult the land cover map in the Final HCP/NCCP and will reduce the acreage subject to the Development Fee by the acreage of the subject property that was identified in the Final HCP/NCCP as urban, turf, landfill or aqueduct land cover.

2 "Fee Zone 4" is not shown on Figure 9.1 of the HCP/NCCP but refers to the fee applicable to those few covered acitivities located in northeastern Antioch (see page 9-21 of the HCP).

Template date: March 15, 2012