

## BAYFRONT CANAL AND ATHERTON CHANNEL PROJECT DESCRIPTION

# MEMORANDUM

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**To:** David Halsing (URS)

**From:** Chris Potter, Megan Bordelon

**Date:** March 6, 2014

**Subject:** Bayfront Canal Flood Improvements - Project Description

**M&N Job No.:** 7681-03

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## 1.0 Project Description

The Bayfront Canal Flood Improvements Project contains four components: open channel improvements, culvert installation, Caltrans stormwater pipe temporary removal, and water control structure installations (Figure 1.1). The primary work will be installing a culvert to direct water from the Bayfront Canal to the Ravenswood Ponds. Open channel improvements will be made upstream and downstream of the proposed culvert installation to enhance flow to and from the culvert. The proposed culvert alignment crosses beneath existing Caltrans stormwater pipes; therefore, the Caltrans pipes will be temporarily removed and replaced during the culvert installation. Lastly, water control structures will be installed in three different locations within and around the Ravenswood Ponds to allow the freshwater outflow from the culvert to move between ponds, and ultimately to the Bay, and also to manage water quality in the ponds during the dry season.

As shown in Figure 1.2, the construction disturbance area will be approximately 2 acres for the open channel improvements, culvert installation, and Caltrans pipe relocation. Approximately 4,600 square feet of pavement will be removed and replaced. The following sections summarize the construction methods and proposed sequence of work.

### 1.1 Open Channel Improvements

Open channel improvements will be conducted on the existing vegetated channels both immediately upstream and downstream of the proposed culvert. The existing channels will be cleared and grubbed. An excavator will remove approximately 1,100 cubic yards of material while grading the upstream channel cross-section to a 2H:1V side-slope. An excavator will remove approximately 1,100 cubic yards of material while grading the downstream channel cross-section to a 1.5H:1V side-slope. The vegetation debris will be recycled or disposed of at an approved offsite recycling or disposal facility. The material excavated from the channel will be trucked on dirt roads approximately 1 mile to the All American Canal, located between the Ravenswood Ponds R3 and R4. Material delivery will be coordinated with the South Bay Salt Pond Restoration Project (SBSP) team.

The upstream inlet of the open channel at the Bayfront Canal will be stabilized. Approximately 700 square feet of articulating concrete block mat or rock riprap will be placed at a 2H:1V slope at the

channel inlet. Geotextile fabric will be placed underneath the rock slope protection. The open channel side slopes will be re-vegetated, and may also be lined with ground stabilizers such as turf reinforcement mats (instead of rock) to restrict tree growth and minimize future maintenance costs.

## **1.2 Culvert Installation**

A culvert consisting of four (4) 63-inch diameter high-density polyethylene (HDPE) pipes will connect the upstream open channel to the downstream open channel, which then connects to the Ravenswood Pond S5 Forebay (Figure 1.2). The HDPE pipe will be specified as DR21 with a wall thickness of 3 inches (outside diameter 63 inches). A trash rack and operational sluice gates will be incorporated into the inlet headwall structure for the culvert. The outlet headwall structure for the culvert will be fitted with flap-gates.

The construction area will initially be cleared and the asphalt removed for disposal at an approved disposal facility. Approximately 6,800 cubic yards of material will be excavated for the pipe installation. Temporary excavation slopes shall be at 1H:1V, beginning near the inlet and proceeding eastward towards the downstream outlet. A cast-in-place concrete headwall will be constructed for the inlet and outlet structures, and estimated at 62 and 56 cubic yards of concrete, respectively. Approximately 120 cubic yards of 1.5-ft thick rock will be placed at the outlet of the culvert to prevent erosion in the open channel. The rock apron will cover approximately 2,100 square feet.

Excavated material will be stockpiled immediately adjacent to the excavation slope, as space allows. Water will be removed from the trench with pumps as needed. The culvert pipes will be placed on bedding material and fused in-place. The excavated material will be used for backfill and compacted with a vibratory roller once the pipes are installed. Marsh Road will be re-paved and vegetation will be re-planted at the completion of the project.

To enhance outflow from the culvert, the Ravenswood Pond S5 Forebay will also be excavated and the material will be placed in the All American Canal, similar to the material removed from the upstream open channel. Approximately 4.3 acres will be excavated, about 24,600 cubic yards of material.

During construction of the inlet headwall for the culvert, public vehicle access to the Bedwell Bayfront Park will be maintained. After completion of the inlet headwall however, excavation will continue eastward and all public vehicle access to the park will temporarily cease. The construction site will be fenced to allow public foot traffic only to proceed to Bedwell Bayfront Park until excavation of the culvert outlet begins, at which point public safety concerns will terminate all public access until the completion of the project (approximately 1.5 months). The contractor will provide traffic safety control throughout the duration of the project.

## **1.3 Caltrans Stormwater Pipe Relocations**

The proposed culvert will cross underneath existing Caltrans double 48" diameter stormwater pipes. In order to install the culvert, the Caltrans reinforced concrete pipes (RCPs) will be removed. (This work will occur during the summer months to avoid stormwater flow; otherwise a temporary bypass will be constructed.) Initially, the area around the Caltrans RCPs will be excavated, allowing approximately 70



linear feet (LF) of the pipes to be removed. The removed pipes shall be disposed of at an approved offsite disposal facility. The contractor will lay bedding material and the HDPE culverts, followed with construction of a concrete encasement for the HDPE pipe culverts. The concrete encasement shall have a half-saddle constructed on top to support the replacement Caltrans pipes. The replacement Caltrans stormwater pipes shall either be HDPE or RCPs. The area will be filled with the excavated material, compacted, re-paved and re-planted to restore the area to existing conditions.

#### **1.4 Water Control Structure Installations**

Three water control structures are proposed at the following locations: between Ravenswood Ponds R4 and R5, between Pond S5 and R3, and between the Pond S5 Forebay and Flood Slough.

##### **1.4.1 Pond R4/R5 Tide-Gate Structure**

The tide-gate structure between Ravenswood Ponds R4 and R5 will be comprised of two to five 4'x4' box culverts. The structure will be prefabricated concrete or steel, trucked to the site, lifted off the trucks with a crane and set into place. The construction work will begin by excavating and stockpiling the existing material in the work area. Due to subsidence concerns in the soft marsh mud, piles will most likely be driven to support the tide-gate structure using a crawler crane pile driver. Once the piles are in-place, bedding material and the structure will be installed. A pump will remove ponded water in the excavated tide-gate location to an adjacent pond or channel if needed. Once the tide-gate structure is in-place and secured to the piles, it will be covered with the excavated material. The outlet of the tide gate will potentially be protected from erosion with riprap.

##### **1.4.2 Pond S5/R3 Water Circulation Culvert**

A water circulation culvert will be installed between Pond S5 and Pond R3 to manage water quality in the ponds during the dry season. A trench will be excavated, the bedding material will be placed, and an HDPE pipe ranging from 24 to 36" diameter will be installed. The trench will be backfilled and replanted to restore to existing conditions.

##### **1.4.3 Pond S5 Forebay/Flood Slough Water Circulation Culvert**

A water circulation culvert will be installed between the Pond S5 Forebay and Flood Slough to manage water quality in the ponds during the dry season. A trench will be excavated, the bedding material will be placed, and an HDPE pipe ranging from 24 to 36" diameter will be installed. The area will be backfilled and replanted to restore to existing conditions.



## 2.0 Wetland delineation

In October 2013, the presence of USACE and US EPA jurisdictional waters were investigated in the project area. The results are summarized below in Table 1 and in “Figure 3. Waters Potentially Subject to Section 404 of CWA and Section 10 of the RHA” (Huffman-Broadway Group, 2013).

**Table 1. Wetland Delineation Summary**

Habitat Type	Subject to Section 404 of the CWA	Subject to Section 10 of the RHA	Acreage
Non-Tidal Wetlands	Yes	No	0.04
Tidal Wetlands Waters	Yes	No	0.27
Non-Tidal Other	Yes	No	0.08
Tidal Other Waters	Yes	Yes	0.12

CWA = Clean Water Act

RHA = Rivers and Harbors Act

## 3.0 Easement Assessment

An easement assessment was completed in March 2014 for the project area (Bohley Consulting 2014). The results can be found in Attachment 1.

## 4.0 Construction Equipment and Materials

Table 2 and Table 3 summarize the anticipated equipment and materials during this project.

**Table 2. Construction Equipment**

Summary of Equipment	
Dozer	Asphalt paver
Excavator	Crawler Crane Pile Driver
Front-end Loader	Trash Pump
Backhoe	Diesel Generator
Crane	Water Truck
Trucks	Hydro seeder
Vibratory Roller	

**Table 3. Estimated Material Quantity**

<b>Summary of Materials</b>	
Type	Quantity
Concrete (Culvert Inlet)	62 yd <sup>3</sup>
Concrete (Culvert Outlet)	56 yd <sup>3</sup>
Concrete (Culvert Encasement)	50 yd <sup>3</sup>
Total Concrete	168 yd <sup>3</sup>
Rock (Open Channel Inlet Banks)	50 yd <sup>3</sup> (675 ft <sup>2</sup> )
Rock (Culvert Inlet)	60 yd <sup>3</sup> (810 ft <sup>2</sup> )
Rock (Culvert Outlet)	120 yd <sup>3</sup> (2,100 ft <sup>2</sup> )
Rock (Water Control Structures)	45 yd <sup>3</sup> (1,200 ft <sup>2</sup> total)
Total Rock	275 yd <sup>3</sup>
Geotextile Fabric (Beneath rock)	4,800 ft <sup>2</sup>
Ground Stabilizer Mats (Open Channel)	9,400 ft <sup>2</sup>
Asphalt	28 yd <sup>3</sup>
Four (4) HDPE Pipes (Culvert)	236 linear ft. (Each) 944 linear ft. (Total)

The equipment and materials will enter the site near the intersection of Bayfront Expressway (Hwy-84) and Marsh Road. The contractor will likely mobilize the equipment from their source location to the site via Highway 101 and Marsh Road. As previously mentioned; the excess material excavated from the open channel improvements will be transported by truck from the project site along Marsh Road and on dirt roads to be deposited in the All American Canal (located between the Ravenswood Ponds R3 and R4). The contractor will perform dust control with a water truck during construction.

#### **4.1 Construction Sequencing**

The work will be performed ideally during the dry summer months to avoid weather delays and stormwater management in and around the excavations. The project is expected to be completed in approximately 4 months.

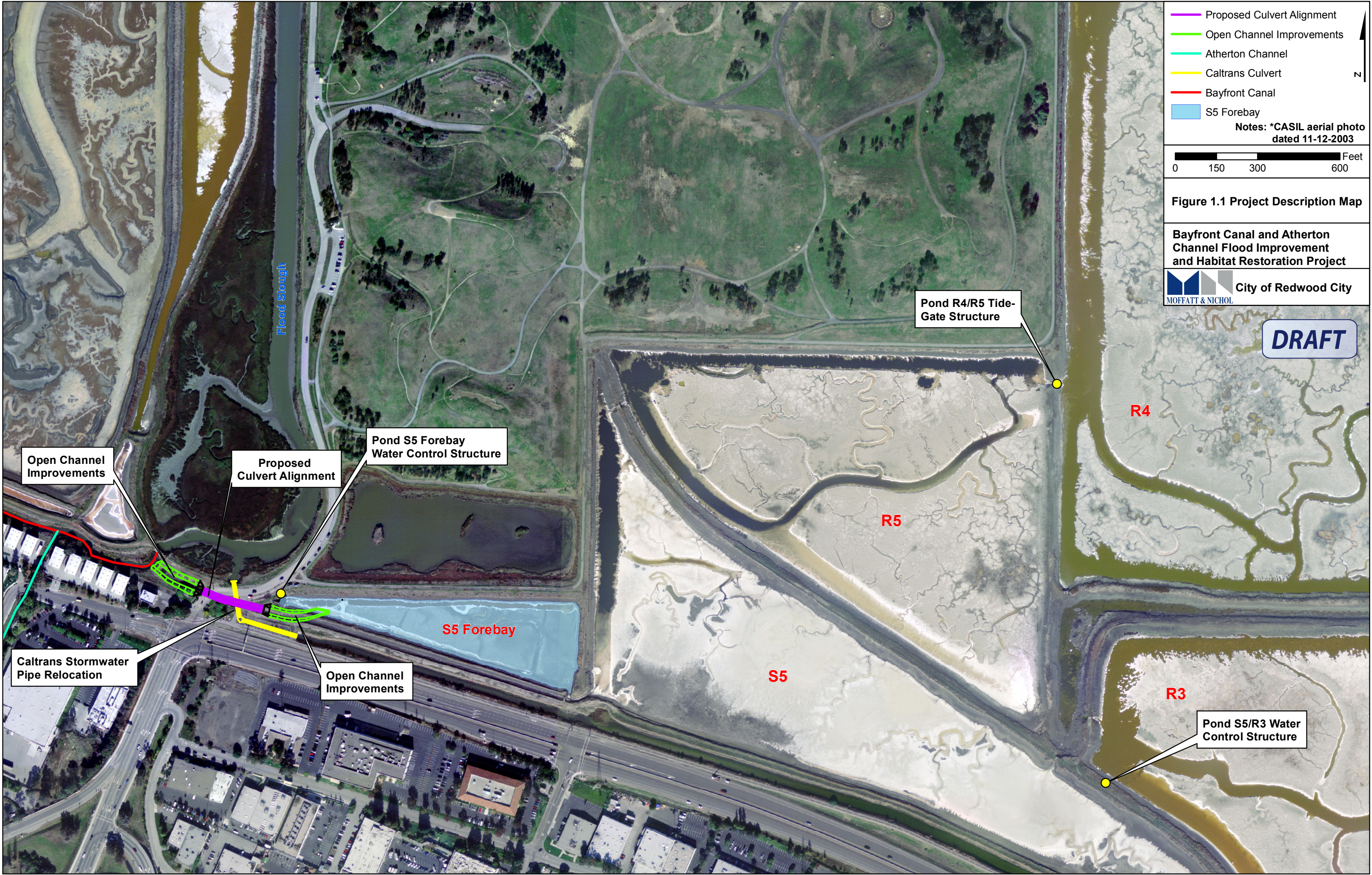
After mobilization, the open channel improvements will be constructed, followed by the culvert inlet construction. The work will proceed eastward towards the culvert outlet structure, in a stepwise fashion as much as possible in order to maintain public access to Bedwell Park. As previously mentioned, all public access will be restricted for approximately 1.5 months when the work progresses to the outlet structure. The construction of the three water control structures is likely to occur during or immediately following the culvert installation. The final tasks near the completion of the project will be re-paving Marsh Road and hydroseeding or planting where necessary.



## FIGURES







- Proposed Culvert Alignment
- Open Channel Improvements
- Atherton Channel
- Caltrans Culvert
- Bayfront Canal
- S5 Forebay

Notes: \*CASIL aerial photo dated 11-12-2003

0 150 300 600 Feet

Figure 1.1 Project Description Map

Bayfront Canal and Atherton Channel Flood Improvement and Habitat Restoration Project

City of Redwood City  
MOFFATT & NICHOL

DRAFT

Open Channel Improvements

Proposed Culvert Alignment

Pond S5 Forebay Water Control Structure

Pond R4/R5 Tide-Gate Structure

Caltrans Stormwater Pipe Relocation

Open Channel Improvements

Pond S5/R3 Water Control Structure

S5 Forebay

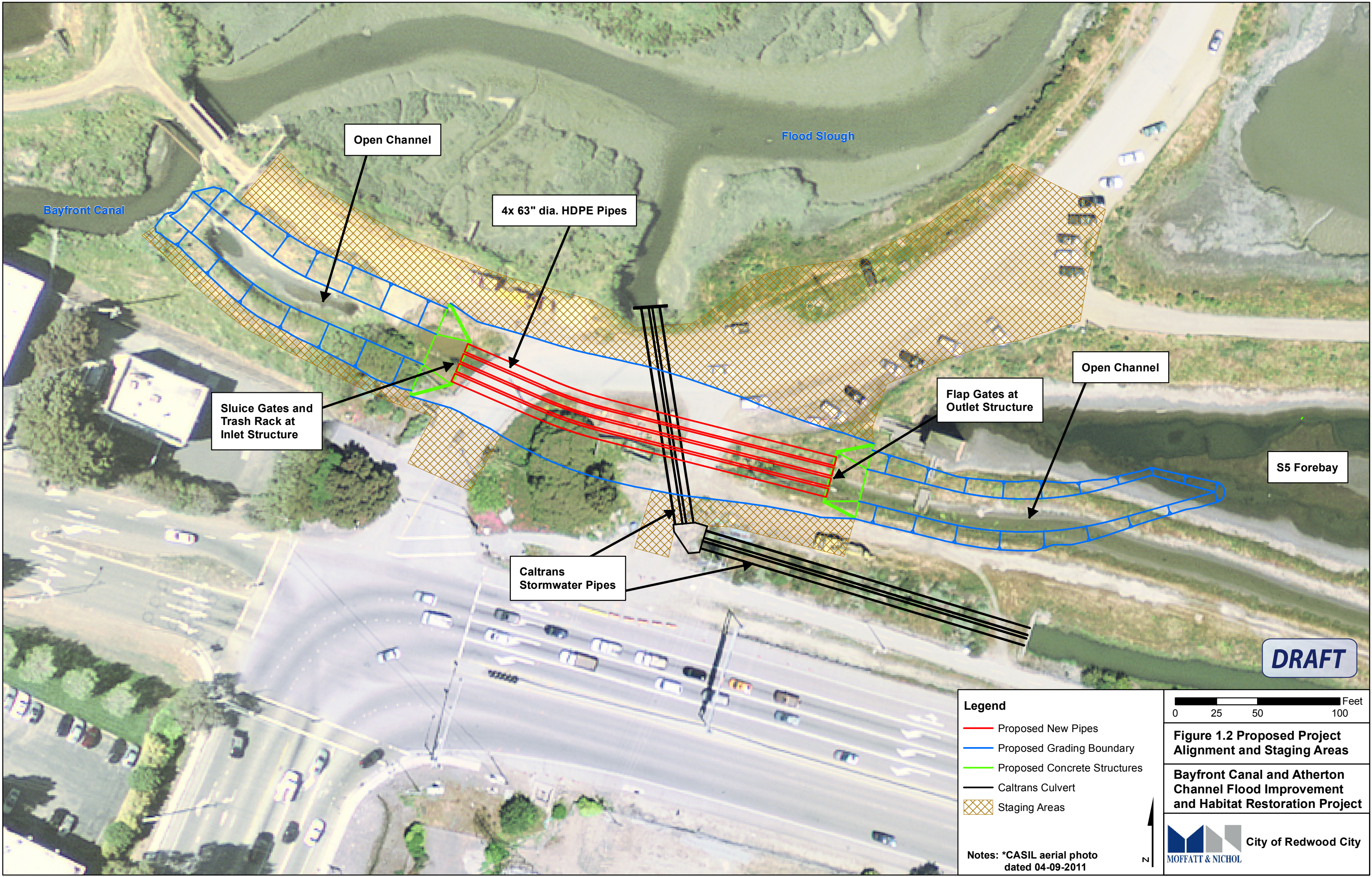
R5

R4

R3

S5







# **ATTACHMENT 1**

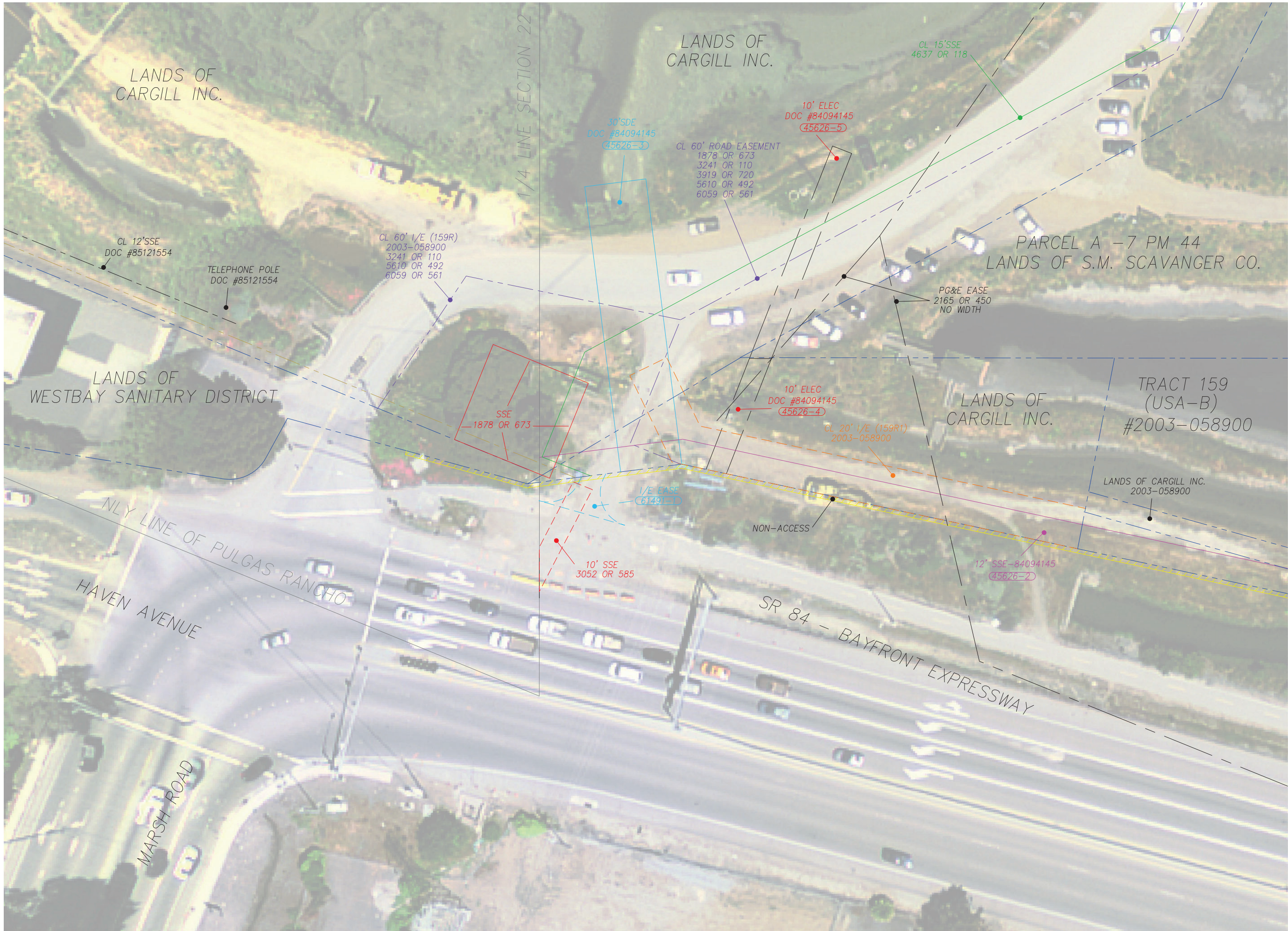
Easement Assessment

Bohley Consulting, Inc.

Draft March 2014







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BAYFRONT  
CANAL

REDWOOD CITY  
CALIFORNIA

Scale	SCALE
Drawing	C-BASE
Job No	201318
Date	3/3/14
Description	



EXISTING  
EASEMENTS  
OF  
RECORD



## **ATTACHMENT 2**

Investigation of the Presence of USACE and US EPA Jurisdictional Waters For the  
Redwood City Bayfront Canal and Atherton Channel Flood Improvement and  
Habitat Restoration Project, Redwood City, San Mateo County, California.

Huffman-Broadway Group, Inc.

Draft November 2013

Note: The U.S. Army Corps has not yet verified the jurisdictional  
status of any water feature discussed or described in this report.





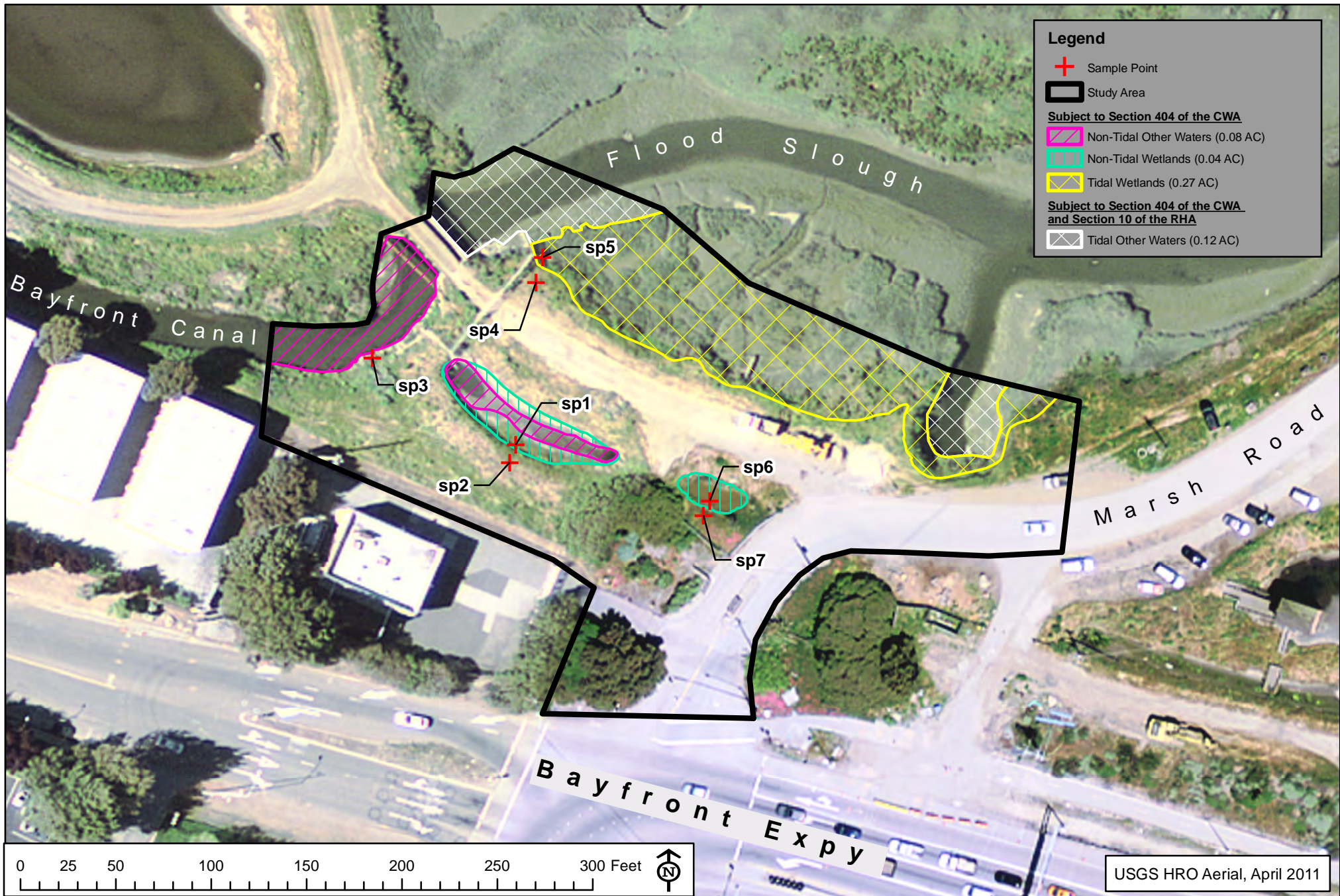


Figure 3. Waters Potentially Subject to Section 404 of CWA and Section 10 of the RHA

Redwood City Bayfront Canal and Atherton Channel  
Flood Improvement and Habitat Restoration Project  
Redwood City, San Mateo County, California