



**Valley Water**

# PLANNING STUDY REPORT

COYOTE CREEK FLOOD MANAGEMENT MEASURES PROJECT

COYOTE CREEK FLOOD PROTECTION PROJECT





# PLANNING STUDY REPORT

## COYOTE CREEK FLOOD PROTECTION

### MONTAGUE EXPRESSWAY TO TULLY ROAD

(Coyote Creek Flood Management Measures Project No. 91864005 &  
Coyote Creek Flood Protection Project No. 26174043)

Prepared by

### Water Resources Planning and Policy Unit

Dámaris Villalobos-Galindo, P.E., QSP/QSD, CFM  
Associate Engineer



Under the direction of

Afshin Rouhani, P.E.  
Water Resources Planning and Policy  
Unit Manager

John Bourgeois  
Watershed Stewardship and Planning  
Deputy Operating Officer

Sue Tippetts, P.E.  
Watersheds  
Interim Chief Operating Officer

MARCH 2022

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Chanie Abuye, <i>Associate Engineer</i>	Groundwater Management Unit
Benjamin Apollo III, <i>Program Administrator</i>	Office of Communications
Erin Baker, <i>Asset Management Manger</i>	Business Support and Asset Management Unit
John Bourgeois, <i>Deputy Operating Officer</i>	Watershed Stewardship and Planning Division
Jacqui Carrasco, <i>Associate Real Estate Agent</i>	Real Estate Services Unit
Roseanne Carter, <i>Senior Office Specialist</i>	Real Estate Services Unit
Jennifer Codianne, <i>Deputy Operating Officer</i>	Watersheds Operations and Maintenance Division
Vanessa De la Piedra, <i>Groundwater Management Manager</i>	Groundwater Management Unit
Zooey Diggory, <i>Senior Biologist</i>	Environmental Mitigation & Monitoring Unit
Don Duran, <i>Field Operations Administrator</i>	Operations & Maintenance Engineering Support Unit
Errol Gabrielsen, <i>Associate Engineer</i>	Community Projects Review Unit
Linh Hoang, <i>Communications Manager</i>	Office of Communications
Bassam Kassab, <i>Water Supply Operations Manager</i>	Raw Water Operations Unit
Clayton Leal, <i>Senior Water Resources Specialist</i>	Environmental Mitigation & Monitoring Unit
Bill Magleby, <i>Senior Real Estate Agent</i>	Real Estate Services Unit
Jennifer Michelsen, <i>Associate Environmental Planner</i>	Environmental Planning Unit
Devin Mody, <i>Operations &amp; Maintenance Engineering Support Manager</i>	Operations & Maintenance Support Unit
Alec Nicholas, <i>Capital Engineering Manager</i>	Design & Construction Unit 1
Julianne O'Brien, <i>Associate Engineer</i>	Design & Construction Unit 1
Michael Potter, <i>Program Administrator</i>	Office of Communications
Melissa Reardon, <i>Associate Engineer</i>	Hydrology, Hydraulics & Geomorphology Unit
Afshin Rouhani, <i>Water Policy &amp; Planning Manager</i>	Water Resources Planning & Policy Unit
Eliseo Serrano, <i>Real Estate Services Manager</i>	Real Estate Services Unit
Bill Springer, <i>Senior Engineer</i>	Design & Construction Unit 1
Cameron Tenner, <i>Intern</i>	Water Resources Planning & Policy Unit
Sue Tippetts, <i>Deputy Operating Officer</i>	Office of the Chief Operating Officer
Jose Villarreal, <i>Public Information Representative III</i>	Office of Communications
Jack Xu, <i>Senior Engineer</i>	Hydrology, Hydraulics & Geomorphology Unit
Liang Xu, <i>Hydrology, Hydraulics and Geomorphology Manager</i>	Hydrology, Hydraulics & Geomorphology Unit
Emily Zedler, <i>Senior Engineer</i>	Hydrology, Hydraulics & Geomorphology Unit

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<b>Barbara Keegan</b>	<b>District 2</b>	<b>Nai Hsueh</b>	<b>District 5</b>	<b>Gary Kremen</b>	<b>District 7</b>
<b>Richard Santos</b>	<b>District 3</b>				



# Executive Summary

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## Purpose of Report

This report serves to fully document the planning phase project formulation for reducing the current risk of flooding from Coyote Creek from Montague Expressway to Tully Road. The aim is for the Valley Water Board of Directors, staff, and the interested public and stakeholders to clearly understand the formulation of the recommended project. This report will also identify the portions of the recommended project that need to be expedited for design and construction to meet the needs of the Coyote Creek Flood Protection project (CCFPP), and the subset of those elements needed to be completed sooner due to the Anderson Dam Seismic Retrofit Project, the Coyote Creek Flood Management Measures Project (CCFMMP), herein collectively referred to as “Project.” The information contained in this report would also serve as the basis for Project design.

## Problem Definition

Valley Water records indicate that flooding has occurred along portions of Coyote Creek since the mid-19<sup>th</sup> century, with the most recent flood event experienced in February 2017. On February 21, 2017, Coyote Creek overtopped its banks at several locations between Montague Expressway and Tully Road, inundating hundreds of homes. Approximately 14,000 residents were put under mandatory evacuation order with an additional 22,000 residents advised to evacuate at a moment’s notice. The 2017 flood event resulted in tens of millions of dollars in property damage. The February 2017 event prompted the acceleration and prioritization of the planning, design, and construction of the CCFPP.

On February 20, 2020 the Federal Energy Regulatory Commission (FERC), one of several agencies overseeing the ongoing Anderson Dam Seismic Retrofit Project, directed Valley Water to expedite construction of the Anderson Dam Tunnel Project, a diversion tunnel that would allow for a quick drawdown of Anderson Dam via an outlet pipe with increased capacity. Approximately 40% of the CCFPP is necessary to be designed and constructed as avoidance and minimization measures in anticipation of the Anderson Dam Tunnel Project, to prevent flooding within urbanized areas of San José. Valley Water then created the CCFMMP in response to the FERC directive.

CCFMMP is to be constructed by December 2023, with the remainder of the CCFPP estimated to be constructed by Fall 2025.

## Solution Approach

The formulation of the recommended solution to address the flood risk problem can be described as follows:

- Identification of Project objectives and timeline



- Identification of conceptual alternatives that meet Project objectives and timeline
- Gathering of public and stakeholder input on conceptual alternatives
- Refinement of conceptual alternatives and identification of feasible alternatives assessment criteria
- Identification of feasible alternatives
- Gathering of public and stakeholder input on feasible alternatives
- Refinement of feasible alternatives and evaluation of alternatives with Valley Water's Natural Flood Protection framework
- Identification of recommended alternative
- Informing public and stakeholders of recommended alternative and obtaining and incorporating their input

### Recommended Project

The recommended project alternative encompasses various flood risk mitigation elements including floodwalls, levees, berms, passive barriers, structure elevation and property acquisition. These measures would reduce the risk of flooding for approximately 600 parcels along the urbanized stretch of Coyote Creek to the 5% recurrence interval or an approximately 20-year storm event. A summary of the proposed flood mitigation measures is included in *Table ES-2*.

### Costs

Capital costs, operations and maintenance costs, and life cycle costs were estimated for the Project. A summary of all costs is included in *Table ES-1* below:

*Table ES-1. Estimated costs for both CCFMMP and CCFPP*

Cost Type <sup>a</sup>	CCFMMP	CCFPP
Capital Cost	\$32,700,000	\$57,400,000
Estimated Annual O&M Cost	\$252,000	\$469,000
Flood Mitigation Element Useful Life (years)	50	50
O&M over Useful Life	\$12,600,000	\$23,500,000
<b>Total 50-year Life Cycle Cost (Capital Cost + O&amp;M over Useful Life)</b>	<b>\$45,300,000</b>	<b>\$80,900,000</b>

**Notes:**

a. All costs are in 2020 dollars and rounded off to the nearest hundred thousand



### Recommendations

The recommended Project would significantly reduce the risk of flooding to the Coyote Creek urban community such that no flooding would occur during flow events up to the 20-year (5%) level. While the Project is set to accomplish this main objective, it should not, however, be viewed as an end-all solution for the many human-induced issues observed throughout the length of the creek such as erosion and sedimentation caused by urban development, increase of impervious surfaces, introduction of non-native flora and fauna, trash and debris deposited within and adjacent to the creek, and toxic contaminants due to industrial activity, among others. If anything, this Project should be viewed as one part of a holistic approach to preserve and enhance Coyote Creek, one of the few unmodified natural creek settings in a heavily urbanized environment.



Table ES-2. Staff Recommended Alternative for Coyote Creek Flood Management Measures Project and Coyote Creek Flood Protection Project

Reach	Facility/Area subject to Flooding	Approx. Existing Creek Capacity (cfs)	Design Flow (cfs)	Flood Mitigation Element Type, Height <sup>a</sup> and Length	Project
4	Charcot Ave. Bridge	7,200	9,500	<ul style="list-style-type: none"><li>• 2,450-ft long, 4-ft tall floodwalls on both banks, U/S &amp; D/S of Charcot Ave. bridge</li><li>• Install two 4-ft, 50-ft long passive barriers on roadway at ends of bridge</li><li>• Install one 4-ft, 25-ft long passive barriers on Hartog Drive entrance to Valley Water easement</li></ul>	CCFPP
5	Mobile Home Parks and UPRR Tracks	2,000	9,500	<ul style="list-style-type: none"><li>• 350ft long, 4-ft tall new levee on west bank south of South Bay Mobile Home Park</li></ul>	CCFMMP
	Notting Hill Dr. and Industrial Area D/S of Berryessa Rd.	1,300	9,500	<ul style="list-style-type: none"><li>• 350-ft long, 2-ft tall floodwall on east bank by Notting Hill Dr.</li><li>• 2,000-ft long, 9-ft tall floodwall on west bank, D/S of Berryessa Rd.</li></ul>	
	Industrial Area U/S Berryessa Rd.	4,100	9,100	<ul style="list-style-type: none"><li>• 2,500-ft long, 9-ft tall floodwall on west bank, U/S of Berryessa Rd.</li></ul>	
6	CSJ Mabury Service Yard	7,200	9,100	<ul style="list-style-type: none"><li>• 1,100-ft long, 3-ft tall floodwall on east bank</li></ul>	CCFPP
	RV Storage Lot	4,500	9,100	<ul style="list-style-type: none"><li>• 1,200-ft long, 6-ft tall floodwall on west bank</li></ul>	CCFMMP
	Highway 101	-----	9,100	<ul style="list-style-type: none"><li>• 350-ft long, 4-ft tall floodwall</li></ul>	CCFPP
	Jackson St.	6,500	9,100	<ul style="list-style-type: none"><li>• 75-ft long, 5-ft tall passive barrier across Jackson St.</li></ul>	CCFPP
	Watson Park	2,000	9,100	<ul style="list-style-type: none"><li>• 1,200-ft long, 6-ft tall floodwall at western edge of Watson Park</li><li>• 75-ft long, 5-ft tall berm at Watson Park</li><li>• 250-ft long, 5.5-ft tall floodwall at northern side of Empire Gardens Elementary School</li></ul>	CCFPP
	Kellogg Company	-----	9,100	<ul style="list-style-type: none"><li>• 850-ft long, 2-ft tall wall at western edge of Kellogg Co.</li></ul>	CCFPP
	Parkside Terrace Apartments	-----	8,400	<ul style="list-style-type: none"><li>• 750-ft long, 5.5-ft tall floodwall on east bank</li></ul>	CCFPP
7	South 17 <sup>th</sup> St., north of San Antonio St.	1,600	8,400	<ul style="list-style-type: none"><li>• Acquire, demo and return to natural conditions or elevate properties located at 50 S. 17<sup>th</sup> St., 60 S. 17<sup>th</sup> St. and 70 S. 17<sup>th</sup> St.</li><li>• 550-ft long, 5.5-ft tall floodwall on the backyards of 82 S. 17<sup>th</sup> St. and 96 S. 17<sup>th</sup> St.</li></ul>	CCFMMP
	Arroyo Way	3,200	8,400	<ul style="list-style-type: none"><li>• Acquire, demo and return to natural conditions or elevate properties located at 120 Arroyo Way, 150 Arroyo Way, 166 Arroyo Way, 180 Arroyo Way</li></ul>	CCFMMP
	Brookwood Ave.	4,300	8,400	<ul style="list-style-type: none"><li>• 100-ft long, 3-ft tall floodwall on the backyard of 329 Brookwood Ave.</li><li>• Acquire, demo and return to natural conditions or elevate properties located at 311 Brookwood Ave., 315 Brookwood Ave., and 321 Brookwood Ave.</li></ul>	CCFPP
	South 17 <sup>th</sup> St. south of San Antonio St.	2,600	8,400	<ul style="list-style-type: none"><li>• Acquire, demo and return to natural conditions or elevate the property located at 398 S. 17<sup>th</sup> St.</li></ul>	CCFMMP
	South 16 <sup>th</sup> St. and William Street.	4,000	8,400	<ul style="list-style-type: none"><li>• 700-ft long, 9-ft tall floodwall along the western edge of Coyote Outdoor Classroom</li><li>• Acquire, demo and return to natural conditions or elevate property located at 797 East William Street.</li><li>• 400-ft long, 4-ft tall floodwall along the backyard perimeter of properties 650 S. 16<sup>th</sup> Street and 654 S. 16<sup>th</sup> Street.</li></ul>	CCFMMP
	William St. Park and William St.	2,500	8,400	<ul style="list-style-type: none"><li>• 1,200-ft long, 4-ft tall vegetated berm on western edge of William St. Park</li><li>• 150-ft long, 3-ft tall passive barrier at entrance of Coyote Outdoor Classroom ramp</li></ul>	CCFPP
	Selma Olinder Park and Olinder Elementary School	3,000	8,400	<ul style="list-style-type: none"><li>• 950-ft long, 5-ft tall floodwall located west of Olinder Elementary School</li><li>• 1,750-ft long, 5-ft tall passive barrier at eastern edge of Selma Olinder Park</li></ul>	CCFPP
8	Creekside Garden Apartments	-----	8,300	<ul style="list-style-type: none"><li>• 350-ft long, 6-ft tall floodwall on west bank, north of Keyes St.</li></ul>	CCFPP
	Rocksprings and Bevin Brook Dr. homes	7,400	8,300	<ul style="list-style-type: none"><li>• 500-ft long, 4.5-ft tall floodwall at edge of Rock Springs Park</li><li>• 1,500-ft long, 4.5-ft tall berm east of SJWC station and Bevin Brook Dr.</li></ul>	
	Tully Rd. San José Water Company Groundwater Station	-----	8,300	<ul style="list-style-type: none"><li>• 600-ft long, 6.5-ft tall floodwall on east bank, D/S of Tully Rd.</li></ul>	

Notes:  
a. All heights are above existing ground level



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## LIST OF ABBREVIATIONS

ADSRP	Anderson Dam Seismic Retrofit Project
ADTP	Anderson Dam Tunnel Project
BFE	Base Flood Elevation
CCC	Central California Coast
CCFMMP	Coyote Creek Flood Management Measures Project
CCFPP	Coyote Creek Flood Protection Project
cfs	cubic feet per second
CNDDB	California Natural Diversity Database
CNPS	California Native Plant Society
D/S	Downstream
DTSC	Department of Toxic Substance Control
EDR	Environmental Data Resources
FAHCE	Fisheries and Aquatic Habitat Collaborative Effort
FEMA	Federal Emergency Management Agency
FERC	Federal Energy Regulatory Commission
FIS	Flood Insurance Study
FOCP	FERC Order Compliance Project
ft	feet
HEC-RAS	Hydrologic Engineering Center – River Analysis System
HSLA	Hazardous Substance Liability Assessment
IPaC	Information for Planning and Consultation
LWD	Large Woody Debris
mg/L	Milligram(s) per Liter
MRFW	Mixed Riparian Forest and Woodland
NAVD	North American Vertical Datum
NMFS	National Marine Fisheries Service
NPL	National Priorities List



NRCS	Natural Resources Conservation Services
O&M	Operations and Maintenance
PSR	Planning Study Report
QEMS	Quality and Environmental Management System
ROW	Right of Way
SMP	Stream Maintenance Program
SSURGO	Soil Survey Geographic Database
STLC	Soluble Threshold Limit Concentration
TTLT	Total Threshold Limit Concentration
USACE	United States Army Corps of Engineers
USDA	United States Department of Agriculture
USFWS	United States Fish and Wildlife Service
UST	Underground Storage Tank
U/S	Upstream
VCP	Voluntary Cleanup Program
WMI	Watershed Management Initiative



A photograph of a pond surrounded by trees and vegetation. The pond is in the center, reflecting the surrounding greenery. The trees are mostly green, with some showing signs of autumn. In the foreground, there are some plants with reddish-brown flowers. A blue semi-transparent box is overlaid on the top right of the image, containing the chapter title.

# ***CHAPTER 1***

## ***INTRODUCTION***



## 1. Introduction

The completion of a Planning Study Report (PSR) is the culmination of the planning phase of a capital project at Valley Water. Completion of a PSR is part of the Quality and Environmental Management System (QEMS) Planning Phase Work Breakdown structure as outlined in document W-730-124, Item 12-I. The PSR serves to fully document the project formulation process during the planning phase so that the public and the Valley Water Board of Directors can fully understand the proposed project and its development process. The PSR presents the proposed project and all supporting information for the Project Owner's approval. As recommended in QEMS document W-730-124, this report is organized as follows:

- Chapter 1. [Introduction](#)
- Chapter 2. [Study Background](#)
- Chapter 3. [Problem Definition](#)
- Chapter 4. [Formulation of Alternatives](#)
- Chapter 5. [Recommended Project](#)
- Chapter 6. [Outreach and Community Involvement](#)
- Chapter 7. [Operations and Maintenance Program](#)
- Chapter 8. [Capital and Maintenance Cost, Funding and Schedule](#)
- Chapter 9. [Conclusions and Recommendations](#)
- Chapter 10. [References](#)
- Chapter 11. [Appendices](#)

### 1.1 Project Origin

Valley Water records indicate that flooding has occurred along portions of Coyote Creek since 1852<sup>1</sup>, with the most recent flood event observed in February 2017<sup>2</sup>. A list of recorded flood events along Coyote Creek is shown in *Table 1.1* as well as illustrated in *Figure 1.1*. *Section 2.3* of this report describes previous engineering studies and construction projects done by Valley Water since 1961 along various segments of Coyote Creek.

In November 2000, voters approved the Clean, Safe Creeks and Natural Flood Protection Plan (Measure B), a 15-year special parcel tax which allocated \$32 million (1999 dollars) to the development of the Mid-Coyote Creek Project.<sup>3</sup> This project aimed to provide 100-year flood protection meeting FEMA standards for homes, schools, businesses, and highways located along Coyote Creek from Montague Expressway to Interstate 280. In 2011, Valley Water completed the Mid-Coyote Creek Project Planning Study. Numerous

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<sup>1</sup> Grossinger, Robin, et al. (2006). *Coyote Creek Watershed Historical Ecology Study: Historical Condition, Landscape Change, and Restoration Potential in the Eastern Santa Clara Valley, California*. Prepared for the Santa Clara Valley Water District. A Report of SFEI's Historical Ecology, Watersheds, and Wetlands Science Programs, SFEI Publication 426, San Francisco Estuary Institute, Oakland, CA.

<sup>2</sup> SCVWD (2017). *Hydraulics, Hydrology, and Geomorphology Unit. Flooding Report (Final), Coyote Creek, Uvas Creek, San Francisquito Creek, and West Llagas Creek, January and February of 2017*. Santa Clara Valley Water District, San Jose, CA. <https://www.valleywater.org/floodready/flood-reports>

<sup>3</sup> SCVWD (2018). *Safe, Clean Water and Natural Flood Protection Program*. Santa Clara Valley Water District, 2018. <https://www.valleywater.org/project-updates/safe-clean-water-and-natural-flood-protection-program>



public meetings were held during this period to better inform the project and to incorporate public input into the Mid-Coyote Creek Project alternatives.<sup>4</sup>

The 2011 Mid-Coyote Creek Project Planning Study concluded that the cost for feasible project alternatives ranged between \$500 million and \$1 billion.<sup>4, 5</sup> To secure additional funding, Valley Water attempted to obtain U.S. Army Corps of Engineers funding support, but the efforts were unsuccessful.<sup>4</sup> With the limited available funding, Valley Water proceeded with initiating the design for the downstream reaches of the project, between Montague Expressway and Interstate 880. However, design work was paused due to uncertainty about the impacts of the ongoing Anderson Dam Seismic Retrofit Project (ADSRP) on Coyote Creek.

In November 2012, voters approved the Safe, Clean Water and Natural Flood Protection Program, a 15-year special parcel tax developed with input from more than 16,000 residents and stakeholders. While this program provided no additional funding to the Mid-Coyote Creek Project, the project and its remaining budget were carried forward into the new program. Due to lack of additional funding and the uncertainty of impacts to and by other projects such as the ADSRP, Upper Penitencia Creek Flood Protection Project, and Ogier Ponds Feasibility Study, on April 29, 2016, the Valley Water Board approved staff's recommendation that the Mid-Coyote Creek Project planning phase be paused until fiscal year 2018-2019 to allow for a revision of the project's alternatives.<sup>5</sup>

During the 2016-2017 winter season, the entire state of California experienced precipitation at 190% of average.<sup>6</sup> In Santa Clara County, various storm systems were regularly moving through the area, keeping the soil saturated and causing significant flooding events and unprecedented reservoir spills. On February 21, 2017, Coyote Creek overtopped its banks at several locations between Montague Expressway and Tully Road. Consequently, hundreds of homes, commercial and industrial businesses were inundated by the creek waters for several hours.<sup>7</sup> Approximately 14,000 residents were put under mandatory evacuation orders and there were tens of millions of dollars in property damage.<sup>8</sup> The February 2017 flood event saw the largest flows on Coyote Creek since the construction of Anderson Dam in 1950, as illustrated in *Figure 1.1*.

The February 2017 flood event prompted a modification of goals and the acceleration of the original November 2000 voter funded Mid-Coyote Creek Project. On June 13, 2017, the Board accelerated the continuation of the project, which had been paused until 2019, to 2017 and revised the proposed level of protection from a 100-year flood to the February 2017 flood event, or an approximately 20-year flood event. The Board also extended the project scope upstream to Tully Road, directing staff to move forward

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<sup>4</sup> SCVWD (2017). *Water District Approves Expediting and Extending a Flood Protection Project for Coyote Creek*. 15 June 2017, <https://www.valleywater.org/news-events/news-releases/water-district-approves-expediting-and-extending-flood-protection-project>

<sup>5</sup> SCVWD (2011). *Mid-Coyote Creek Project Planning Study*. Montague Expressway to Interstate 280. Planning Study Report.

<sup>6</sup> *California Monthly Climate Summary, February 2017*. California Department of Water Resources, 2017. [https://water.ca.gov/LegacyFiles/floodmgmt/hafoo/csc/docs/California\\_Climate\\_Summary\\_022017.pdf](https://water.ca.gov/LegacyFiles/floodmgmt/hafoo/csc/docs/California_Climate_Summary_022017.pdf)

<sup>7</sup> SCVWD (2017). *Hydraulics, Hydrology, and Geomorphology Unit. Flooding Report (Final), Coyote Creek, Uvas Creek, San Francisquito Creek, and West Llagas Creek, January and February of 2017*. Santa Clara Valley Water District, San Jose, CA. Available at <https://www.valleywater.org/floodready/flood-reports>

<sup>8</sup> Dueñas, Roberto L. *Coyote Creek Flood Preliminary After Action Report*. City of San Jose, San Jose, CA. 8 March 2017, [http://sanjose.granicus.com/MetaViewer.php?view\\_id=&event\\_id=2760&meta\\_id=622008](http://sanjose.granicus.com/MetaViewer.php?view_id=&event_id=2760&meta_id=622008)



with the planning, design, and construction of the renamed Coyote Creek Flood Protection Project (CCFPP).<sup>9</sup>

Table 1.1. Recorded flood events along Coyote Creek

Flood Event Date	Summary of Event	Observed Peak Discharge, cubic feet per second (cfs) <sup>a,b</sup>
Winter 1852 - 1853 <sup>1</sup>	Downstream from Montague Expressway, Coyote Creek diverted and continued west to merge with Guadalupe River. At the current crossing with Highway 237, flow spread both east and west, and extended northwest into the marshlands.	Unknown
Winter 1861 - 1862 <sup>1</sup>	Known as the Great Flood of 1862, it affected most of the State of California. Historical documentation indicates extensive flooding along Coyote Creek and Guadalupe River.	Unknown
March 7-9, 1911 <sup>10, 11</sup>	Coyote Creek and Guadalupe River merged together at various points.	25,000
1917 <sup>3, 4</sup>	Flood year mentioned and confirmed in various historical documents.	10,100
1932 <sup>4</sup>	Flood year mentioned and confirmed in various historical documents.	10,600
April 1958 <sup>4</sup>	Largest flood on Coyote Creek following the construction of Anderson Dam.	5,750
February 1969 <sup>3, 4</sup>	Flood year mentioned and confirmed in various historical documents.	3,570
March - April 1982 <sup>12</sup>	Flooding observed in lower Coyote Creek. Approximately 2,000 people evacuated.	3,780
January - March 1983 <sup>13</sup>	Flooding observed in lower Coyote Creek (Alviso). Approximately 1,900 people evacuated.	4,580
Winter 1996 - 1997 <sup>14</sup>	Coyote Creek overtopped its banks at several locations from Morgan Hill to the City of San Jose.	6,280
February 2 - 9, 1998 <sup>15</sup>	Flooding observed at various locations along Coyote Creek downstream of Highway 280.	3,833
January – February, 2017 <sup>16</sup>	Coyote Creek overtopped its banks at several locations between Montague Expwy and Tully Rd., 14,000 residents placed under mandatory evacuation orders and 22,000 advised to evacuate	7,410

**Notes:**

a. Madrone Stream Discharge Gauge Station record.

b. Location for stream discharge gauging station can be found in Figure 2.52, *Section 2.5. Hydrology*

<sup>9</sup> SCVWD (2017). *Public Hearing on Proposed Modification to the Coyote Creek Flood Protection Project of the Safe, Clean Water and Natural Flood Protection Program*. Santa Clara Valley Water District, 13 June 2017, <https://scvwd.legistar.com/LegislationDetail.aspx?ID=3064265&GUID=D843FFA6-6EA4-4825-9A8F-76221C76BB82&Options=&Search=&FullText=1>

<sup>10</sup> Grossinger, Robin, et al. (2006). *Coyote Creek Watershed Historical Ecology Study: Historical Condition, Landscape Change, and Restoration Potential in the Eastern Santa Clara Valley, California*. Prepared for the Santa Clara Valley Water District. A Report of SFEI's Historical Ecology, Watersheds, and Wetlands Science Programs, SFEI Publication 426, San Francisco Estuary Institute, Oakland, CA.

<sup>11</sup> U.S. Army Corps of Engineers (1977). *Hydrologic Engineering Office Report: Guadalupe River and Coyote Creek, Santa Clara County, California*. San Francisco District, San Francisco, CA.

<sup>12</sup> SCVWD (1982). *Report on Flooding and Flood Related Damages, Santa Clara County, January 1 to April 30, 1982*. Santa Clara Valley Water District, San Jose, CA. Available at <https://www.valleywater.org/floodready/flood-reports>

<sup>13</sup> SCVWD (1983). *Report on Flooding and Flood Related Damages, Santa Clara County, January 1 to April 30, 1983*. Santa Clara Valley Water District, San Jose, CA. Available at <https://www.valleywater.org/floodready/flood-reports>

<sup>14</sup> SCVWD (1998). *Report on Flooding and Flood Related Damages in Santa Clara County, December 31, 1996 to January 27, 1997*. Santa Clara Valley Water District, San Jose, CA. Available at <https://www.valleywater.org/floodready/flood-reports>

<sup>15</sup> SCVWD (1999). *Report on Flooding and Flood Related Damages in Santa Clara County, February 2 to 9, 1998*. Santa Clara Valley Water District, San Jose, CA. Available at <https://www.valleywater.org/floodready/flood-reports>

<sup>16</sup> SCVWD (2017). *Hydraulics, Hydrology, and Geomorphology Unit. Flooding Report (Final), Coyote Creek, Uvas Creek, San Francisquito Creek, and West Llagas Creek, January and February of 2017*. Santa Clara Valley Water District, San Jose, CA. Available at <https://www.valleywater.org/floodready/flood-reports>



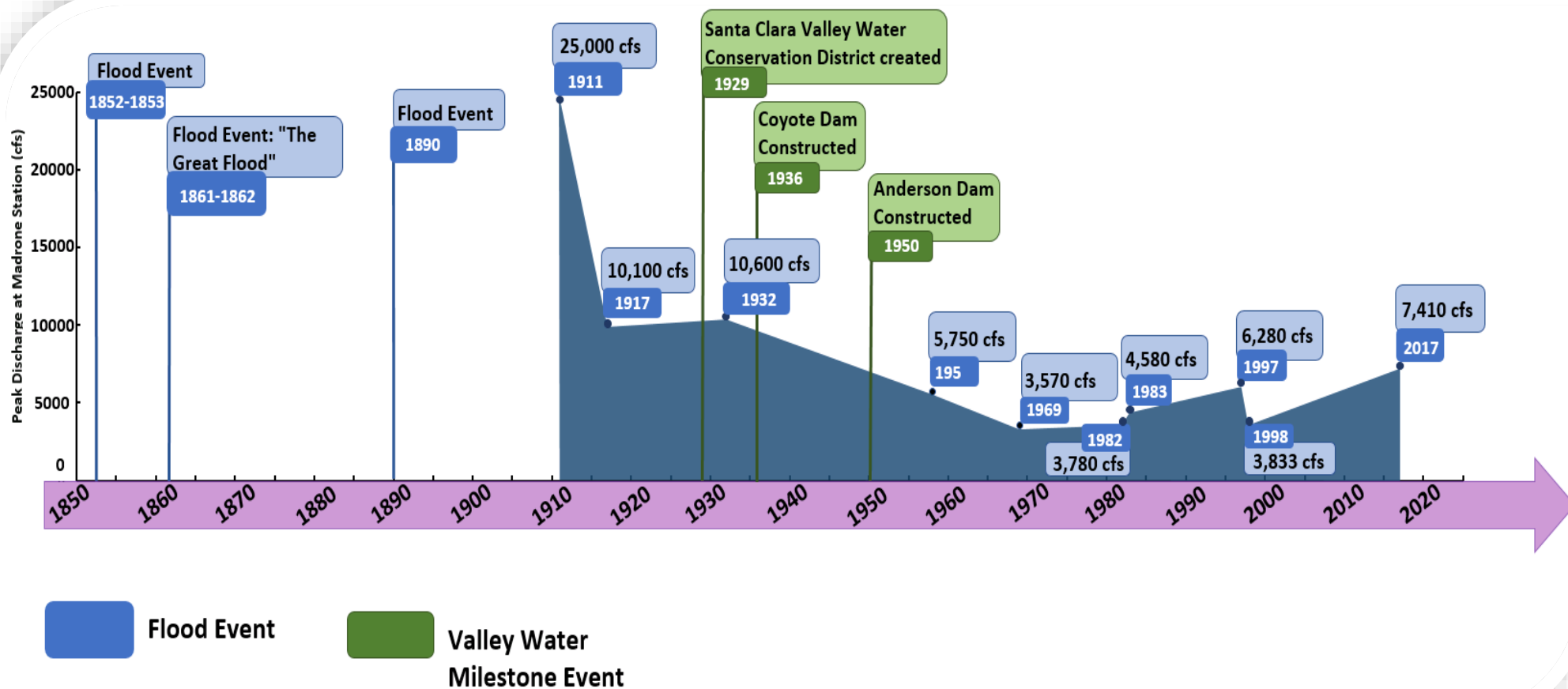
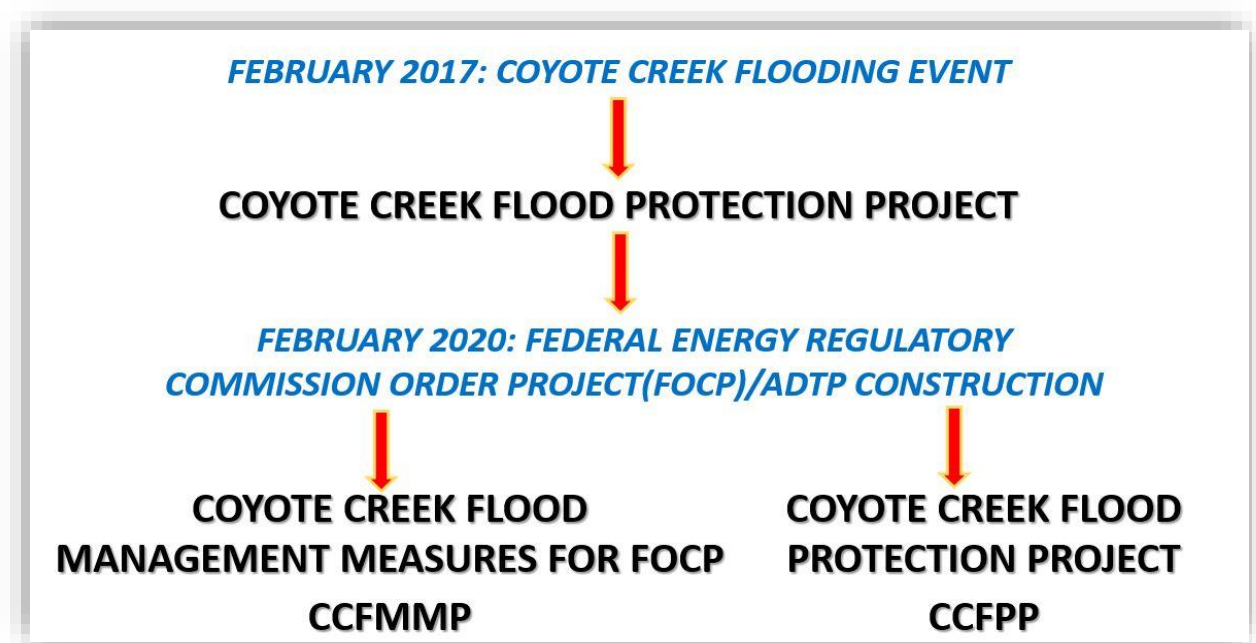


Figure 1.1. Flooding History within Coyote Creek



On February 20, 2020, the Federal Energy Regulatory Commission (FERC) directed Valley Water to start lowering Anderson Dam to deadpool (lowest attainable level in the reservoir using the outlet works) no later than October 1, 2020, as well as to expedite implementation of the diversion tunnel system, known as the Anderson Dan Tunnel Project (ADTP).<sup>17</sup> As part of the implementation of the ADTP, early completion of some elements of the ongoing CCFPP were found necessary as avoidance and minimization measures for the ADTP to prevent flooding within urbanized areas of Coyote Creek as a result of the utilization of the diversion tunnel system. These identified and prioritized elements within the CCFPP are what is now known as the Coyote Creek Flood Management Measures for the FERC Order Compliance Project or Coyote Creek Flood Management Measures Project (CCFMMP) for short. The rest of the project elements not included in the CCFMMP are still known as the CCFPP. For purposes of this Planning Study Report, both projects will be collectively referred to as “Project” and referred to by name individually, where appropriate. *Figure 1.2* shows a schematic illustrating the project split due to the February 20, 2020 FERC Order and *Figure 1.3* shows an overview of the extent of both projects.



*Figure 1.2. Schematic depicting flood protection project split following FERC Order*

<sup>17</sup> SCVWD (2020). *Approve the preliminary Project Description for the Anderson Dam Federal Energy Regulatory Commission Order Compliance Project and find that the requirements of the Federal Energy Regulatory Commission Order Compliance Project are consistent with Santa Clara Valley Water Resolution No. 605*. Santa Clara Valley Water District, 26 May 2020. <https://scvwd.legistar.com/LegislationDetail.aspx?ID=4544457&GUID=90C04448-3866-4CEF-93D1-7A7222AC65B7&Options=&Search=&FullText=1>



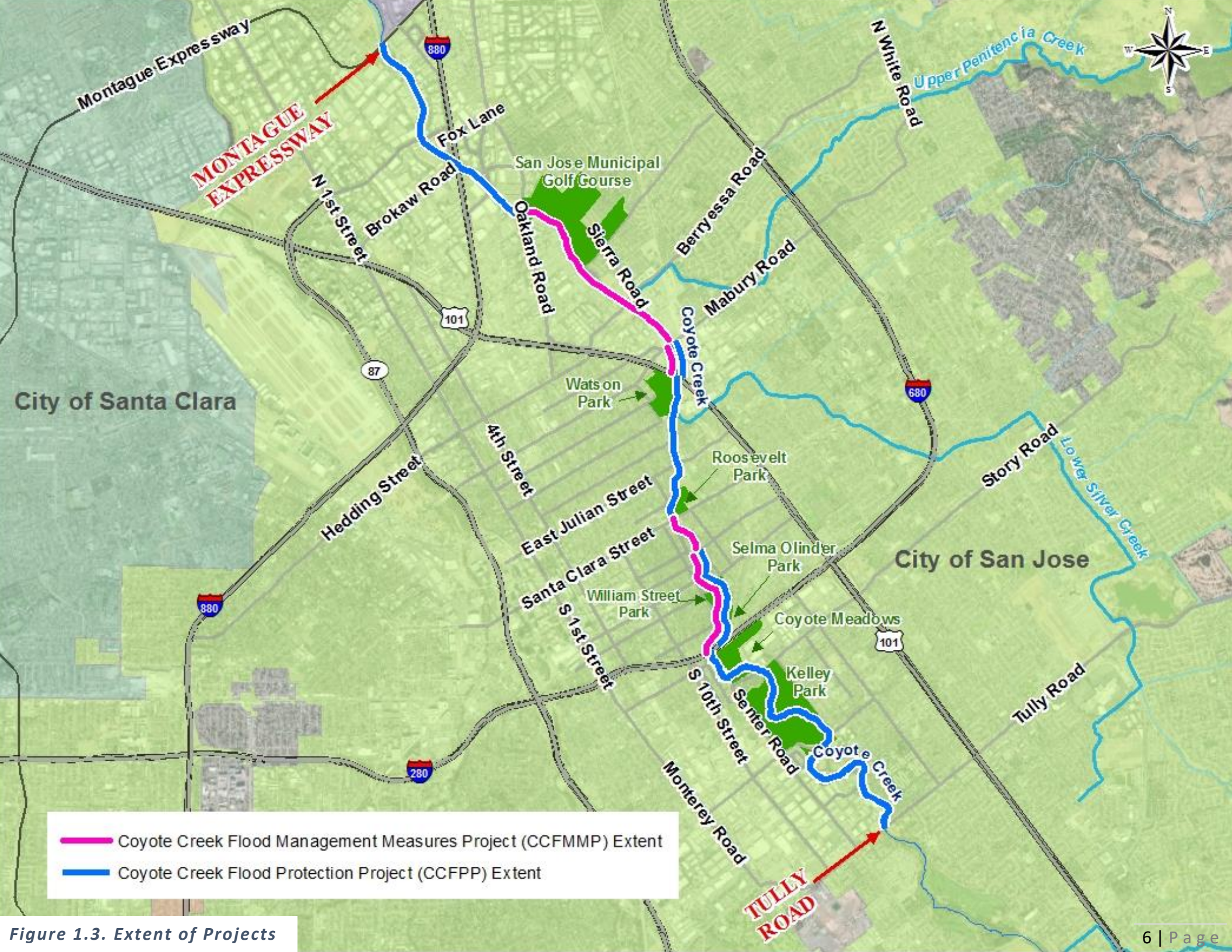


Figure 1.3. Extent of Projects



## 1.2 Relevant Board Governance Policies

As described in Board Governance Policy GP-1, the purpose of the Valley Water Board of Directors is to see that Valley Water provides Silicon Valley with safe, clean water for a healthy life, environment, and economy on behalf of the people of Santa Clara County. In line with this purpose, the Board adopts policies to govern its own processes, delegate its power, communicate Valley Water’s mission, general principles and Ends, and to provide constraints on executive authority. These Board policies are collectively called Board Governance Policies.

In pursuit of Valley Water’s mission of providing Silicon Valley with safe, clean water for a healthy life, environment and economy, the Board established three main Ends to accomplish:

- **Governance Policy E-2 Water Supply (WS) Services:** Valley Water provides a reliable, safe, and affordable water supply for current and future generations in all communities served;
- **Governance Policy E-3 Natural Flood Protection (NFP):** There is a healthy and safe environment for residents, businesses and visitors, as well as for future generations, and
- **Governance Policy E-4 Water Resources Stewardship (WRS):** Water resources stewardship protects and enhances ecosystem health.

Each of the three main Ends described above is associated with specific goals and objectives which can be found in the Board Governance Policies, Section III. All capital projects planned, designed and constructed by Valley Water are to follow the appropriate Board Governance Policies. The Project described in this report complies with Board Governance Policies E-2 through E-4.

## 1.3 Project Objectives

The primary goal of the Project is to reduce the risk of flooding to homes, schools, businesses, and transportation infrastructure from Montague Expressway to Tully Road, from a flood event equivalent to the February 2017 flood event (approximately a 20-year flood event) under current channel and floodplain land use conditions. *Table 1.2* shows the 20-year design flow criteria for the entire extent of the Project.

Additional objectives include:

- Identify stream habitat enhancement opportunities
- Identify opportunities to improve water quality
- Identify opportunities to provide for public recreation and access
- Minimize the need for future operations and maintenance activities
- Obtain community support

*Table 1.2. Design flows for the Project*

Location along Coyote Creek	Design Flow (cfs) <sup>a</sup>
Tully Road	8,300
I-280	8,400
East William Street	8,400
U/S Lower Silver Creek	8,400
D/S Lower Silver Creek	9,100
U/S Upper Penitencia Creek	9,100
Berryessa Road	9,500
I-880	9,500
Montague Expressway	9,500

a. Assumes flow is contained within channel or within 20-year floodplain areas



## 1.4 Location and Study Limits

The Project extent comprises approximately nine miles of Coyote Creek, from the downstream face of Montague Expressway bridge to the upstream face of the Tully Road bridge as illustrated in *Figure 1.3*. The entire extent of the Project is located within the City of San José. The extent includes those sections of urbanized creek length that remain subject to risk of frequent flooding. The Project is located in the mid to lower portion of Coyote Creek as illustrated in *Figure 1.4*.

There are several major roads and highways within the scope of the Project including Highway 101, Interstate 280 and Interstate 880. There are also two major tributaries draining into Coyote Creek within the limits of the Project: Upper Penitencia Creek and Lower Silver Creek. Major parks and open spaces adjacent to Coyote Creek within the extent of the Project include Watson Park, Roosevelt Park, William Street Park, Selma Olinder Park, Coyote Meadows, Rocksprings Park and Kelley Park, which are also shown in *Figure 1.3*.

To better study and define problem areas, the nine-mile extent was divided into five reaches, which limits are summarized in *Table 1.3* and illustrated in *Figure 1.5*. To give continuity to the previously completed three reaches of the Lower Coyote Creek flood protection project, the reaches have been numbered 4 to 8.

*Table 1.3 Project Reaches*

Reach	Limits
4	Montague Expressway to Old Oakland Road - CCFPP
5	Old Oakland Road to Mabury Road - CCFMMP
6	Mabury Road to East Santa Clara Street - CCFPP & CCFMMP
7	East Santa Clara Street to Highway 280 - CCFPP & CCFMMP
8	Highway 280 to Tully Road - CCFPP



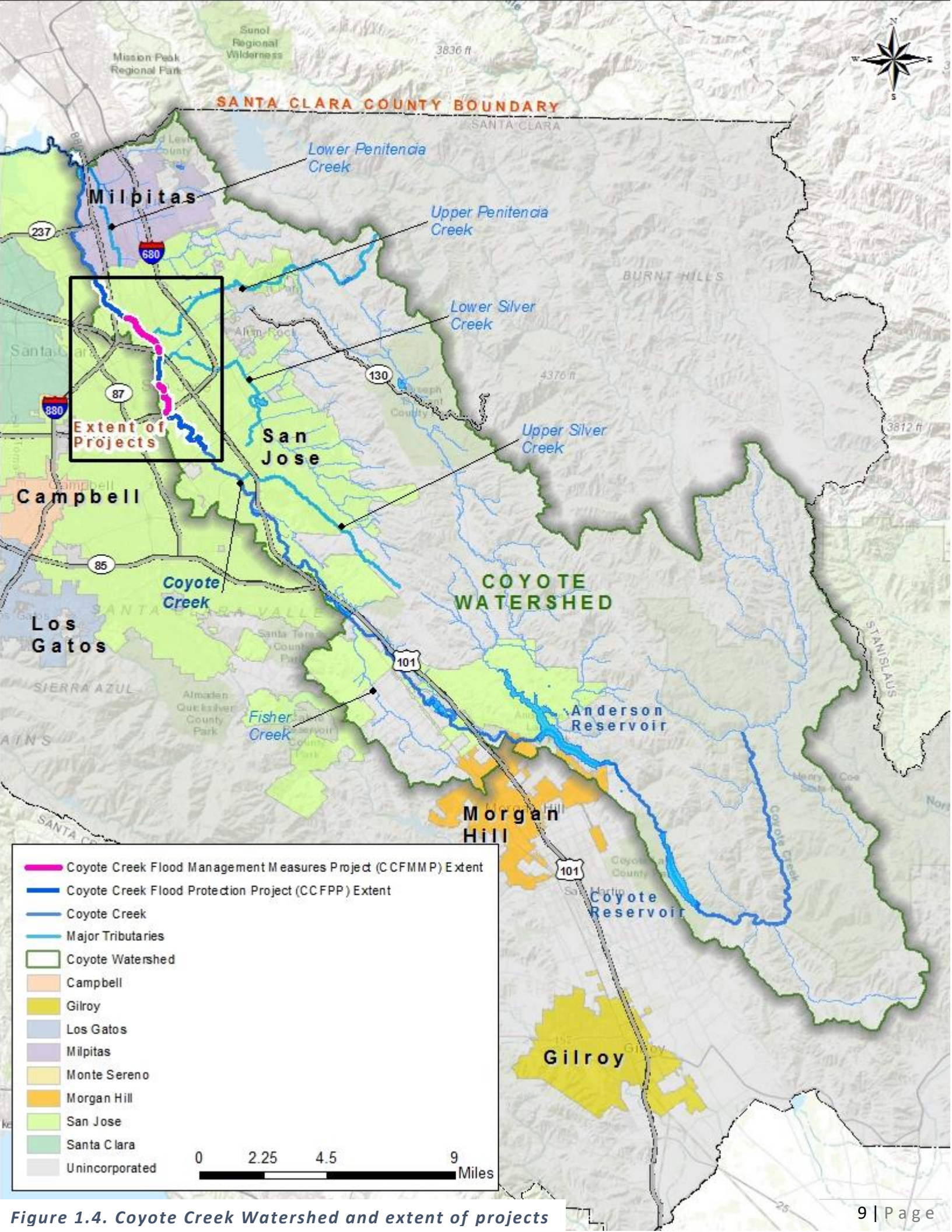


Figure 1.4. Coyote Creek Watershed and extent of projects



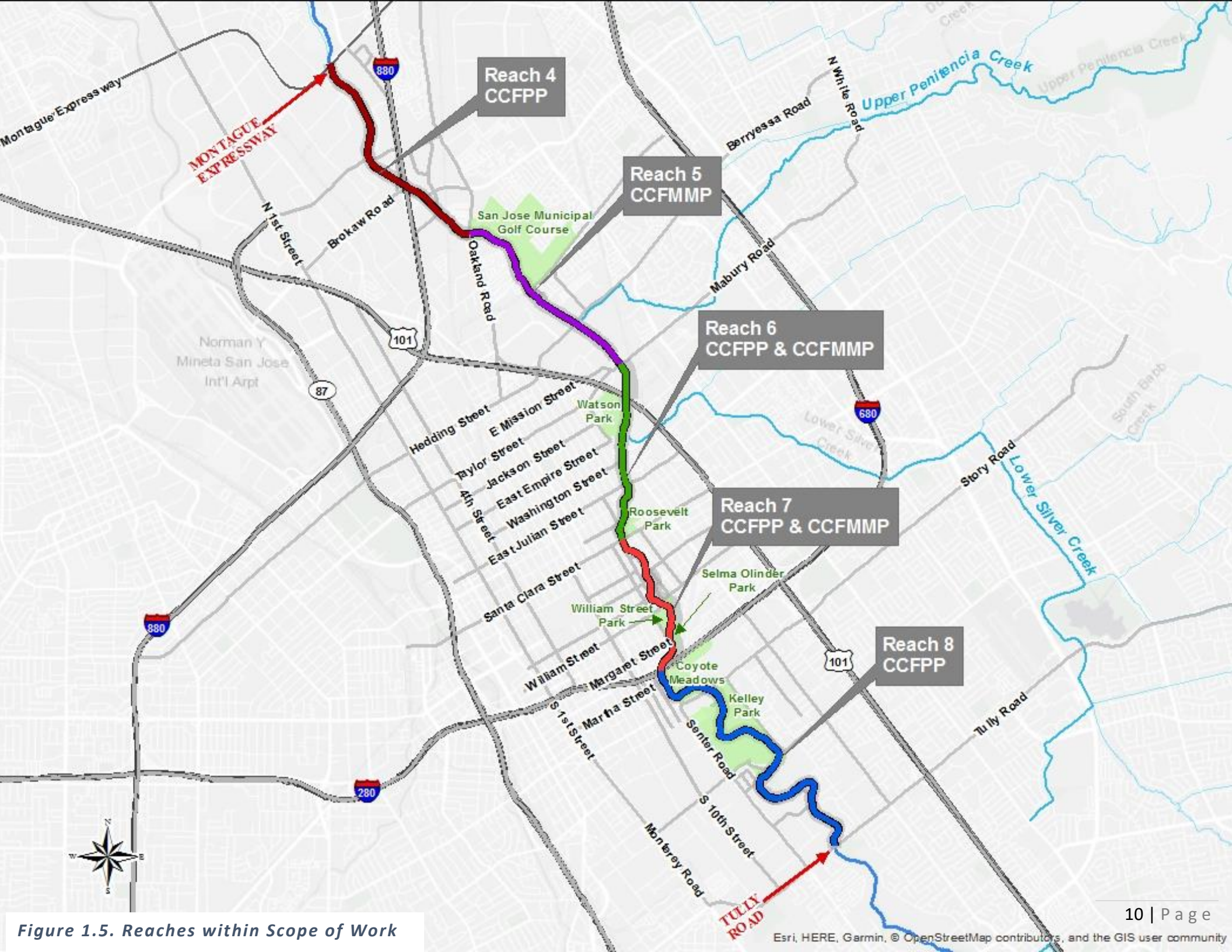


Figure 1.5. Reaches within Scope of Work



# ***CHAPTER 2***

## ***STUDY BACKGROUND***





## 2. Study Background

This chapter provides historical data as well as descriptive information on the Coyote Creek Watershed, the entire Coyote Creek, and the extent of the Project. The main purpose of this chapter is to see beyond the scope of the Project and study the entire watershed, following the integrated watershed management approach directed by the Board which looks to balance environmental quality and protection from flooding within the entire watershed context as outlined in Governance Policy E-3. The information in this chapter will help to assess the appropriateness of the Project to its location within the watershed.

### 2.1 Coyote Creek Watershed Description

The Coyote Creek Watershed encompasses an area of approximately 322 square miles and extends from the urbanized valley floor upward to the western face of the Diablo Mountain Range.<sup>18</sup> The city of Milpitas and portions of the Cities of San José and Morgan Hill, as well as parts of unincorporated Santa Clara County lie within the watershed, as shown in Figure 2.1. Major roads and arterials crossing the watershed are also illustrated in Figure 2.1. They include Highways 101, 237, 85, 87 and 130, and Interstates 680, 880 and 280.

The Coyote Creek Watershed slopes down from south to north and east to west, draining to San Francisco Bay via the 62-mile long Coyote Creek.<sup>19</sup> The upper elevation zone of the watershed is comprised mainly of agricultural land and rangeland as well as open space. Urbanized land use is confined to the downstream region of the lower elevation zone watershed. Industrial development exists as well in the lower elevation zone of the watershed, near major transportation corridors, as illustrated in Figure 2.1.

### 2.2 Coyote Creek Description

Coyote Creek originates in Henry Coe State Park and surrounding hills within the Diablo Range Mountains.<sup>18</sup> From there, it flows south approximately eight miles, then west for about three miles to Coyote Reservoir turning northwest and traversing Anderson Reservoir, then continuing northwest to the south end of San Francisco Bay.<sup>19</sup> Through its 62-mile path, it crosses parts of the cities of Morgan Hill and San José, the City of Milpitas, and unincorporated areas of Santa Clara County. The creek traverses the western edge of the Coyote Creek Watershed, with at least five major tributaries draining into it, including Lower Penitencia Creek, Upper Penitencia Creek, Lower Silver Creek, Upper Silver Creek, and Fisher Creek, as illustrated in Figure 2.1, left side. Approximately 68 major storm drain outfalls from the various municipalities as well as various privately owned outfalls also contribute to Coyote Creek.<sup>20</sup>

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<sup>18</sup> SCVWD (2018). *Watersheds of Santa Clara Valley*. Santa Clara Valley Water District, 2018, <https://www.valleywater.org/learning-center/watersheds-of-santa-clara-valley>

<sup>19</sup> *Feature Detail Report for: Coyote Creek*. United States Geological Survey. 18 December 2018. [https://geonames.usgs.gov/apex/f?p=gnispq:3:::NO::P3\\_FID:255083](https://geonames.usgs.gov/apex/f?p=gnispq:3:::NO::P3_FID:255083)

<sup>20</sup> SCVURPPP (2001). *Stormwater Environmental Indicators Demonstration project, Final Report*. San Jose: Prepared for the Water Environment Research Foundation, Project 96-IRM-3, USEPA Cooperative Agreement #CX 823666-01-2, 2001.



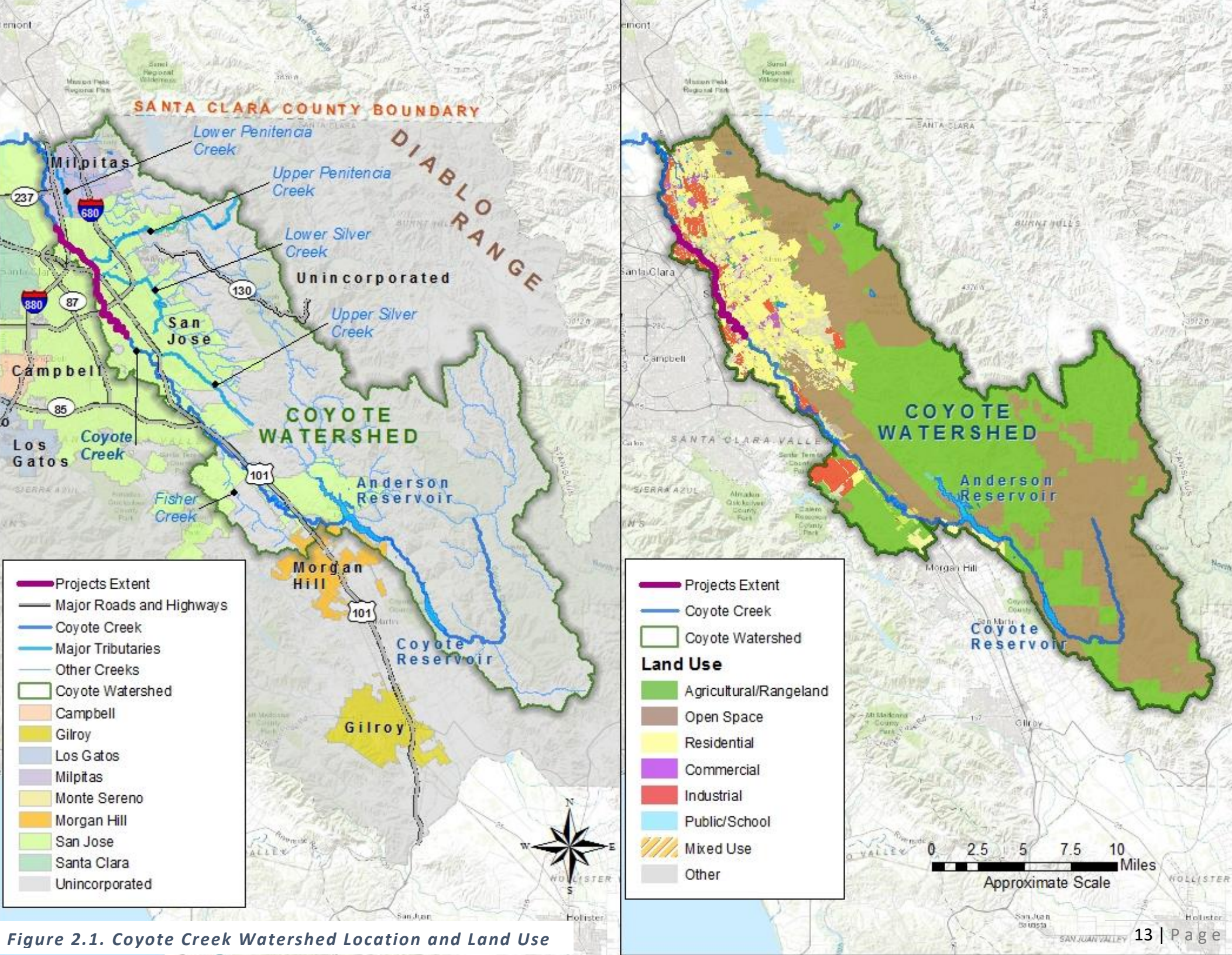


Figure 2.1. Coyote Creek Watershed Location and Land Use



Coyote Creek is impounded by two dams, Coyote and Anderson Dams, built in 1936 and 1950, respectively. The two dams were constructed primarily to capture seasonal streamflow for groundwater recharge and water supply storage.<sup>21</sup>

Between Anderson Dam and the South San Francisco Bay, two major pond systems are located within or adjacent to Coyote Creek: Ogier Ponds and Metcalf Ponds. Ogier Ponds were originally isolated from the natural channel but connected to the creek in 1997 when a levee bounding one of the ponds was breached (see *Figure 2.2*).<sup>22</sup> Metcalf Ponds are located just downstream of Coyote Narrows, and the Coyote Percolation Pond, located within the Metcalf Pond system, is currently a Valley Water-managed groundwater percolation pond.<sup>21</sup> Valley Water installs and operates a flashboard dam at this pond.

As Coyote Creek nears the South San Francisco Bay, a transition occurs from a freshwater environment to an estuarine environment where the channel and adjacent baylands contain brackish marsh, salt marsh and mudflats.



*Figure 2.2. Ogier Ponds, looking southeast towards East Bay Hills*

<sup>21</sup> Grossinger, Robin, et al. (2006). *Coyote Creek Watershed Historical Ecology Study: Historical Condition, Landscape Change, and Restoration Potential in the Eastern Santa Clara Valley, California*. Prepared for the Santa Clara Valley Water District. A Report of SFEI's Historical Ecology, Watersheds, and Wetlands Science Programs, SFEI Publication 426, San Francisco Estuary Institute, Oakland, CA.

<sup>22</sup> SCVWD (2018). *Ogier Ponds Feasibility Study, Feasibility of Removing Surface Hydraulic Connection Between Coyote Creek and Ogier Ponds, Santa Clara County, California*. March 2018. Santa Clara Valley Water District, San Jose.



### 2.2.1 Coyote Creek Description within Project Extent

Following is a detailed description of Coyote Creek within the specific Project reaches, from downstream to upstream. For reference, all photography illustrating typical creek conditions included in this report were taken from 2018 to 2020 during various seasons.

#### REACH 4: Montague Expressway to Old Oakland Road

Reach 4 extends approximately 1.9-miles (9,763-ft) between the downstream face of Montague Expressway bridge and the upstream face of Old Oakland Road bridge. Typical conditions observed at Charcot Avenue bridge, located within Reach 4, are shown in *Figures 2.3* and *2.4*, and typical cross-section conditions are illustrated in *Figure 2.5*. Within this reach, the creek is found mostly between earthen embankment structures with about 2 to 1 (horizontal to vertical) side slopes. As observed in *Figure 2.5*, the width measured between embankment tops is between 170-ft and 190-ft, with observed depths of 14-ft to 19 ft to the top of the low flow channel. The creek's low flow side slopes are about 1.5 to 1 (horizontal to vertical) and the observed low flow channel width is between 30-ft and 60-ft, with a depth of approximately 6-ft.



*Figure 2.4. At Charcot Avenue bridge, upstream, looking southwest towards channel and riparian vegetation*



*Figure 2.3. At Charcot Avenue bridge, looking west along Charcot Avenue*

There are at least 14 major storm drain outfalls that terminate on the creek's banks, and a City of San José seasonal stormwater pump station adjacent to Coyote Creek in this area. The reach is perennial with freshwater flow. The channel slope is approximately 0.001-ft/ft and the reach is entrenched, straightened, narrow and deep with low sinuosity. Most of the reach is constrained by urban encroachment, mostly zoned as industrial land use, as illustrated in *Figure 2.6*. Eight bridge crossings are located within this reach, including one railroad crossing. *Table 2.1* lists all bridges located within Reach 4. Vegetation within the reach includes large trees, low brush, grass, and reeds which are dense on the stream sides and



continuous across the floodplains, which extend from the low flow top of bank to the embankment toes on both sides of the creek. For most of this reach, the riparian corridor is owned in fee title by Valley Water or is within a Valley Water easement, which is also illustrated in *Figure 2.6*. There are neither tributary confluences nor adjacent public parks within this reach.

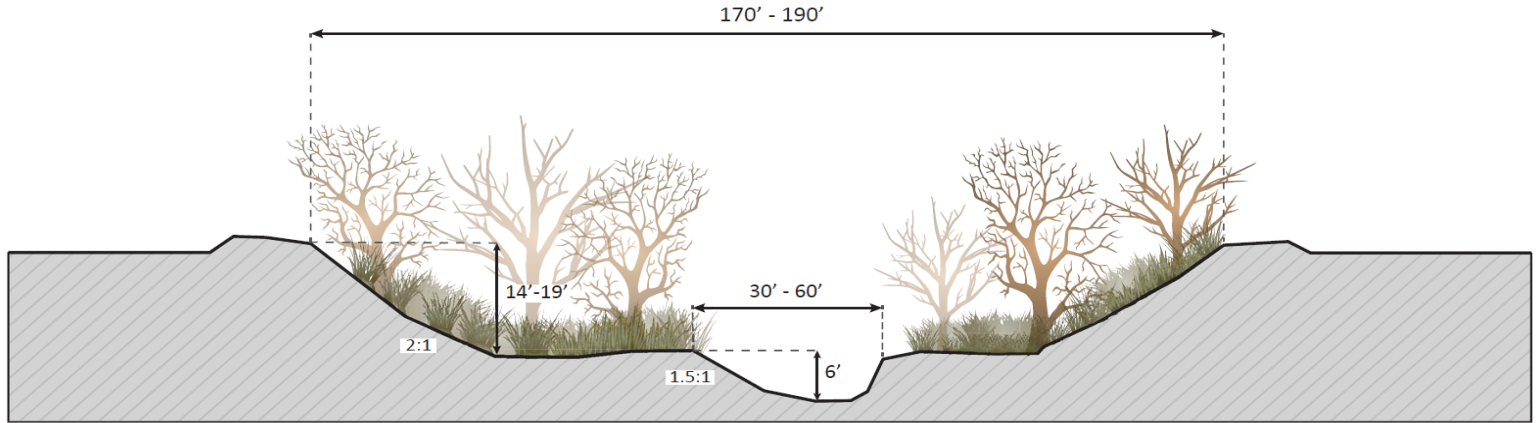


Figure 2.5. Typical Reach 4 cross-section, looking downstream

NOT TO SCALE

Table 2.1. Bridges located within Reach 4

Bridge	Date of Construction	Station (ft)	L x W (ft)	Soffit Elev. (NAVD ft) <sup>a</sup>
Montague Expressway	1966/1974	2+60	196 x 126	40.7
Charcot Avenue	1971	46+70	171 x 51	44.1
O'Toole Avenue	1952	61+50	270 x 30	53.8
Interstate 880	1952	65+35	485 x 35	64.0
Brokaw Road	1982	74+00	306 x 105	54.4
Ridder Park Drive	1982	81+30	250 x 55	60.7
Southern Pacific Railroad	1972	87+15	296 x 20	60.3
Old Oakland Road	1931/1999	98+55	234 x 102	62.6

**Notes:**

a. Soffit elevations shown are the lowest of both the upstream and downstream bridge faces. Soffit measurements for bridges with arched spans were measured at the lowest elevation where the arch meets the vertical abutment.





Looking north at upstream face of Montague Expressway Bridge. Date: December 24, 2018



Looking west at upstream face of Charcot Avenue Bridge. Date: February 20, 2017



Underneath Highway 880, Looking northwest towards Coyote Creek. Date: May 7, 2019



Maintenance Road off of Brokaw Road. Date: May 7, 2019



On Corie Court, looking northeast towards Coyote Creek, left bank. Date: October 4, 2018

Land Use	Railroad
Agricultural/Rangeland	VTA
Open Space	SOUTHERN PACIFIC RAILROAD
Residential	WESTERN PACIFIC RAILROAD
Commercial	
Industrial	
Public/School	
Mixed Use	
Other	
Storm Drain Outfalls	

Valley Water Fee	Valley Water Easement
In	In
	Out (to others)

Figure 2.6. Reach 4 – from Montague Expressway to Old Oakland Road

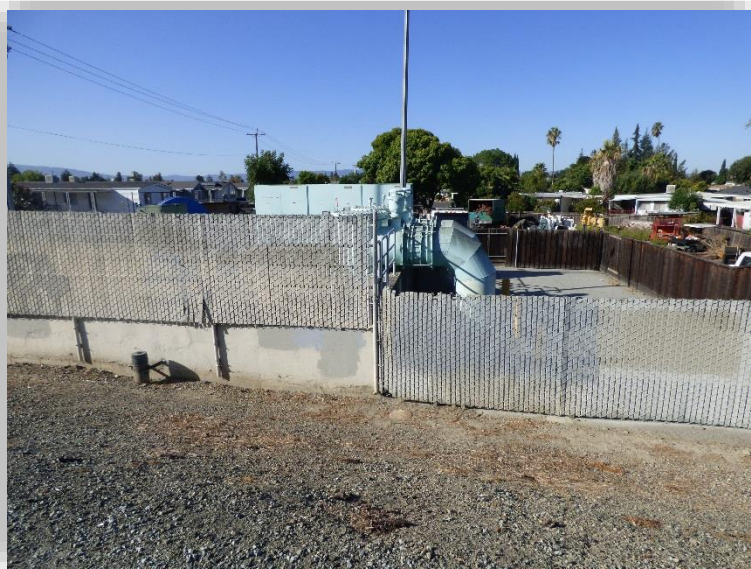
Service Layer Credits: Esri, HERE, Garmin, © OpenStreetMap contributors, and the GIS user community



### REACH 5: Old Oakland Road to Mabury Road

Reach 5 extends approximately 1.6-miles (8,470-ft) between the upstream face of Old Oakland Road bridge to the upstream face of Mabury Road bridge. A map of the entire Reach 5 is shown in *Figure 2.15* and typical conditions observed within the reach are illustrated in *Figures 2.7* through *2.14*.

There are at least 12 major storm drain outfalls that terminate on the creek banks as well as a creek adjacent stormwater pump station located at the Golden Wheel Mobile Home Park (see *Figure 2.7*). This pump station was built by the City of San José in 2001, is maintained by the city and has a total capacity of 42,000-GPM.



*Figure 2.7. City of San José Stormwater Pump Station*

The reach is perennial with freshwater flow and is generally narrow and deep with low sinuosity. In addition, there is sediment and flow contribution from Upper Penitencia Creek, which conflues with Coyote Creek just upstream from Berryessa Road (see *Figure 2.15*).

Two bridge crossings, Berryessa Road and Mabury Road are located within Reach 5. *Table 2.2* lists the bridge details and *Figure 2.8* shows a current view underneath Berryessa Road bridge.



*Figure 2.8. Downstream of Berryessa Road Bridge, looking southeast along Coyote Creek underneath bridge*

The channel slope within this reach is approximately 0.004-ft/ft from Old Oakland Road to Berryessa Road, and 0.0003-ft/ft from Berryessa Road to the upstream end of the reach. Except for the San José Municipal Golf Course, most of the reach is constrained by urban encroachment, particularly industrial and residential land use, with new mixed-use development planned at the existing Flea Market location (see *Figure 2.15*). There is also a railroad located within this reach owned by the Union Pacific Railroad (UPRR) Company which is active and brings raw materials to Graniterock, a concrete-making company located at 11711 Berryessa Road, just adjacent to Coyote Creek (see *Figures 2.9* and *2.15*).





*Figure 2.9. Looking southeast along top of west bank of Coyote creek and UPRR alignment*

Dense riparian vegetation, both native and invasive, occurs on both east and west banks of the low flow channel as observed in *Figures 2.10, 2.11 and 2.12*. Upslope of the dense riparian vegetation, the west bank's vegetation ranges between 10 and 200-feet from the low flow channel top of bank to the top of the setback levee. The east bank's riparian vegetation extends about 400-feet away from the creek's low flow.



*Figure 2.10. Looking northeast across Coyote Creek towards dense riparian vegetation*

As evidenced in *Figures 2.11 and 2.12*, this reach has a heavy encampment presence and there is a significant amount of trash and improvised creek crossings made with various types of materials observed throughout the reach.



*Figure 2.11. Looking northeast across Coyote Creek towards east bank, dense riparian vegetation, trash and improvised creek crossing*

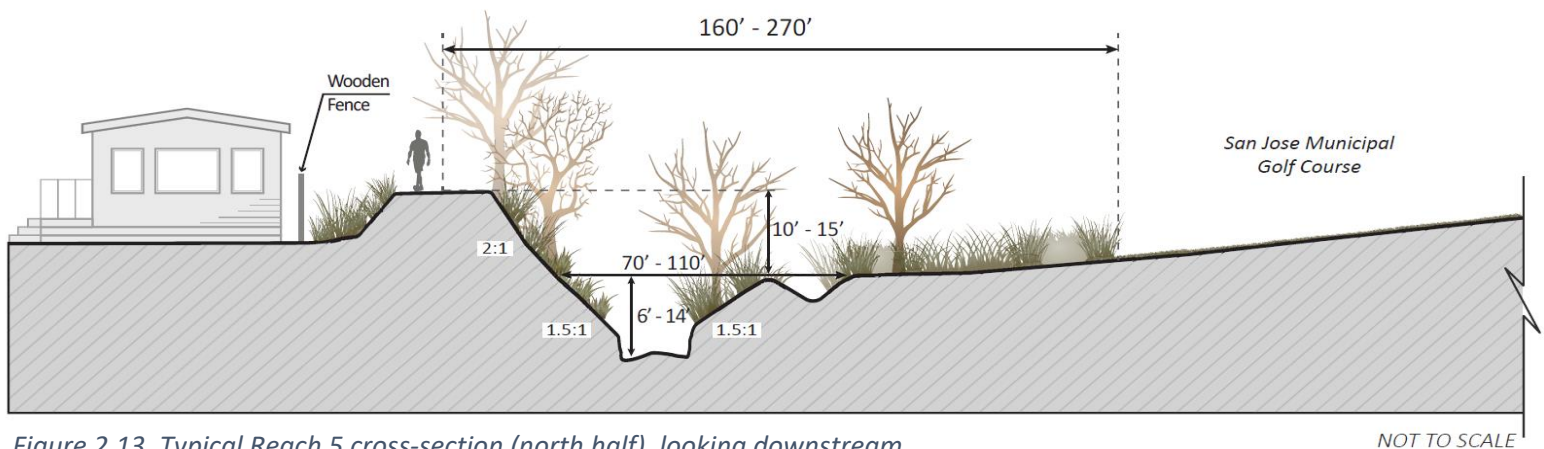


*Figure 2.12. Looking northeast across Coyote Creek towards east bank invasive species, dense riparian vegetation and trash*



Two representative cross-sections for Reach 5 are displayed in *Figures 2.13* and *2.14*. *Figure 2.13* illustrates typical creek conditions within the north half of the reach (approx. 0.7-miles). As observed in *Figure 2.13*, the north half of Reach 5 is contained on the west by an earthen, levee like structure with about 2 to 1 (horizontal to vertical) side slopes, and to the east by the San José Municipal Golf Course. The levee-like structure was built by Valley Water after the flooding event of 1958, and it is owned by the City of San José. For this north half of the reach, the creek's top width, as measured from the westerly top of the levee, ranges between 160-ft and 270-ft, while the observed depth is approximately between 10-ft and 15 ft to the top of the low flow channel. The creek's low flow channel side slope is about 1.5 to 1 (horizontal to vertical) and the low flow channel width ranges between 70-ft and 110-ft, with estimated depths between 6-ft and 14-ft.

Three mobile home parks are bordering the west side of Coyote Creek within Reach 5, as shown in *Figure 2.15*. In 2002, Valley Water completed construction of an approximately 4-ft-tall floodwall south of the South Bay Mobile Home Park,<sup>23</sup> which was overtopped during the February 2017 flood event.



*Figure 2.13. Typical Reach 5 cross-section (north half), looking downstream*

*Figure 2.14* illustrates creek conditions observed south of the San José Municipal Golf Course. Within this southern half of the reach, the easterly top of bank ranges between 6-ft and 15-ft higher than the west bank, with about 1.5:1 (horizontal to vertical) side slopes. The top width of the channel, as measured horizontally from the easterly top of bank to the lower west bank, is estimated to be between 100-ft and 200-ft. The creek's low flow side slopes are about 1.5 to 1 (horizontal to vertical) and the observed low flow channel width is between 80-ft and 110-ft, with a height of approximately 10-ft to 14-ft.

<sup>23</sup> SCVWD (2000). *South Bay Mobile Home Park Floodwall, Santa Clara County, California*. November 200. Santa Clara Valley Water District, San Jose.



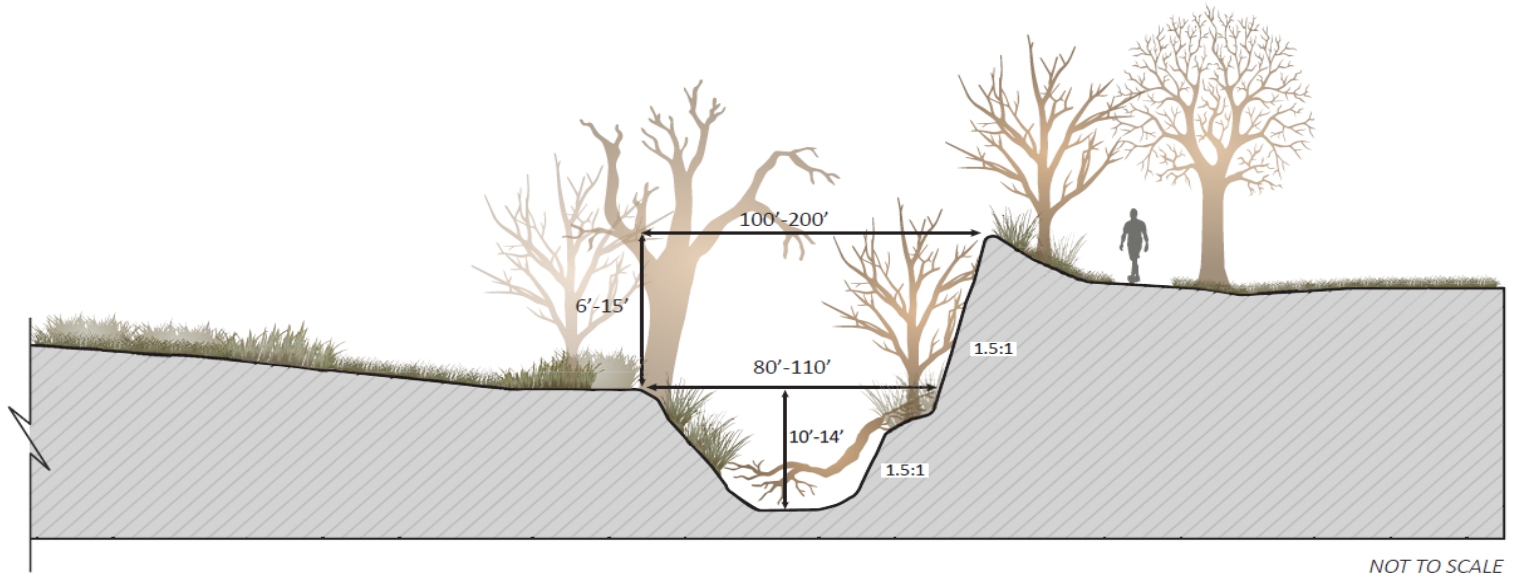


Figure 2.14. Typical Reach 5 cross-section (south half), looking downstream

Table 2.2. Bridges located within Reach 5

Bridge	Date of Construction	Station (ft)	L x W (ft)	Soffit Elev. (NAVD ft) <sup>a</sup>
Berryessa Road	1971	158+25	188 x 115	76.9
Mabury Road	1983	173+65	173 x 65	82.1

**Notes:**

a. Soffit elevations shown are the lowest of both the upstream and downstream bridge faces. Soffit measurements for bridges with arched spans were measured at the lowest elevation where the arch meets the vertical abutment.





Looking southeast towards Old Oakland Road Bridge and creek. Date: January 24, 2019



East of Riverbend Mobile Home Park, looking upstream towards creek and Golf Course Date: January 24, 2019



Looking west towards South Bay Mobile Home Park floodwall. Date: January 24, 2019



Looking south towards downstream face of Mabury Road bridge. Date: January 24, 2019



Looking downstream at Coyote Creek from Berryessa Road Bridge. Date: October 4, 2018



Figure 2.15. Reach 5 – from Old Oakland Road to Mabury Road



### REACH 6: Mabury Road to East Santa Clara Street

Reach 6 extends approximately 1.9-miles (9,980-ft) between the upstream face of Mabury Road bridge and the upstream face of East Santa Clara Street bridge. A map of the entire Reach 6 is illustrated in *Figure 2.25* and typical conditions observed within the reach are illustrated in *Figures 2.16* through 2.24.



*Figure 2.16. On Coyote Creek east bank, looking east towards City of San José's Mabury Yard buildings*

There are at least 12 major storm drain outfalls that terminate on the creek banks, and no known major stormwater pump stations. Some channel modifications and minor erosion have been observed near the outfalls. In general, this reach is perennial with freshwater flow. Land use type within this reach is a mix of industrial, public, open space, and residential (see *Figure 2.25*). Just upstream of Mabury Road, on the east side of the creek, a critical City of San José facility was identified. This facility is the City of San José Mabury Service Yard and is located at 1404 Mabury Road. The facility services city vehicles that do maintenance work throughout San José and serves as a repository of sandbags that can be distributed to the public in anticipation of large rain events. *Figure 2.16* shows a view of the facility from the east bank of Coyote Creek. This area of the creek, from Mabury Road to Highway 101

along the east bank, is heavily vegetated and some trash and encampments are present as shown in *Figures 2.17* and 2.18.



*Figure 2.17. On Coyote Creek east bank, downstream of Highway 101, looking west towards creek, riparian vegetation and encampment*



*Figure 2.18. On Coyote Creek east bank, downstream of Highway 101, looking west towards improvised access to west side of creek*



Approximately 1,300-ft upstream from the Highway 101 bridge, Lower Silver Creek confluences with Coyote Creek (see *Figure 2.19*). It has been observed that during the summer months, Coyote Creek stream flow is very low and areas upstream from the Lower Silver Creek confluence can best be described as nearly stagnant, mid-channel deep pools.



*Figure 2.19. Confluence with Lower Silver Creek, looking west towards Coyote Creek and confluence*

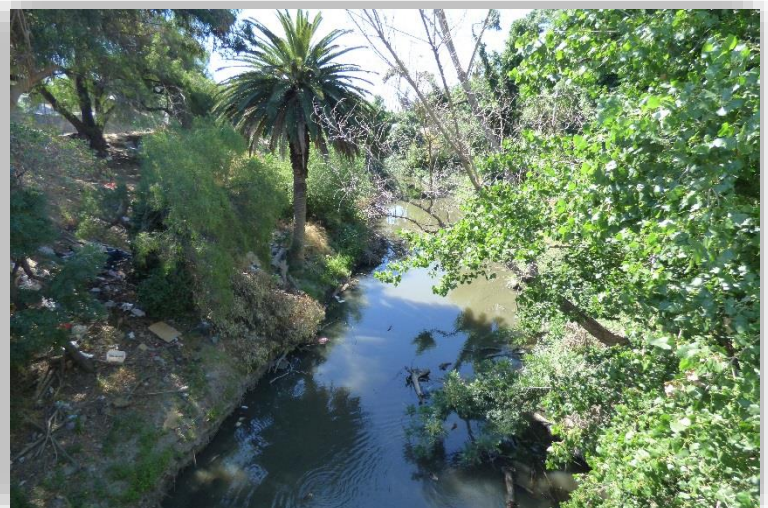
Three bridge crossings, Highway 101, Julian Street, and East Santa Clara Street are found within Reach 6. Typical creek conditions observed near the bridge crossings are illustrated in *Figures 2.20 through 2.22*. The East Santa Clara Street bridge is scheduled to be replaced by the City of San José in Spring of 2023 and Valley Water is coordinating with the City of San José to make sure that the bridge improvements meet the Project design. *Table 2.3* lists bridge details within the reach.



*Figure 2.20. Coyote Creek, downstream of Highway 101 bridge*



*Figure 2.21. Coyote Creek, downstream of East Julian Street*



*Figure 2.22. Coyote Creek, upstream of East Santa Clara Street*



Two City of San José public parks are located within this reach: Watson Park and Roosevelt Park. A current view of Watson Park is illustrated in *Figure 2.23*.

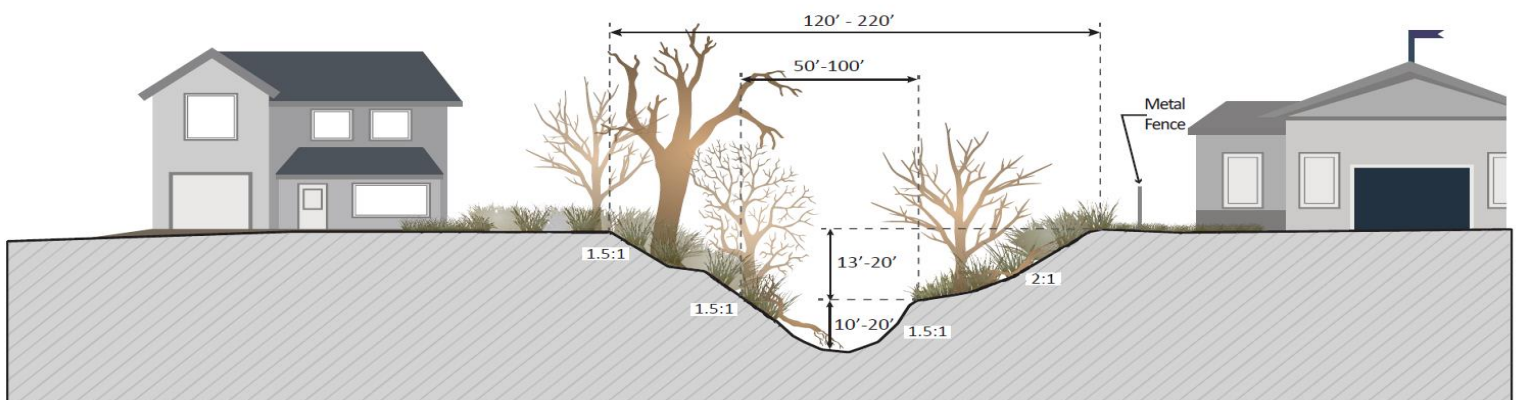
Watson Park begins south of Highway 101 and extends for about 2,200-ft south along the west side of the creek, ending about 320-ft short of Washington Street. Within the extent of Watson Park, riparian vegetation generally extends from the water's edge to the top of the bank and then ranges between 50-ft and 100-ft beyond both tops of banks. The east top of bank elevation along Watson Park is about 8-ft to 10-ft higher than the floodplain bench on which the park is located.

Roosevelt Park extends approximately 750-ft in the downstream direction from the East Santa Clara Street bridge along the east bank of the creek. Within the extent of Roosevelt Park, riparian vegetation extends from the water's edge to the top of both banks and is constrained by San Jose Water Company's 17<sup>th</sup> Street Groundwater Pump Station to the west and by the regularly mowed grass of the park to the east, which extends roughly 190-ft away from the creek. The west top of bank elevation is about 10-ft higher than the east top of bank where the park is located. Both parks are on lower ground and flooded in 2017 as both park areas are part of the historical floodplain of Coyote Creek.



*Figure 2.23. At Watson Dog Park, looking east towards Coyote Creek west bank and Highway 101*

A typical cross-section for Reach 6 is illustrated in *Figure 2.24*. As shown in *Figure 2.24*, the typical conditions within the creek in this reach can be described by a trapezoidal vegetated earth channel. The top width is approximately 120-ft to 220-ft with an estimated depth of 13-ft to 20-ft to the top of the low flow channel, and slopes of approximately 2 to 1 on the east bank and 1.5 to 1 on the west bank. The creek's low flow side slopes are about 1.5 to 1 and the estimated low flow channel width is between 50-ft and 100-ft, with depths of approximately 10-ft to 20-ft. The average channel slope within this reach is approximately 0.0003-ft/ft. The channel within this reach is generally narrow.



*Figure 2.24. Typical Reach 6 cross-section, looking downstream*

NOT TO SCALE



Table 2.3. Bridges located within Reach 6

Bridge	Date of Construction	Station (ft)	L x W (ft)	Soffit Elev. (NAVD ft) <sup>a</sup>
Hwy 101	1939/1957/1970	196+90	147 x 130	84.4
Julian Street	1933	232+40	155 x 47	88.8
East Santa Clara Street	1918	255+95	183 x 75	89.1

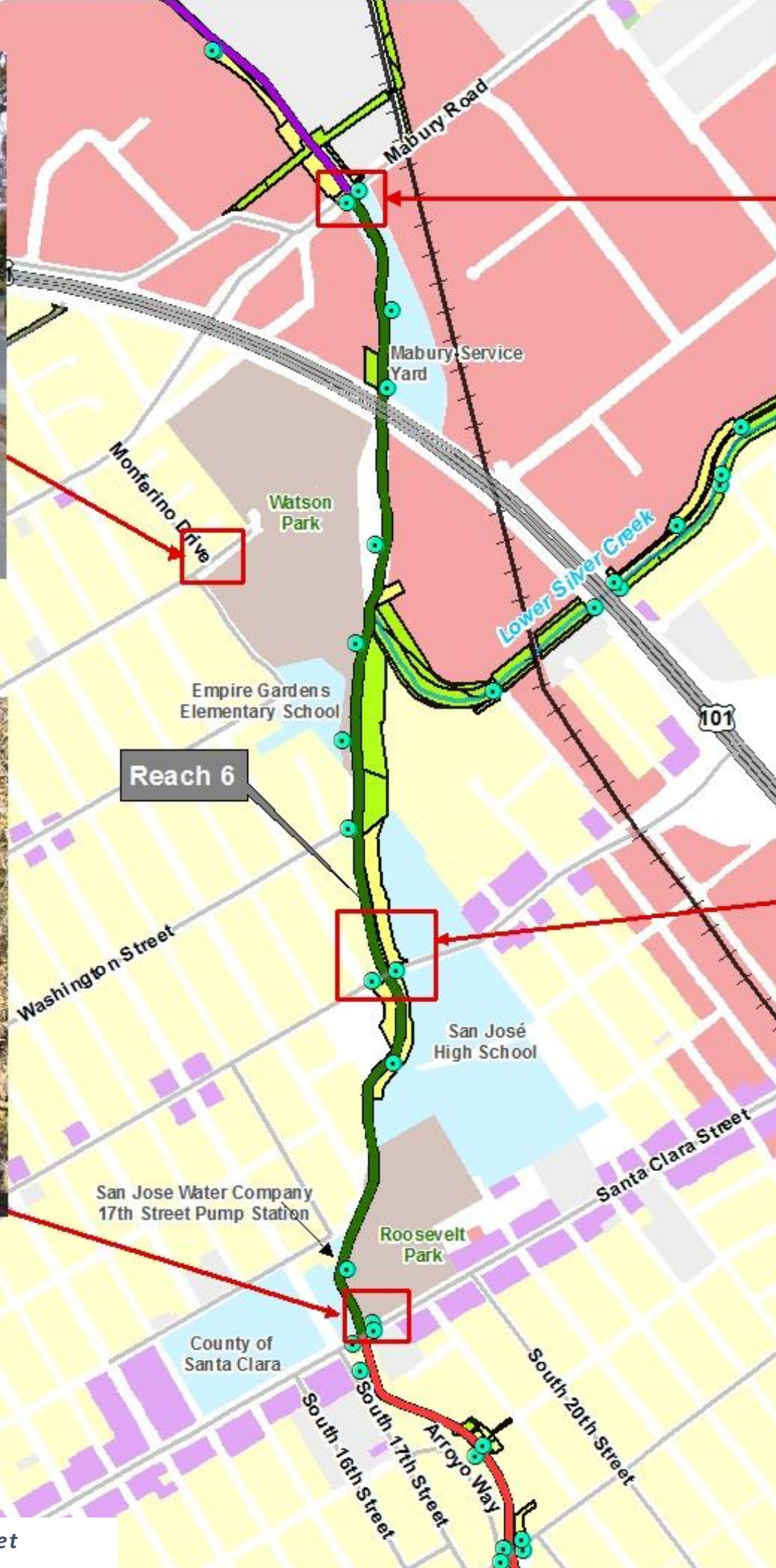
**Notes:**

a. Soffit elevations shown are the lowest of both the upstream and downstream bridge faces. Soffit measurements for bridges with arched spans were measured at the lowest elevation where the arch meets the vertical abutment.





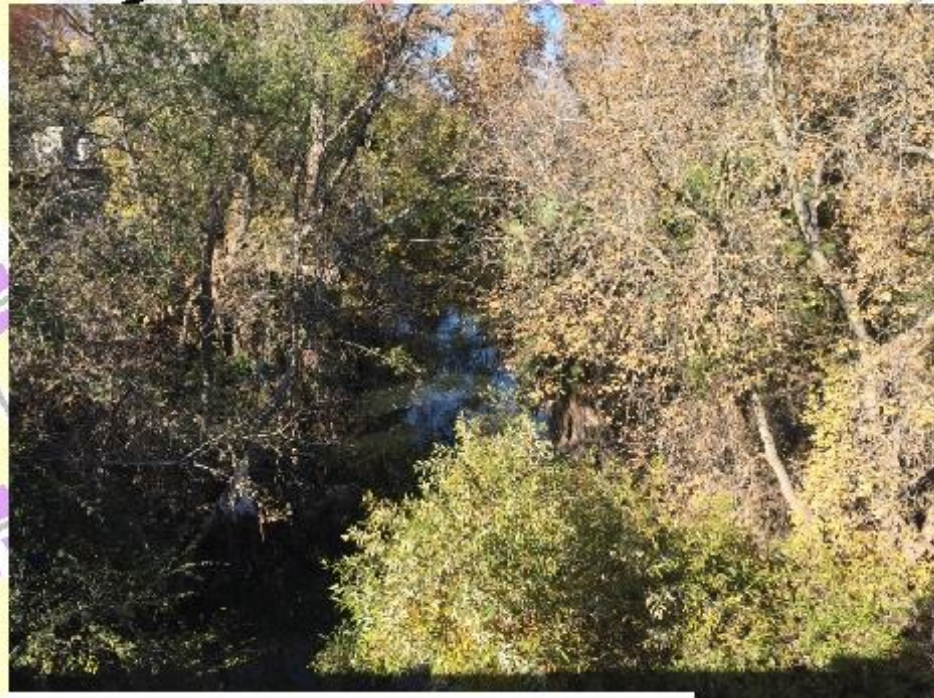
On Jackson Street, looking east towards Watson Street.  
Date: November 26, 2019



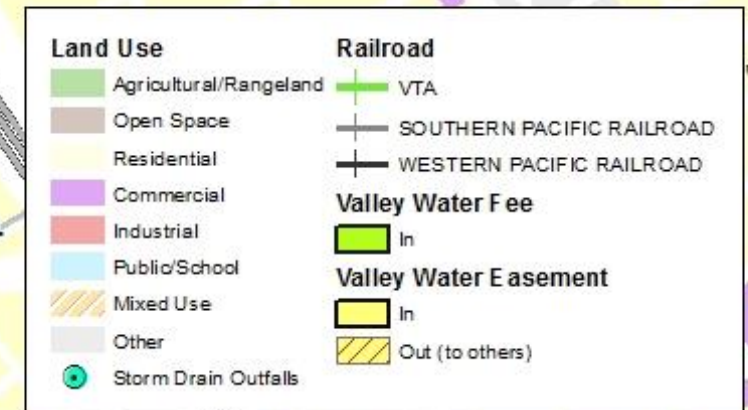
On Mabury Road bridge, looking southwest along Mabury Road towards Mabury Road southwest. Date: November 2, 2020



East Julian Street bridge, looking upstream.  
Date: February 20, 2017



Santa Clara Street bridge, looking downstream.  
Date: December 12, 2017



0 1,100 2,200 Feet

Service Layer Credits: Esri, HERE, Garmin, © OpenStreetMap contributors, and the GIS user community

Figure 2.25. Reach 6 – from Mabury Road to East Santa Clara Street



### REACH 7: East Santa Clara Street to Interstate 280

Reach 7 extends approximately 1.2-miles (6,410-ft) between the upstream face of East Santa Clara Street bridge and the upstream face of Interstate 280 bridge. A map of the entire Reach 7 is illustrated in *Figure 2.36* and typical conditions observed within the reach are illustrated in *Figures 2.26* through *2.35*.

There are at least 14 major storm drain outfalls that terminate on the creek's banks, and some channel modifications and minor erosion have been observed near the outfalls. This reach is perennial with freshwater flow and there are no tributary confluences.



*Figure 2.26. Looking southeast towards William Street Park and South 16<sup>th</sup> Street*

As observed in *Figure 2.36*, land use within this reach is mainly residential with a significant portion that includes parkland towards the southern half of the reach, which includes William Street and Selma Olinder Parks (see *Figures 2.26* and *2.27*). The Naglee Park historical residential neighborhood is found within this reach with its limits being East Santa Clara Street to the north, Margaret Street to the south, South 11<sup>th</sup> Street to the west and Coyote

Creek to the east, as illustrated in *Figure 2.36*. Several residential homes located in this neighborhood and adjacent to Coyote Creek, mainly along South 17<sup>th</sup> Street, Arroyo Way and South 16<sup>th</sup> Street, have backyards which are part of the west bank of Coyote Creek. *Figures 2.28* and *2.29* illustrate typical creek conditions in riparian areas overlapped by residential parcels along Arroyo Way.



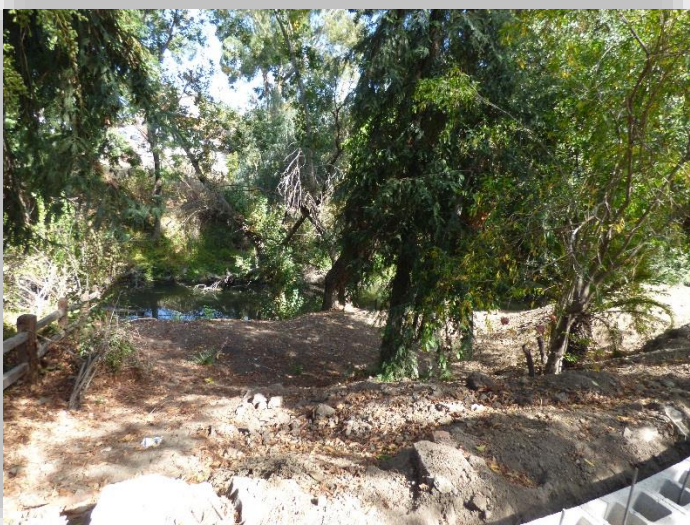
*Figure 2.27. Looking southeast towards Selma Olinder Park, Olinder Elementary School and dense riparian vegetation on east bank of Coyote Creek*

Four bridge crossings are found within Reach 7, including a pedestrian bridge located just upstream from East William Street. *Table 2.4* lists the bridge details within the reach and *Figure 2.36* shows the bridge locations. Typical creek conditions observed near the bridge crossings are illustrated in *Figures 2.30* through *2.33*.





*Figure 2.28. Current residential backyard/Coyote Creek west bank divide behind Arroyo Way property, looking northwest*



*Figure 2.29. Current residential backyard/Coyote Creek west bank divide behind Arroyo Way property, looking east*

As previously mentioned, two City of San José public parks are located within this reach: William Street Park and Selma Olinder Park. Current conditions at William Street Park are illustrated in *Figure 2.26*. William Street Park begins south of East William Street and extends for about 1250-ft south along the west bank of the creek, ending about 400-ft short of Margaret Street. Selma Olinder Park extends approximately 2,500-ft in the upstream direction from the East Santa Clara Street bridge along the east bank of the creek ending at the downstream face of Interstate 280. Current conditions at Selma Olinder Park are illustrated in *Figure 2.27*.

Two representative cross-sections for Reach 7 are displayed in *Figures 2.34* and *2.35*. Average creek conditions in the north half of Reach 7 (between East Santa Clara Street and East William Street) are illustrated in *Figure 2.34*. Within this north half of the reach, the floodplain is generally narrow, with riparian vegetation, both native and invasive, located in many cases within the backyards of residential properties. The estimated creek width within the north half of the reach is between 200-ft and 300-ft, which as illustrated in *Figure 2.34*, includes residential properties, mainly on the west bank. The estimated depth from the west top of bank to the top of the low flow channel is between 10-ft and 15-ft. The low flow channel width is approximately 80-ft to 160-ft, with a depth estimated between 17-ft and 24-ft. While the west bank within this north half of the reach is generally steep, with a slope of 1.5 to 1, the east bank has a gradual slope (approximately 7 to 1).





*Figure 2.30. Looking east towards downstream side of East San Antonio Bridge*



*Figure 2.32. Looking southeast towards E William Street pedestrian bridge along Coyote Creek*



*Figure 2.31. Looking underneath East William Street bridge*



*Figure 2.33. Looking underneath Interstate-280 bridge, looking south towards Coyote Meadows Park*



Figure 2.35 shows typical creek conditions observed upstream of East William Street. Within this southern half of the reach, the mildly sloped floodplain is wide (slope of 80 to 1, horizontal to vertical) with widths estimated between 400-ft and 1,000-ft, which include the lands of the City of San José-owned William Street Park and Selma Olinder Park. The creek's low flow side slopes are about 2 to 1 and the observed low flow channel width is between 100-ft and 200-ft, with depths of approximately 15-ft to 25-ft. The average channel slope within the entire Reach 7 is approximately 0.0003-ft/ft.

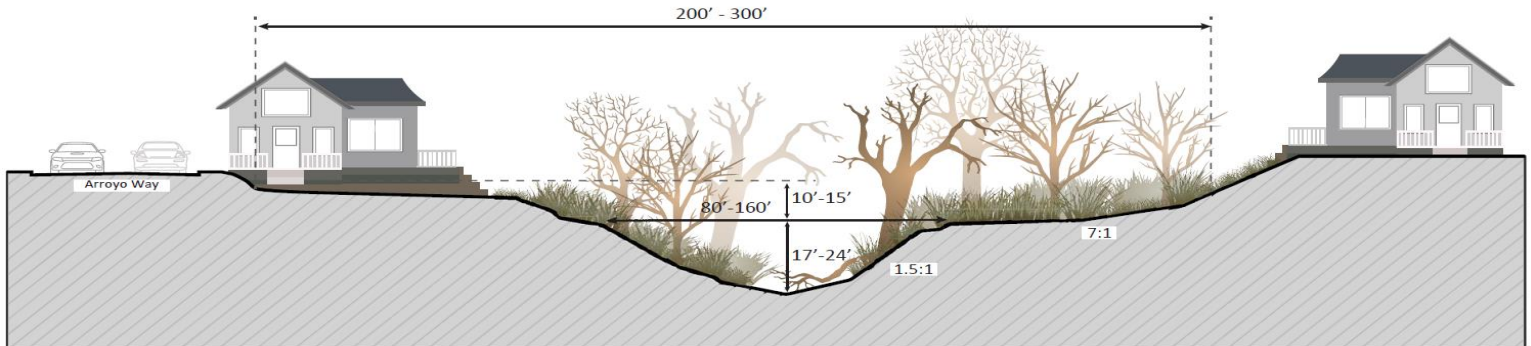


Figure 2.34. Typical Reach 7 cross-section (north half), looking downstream

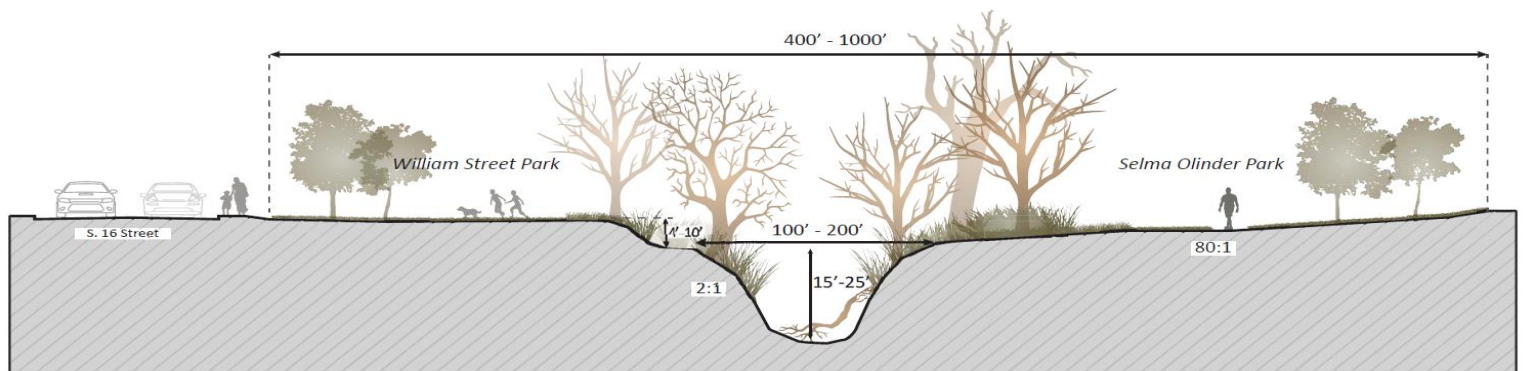


Figure 2.35. Typical Reach 7 cross-section (south half), looking downstream

NOT TO SCALE

Table 2.4. Bridges located within Reach 7

Bridge	Date of Construction	Station (ft)	L x W (ft)	Soffit Elev. (NAVD ft) <sup>a</sup>
East San Antonio Street	1928	273+65	148 x 45	88.5
East William Street	1925	289+40	146 x 36	89.1
Pedestrian bridge	1979	290+10	170 x 12	89.3
Interstate 280	Unknown	400+175	400 x 175	110.4

**Notes:**

a. Soffit elevations shown are the lowest of both the upstream and downstream bridge faces. Soffit measurements for bridges with arched spans were measured at the lowest elevation where the arch meets the vertical abutment.





Looking downstream at Coyote Creek from East San Antonio Street bridge. Date: February 20, 2017



On Arroyo Way, looking northeast towards typical structure elevation with respect to street. Date: July 23, 2019



East William Street bridge, looking upstream towards pedestrian bridge. Date: October 4, 2018



East William Street bridge, looking downstream. Date: October 4, 2018



Looking east towards William Street Park, William Street and S 16th Street. Date: October 10, 2018



Figure 2.36. Reach 7 – from East Santa Clara Street to Interstate 280



### REACH 8: Interstate 280 to Tully Road

Reach 8 extends approximately 2.8-miles (15,220-ft) between the upstream face of Interstate 280 to the upstream face of Tully Road. A map of the entire Reach 8 is illustrated in *Figure 2.45* and typical conditions observed within the reach are illustrated in *Figures 2.37* through *2.44*.

There are at least 18 major storm drain outfalls that terminate on the creek banks within this reach and no known major stormwater pump stations. The reach is perennial, and stream flow is very low in the summer months, with deep pools that are nearly stagnant. There are no tributary confluences within the reach.

Land use is a mix of open space, residential, industrial and public utility use, as illustrated in *Figure 2.45*. Two critical facilities were identified immediately adjacent to Coyote Creek within the reach, San Jose Water Company Needles Drive Pump Station as well as the San Jose Water Company Tully Road Groundwater Station. Both potable water stations distribute retail water to residents in the City of San José. *Figure 2.45* shows the locations of both facilities.

Four bridges, the Western Pacific Railroad, Story Road, bent bridge (connects the Kelly Park east parking lot to the Happy Hollow Park and Zoo) and Tully Road, cross over the creek within this reach. *Table 2.5* lists the bridge details within Reach 8 and *Figure 2.45* shows the bridge locations. *Figure 2.37* shows a current view of the Western Pacific Railroad. A significant amount of trash and a moderate number of encampments have been observed in the area, as illustrated in *Figure 2.37*.



*Figure 2.37. Looking east towards Western Pacific Railroad and accumulated trash*

Two City of San José parks are located within this reach: Kelley Park and Rocksprings Park. Kelley Park extends between Interstate 280 and Phelan Avenue. Rocksprings Park extends about 400-ft upstream of Needles Drive on the west bank of the creek. The park is bounded to the east by a 400-ft-long vinyl sheet pile wall and a 500-ft-long soil berm which were installed by Valley Water in December 2017 as an interim measure to protect the Rock Springs community from future flooding similar to the February 2017 flood event (see *Figures 2.38* through *2.40*).





Figure 2.38. Looking east towards Rocksprings Park



Figure 2.39. Looking east towards interim floodwall at Rocksprings Park



Figure 2.40. Looking north towards interim floodwall and berm at San Jose Water Company Needles Pump Station

Though the creek remains entrenched, compared to the four reaches downstream, the creek within this reach has high sinuosity, as observed in *Figure 2.45*. Two representative cross-sections for Reach 8 are displayed in *Figures 2.43* and *2.44*. Typical creek conditions in the north half of Reach 8 (Interstate 280 to Phelan Avenue) are schematized in *Figure 2.43*. Within this north half of the reach, the floodplain is generally wide, with the west top of bank typically lower than the east top of bank. Typical estimated top widths are between 300-ft and 700-ft, which include parts of various open spaces and parks such as Coyote Meadows, Happy Hollow Park & Zoo, and Kelley Park. The high flow creek depth, as measured from the west top of bank to the top of the low flow channel, was estimated to be between 8-ft and 15-ft. The creek's low flow side slope within this north part of reach 8 is about 2 to 1 and the estimated low flow channel width between 100-ft and 200-ft, with depths of approximately 20-ft to 25-ft as measured from the top of the low flow channel on the west bank, as illustrated in *Figure 2.43*.

*Figure 2.44* shows a typical cross-section for creek areas upstream of Phelan Avenue, including the Rock Springs community. *Figures 2.41* and *2.42* show current conditions observed within the creek in this lower reach segment. As observed in *Figure 2.44*, the estimated top width within this portion of the reach is approximately 600-ft to 800-ft. The low flow channel width is approximately 100-ft to 200-ft, with an estimated channel depth of 15-ft to 25-ft, and an average slope of 2 to 1. The average channel slope within the entire reach is approximately 0.002-ft/ft.





Figure 2.41. Looking east towards Coyote Creek from Wool Creek Drive at significant erosion and dense riparian vegetation



Figure 2.42. Looking east towards Coyote Creek from Wool Creek Drive at large trash raft

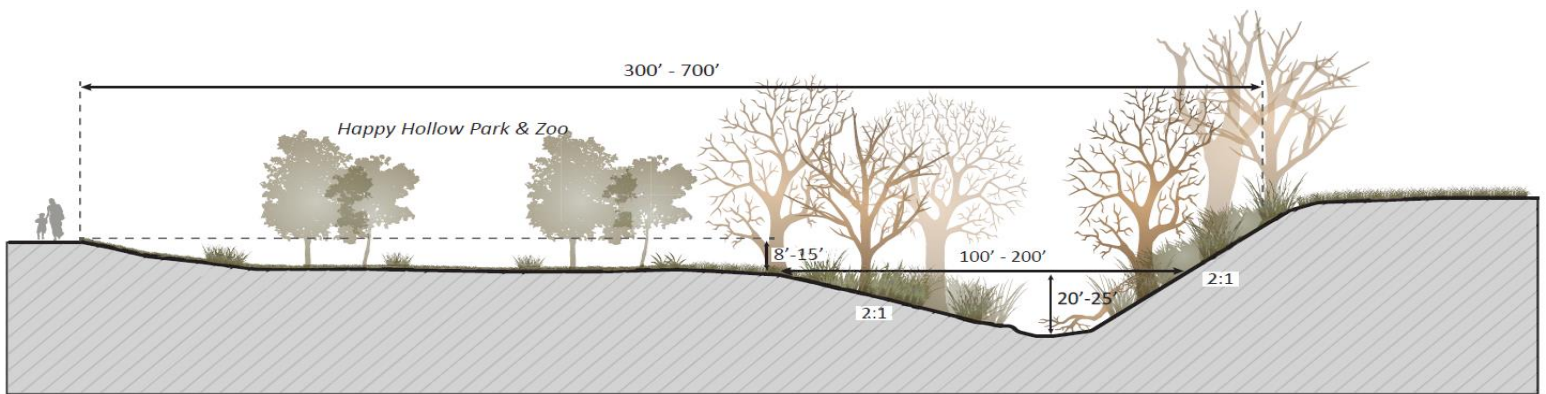


Figure 2.43. Typical Reach 8 cross-section (north half), looking downstream

NOT TO SCALE

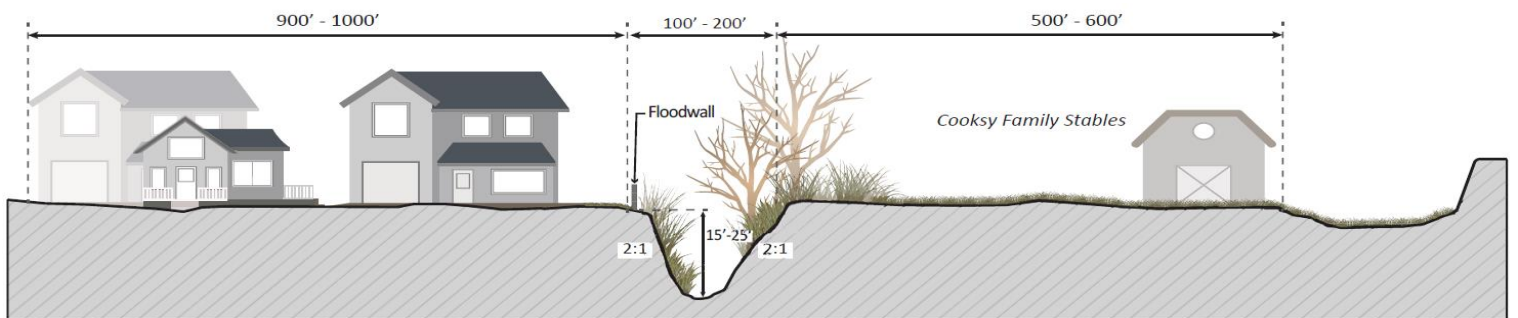


Figure 2.44. Typical Reach 8 cross-section (south half), looking downstream

NOT TO SCALE



Table 2.5. Bridges located within Reach 8

Bridge	Date of Construction	Station (ft)	L x W (ft)	Soffit Elev. (NAVD ft) <sup>a</sup>
Western Pacific RR	Unknown	334+57	260 x 8	104.2
Story Road	1954/1975	348+96	206 x 85	99.0
Bent bridge	2011	355+67	564 x 13	112.0
Tully Road	1965	471+88	160 x 76	120.3

**Notes:**

a. Soffit elevations shown are the lowest of both the upstream and downstream bridge faces. Soffit measurements for bridges with arched spans were measured at the lowest elevation where the arch meets the vertical abutment.





Figure 2.45. Reach 8 – from Interstate 280 to Tully Road



### 2.3 Previous Engineering Studies and Construction Projects

Various segments of Coyote Creek have been partially modified for flood protection. In addition, several miles of tributary stream channels have been similarly modified, including portions of Lower Penitencia, Berryessa, Calera, and Lower and Upper Silver Creeks, among other tributaries located within the Coyote Creek Watershed, as listed below and illustrated in *Figure 2.46*. In addition, numerous studies have been completed or are ongoing within the Coyote Creek Watershed. A schematic showing the timeline of these studies is illustrated in *Figure 2.47* and a list with detailed descriptions follows.

#### Previous Construction Projects and Programs

- 1961 – North Babb Creek, from McCovey Lane to Meadow Lane: Various flood protection improvements
- 1964 – Miguelita Creek, from Lower Silver Creek to Toyon Avenue: Various flood protection improvements
- 1965 – Los Coches Creek, from 100-ft west of Carnegie Drive to 624-ft East of Dempsey Road: Various flood protection improvements to the Berryessa-Los Coches Diversion Channel
- 1967 – Berryessa Creek, from Copley Avenue to Baronscourt Way: Various flood protection improvements
- 1967 – Sierra Creek, from Berryessa Creek to Burgundy Drive: Various flood protection improvements
- 1970 – Tularcitos Creek, from Berryessa Creek to 500-ft East of Dempsey Road: Various flood protection improvements
- 1970 – Cribari Creek, from Thompson Creek confluence to 2,150-ft east of San Felipe Road: Various flood protection improvements
- 1972 – Coyote Creek, from Montague Expressway to I-880<sup>24</sup>: Creek realigned with levee to convey a flow of 14,700 cfs - Not FEMA Accredited.
- 1973 – Piedmont Creek from Dempsey Road to South Temple Drive: Various flood protection improvements
- 1974 – Upper Silver Creek, from Coyote Creek to 1000-ft west of Silver Creek Road: Various flood protection improvements
- 1976 – Norwood Creek, from Thompson Creek to Foothills: Various flood protection improvements
- 1977 – Calera Creek, from Lower Penitencia Creek to Escuela Parkway: Flood protection improvements to the 1% level for communities adjacent to Calera Creek
- 1977 – Berryessa Creek, from Lower Penitencia Creek to Calaveras Boulevard: Flood protection improvements to the 1% level for communities adjacent to Berryessa Creek
- 1979 – Flint Creek, from Ruby Creek to Mount Pleasant Road: Flood control project built by City of San José but Valley Water is responsible for maintenance. Entire extent is underground pipe.
- 1979 – Thompson Creek, from Norwood Creek to Quimby Road: Various flood protection improvements

<sup>24</sup> SCVWD (1968). *Improvement of Coyote Creek from Trimble Road to Nimitz Freeway in Santa Clara County*, Project Number 40021. Creegan and D'Angelo Consultant Engineers. Santa Clara Valley Water District, San Jose, CA.



- 1979 – Lower Silver Creek, from Quimby Road to King Road: Various flood protection improvements
- 1980 - Berryessa Creek, from Cropley Avenue to Highway 680: Various flood control improvements
- 1980 – Quimby Creek, from Thompson Creek to White Road: Various flood protection improvements
- 1984 – Lower Penitencia Creek, from Berryessa Creek to Marylinn Drive: Flood protection project - FEMA accredited from I-880 to Berryessa Creek only
- 1984 – Upper Silver Creek, from Highway 101 to Greenyard Street: Channel rehabilitation
- 1985 – Lower Penitencia Creek, from Marylinn Drive to Montague Expressway: Built concrete lined channel
- 1988 – Coyote Bypass: Levee construction across Leslie Salt pond
- 1989 – Coyote Bypass: Levee construction, Leslie Salt Pond to Milpitas Sewage Treatment Plant
- 1990 – Coyote Creek, from Milpitas Sewage Treatment Plant to 3,500-ft downstream of Highway 237: Levee construction - FEMA Accredited.
- 1991 – Thompson Creek, from Quimby Drive to Aborn Avenue: Various flood protection improvements
- 1994 – Coyote Creek, from 3,500-ft downstream of Highway 237 to Highway 237: Levee construction - FEMA Accredited
- 1996 – Coyote Creek, from Highway 237 to Montague Expressway<sup>25</sup>: Valley Water/USACE joint improvement project providing 1% level of flood protection
- 2000 – Coyote Creek, from South Bay Mobile Home Park Floodwall<sup>26</sup>: Design and construction of a floodwall to protect mobile home park from 1% flood event
- 2001 – Coyote Creek - Acquisition Program for Flood Hazard Mitigation<sup>27</sup>: As part of this program three houses were purchased near William Street were purchased and cleared creating 1.5-acres of open space for flood protection education called Coyote Outdoor Classroom
- 2004 – Coyote Creek - Acquisition and demolition of property located at 344 South 17<sup>th</sup> Street following damage by March 1997 landslide
- 2006 – Coyote Creek - Acquisition and demolition of property located at 328 South 17<sup>th</sup> Street following damage by March 1997 landslide
- 2006 – Lower Silver Creek, from Coyote Creek to Interstate 680: Construction of approximately 2000-ft of concrete lined channel
- 2016 – Lower Silver Creek, from Interstate 680 to Cunningham Avenue: Various flood protection improvements
- 2017 – Coyote Creek - Rock Springs Area temporary flood protection measures<sup>28</sup>: Design and construction of temporary flood barrier to the level of February 2017 flood event

<sup>25</sup> SCVWD (1984). Coyote Creek Planning Study (San Francisco Bay to Montague Expressway). Santa Clara Valley Water District, San Jose, CA.

<sup>26</sup> SCVWD (2000). South Bay Mobile Home Park Flood Wall, November 2000. Santa Clara Valley Water District, San Jose, CA.

<sup>27</sup> SCVWD (2001). Coyote Creek Outdoor Classroom, 791 William Street. Santa Clara Valley Water District, San Jose, CA. Available at <https://www.valleywater.org/coyote-creek-outdoor-classroom>

<sup>28</sup> Valley Water News (2017). *Water District Moves Forward with its Short-Term Project Elements in Rock Springs*. <https://valleywater.org/2017/08/28/water-district-moves-forward-with-short-term-project-elements-in-rock-springs/>.



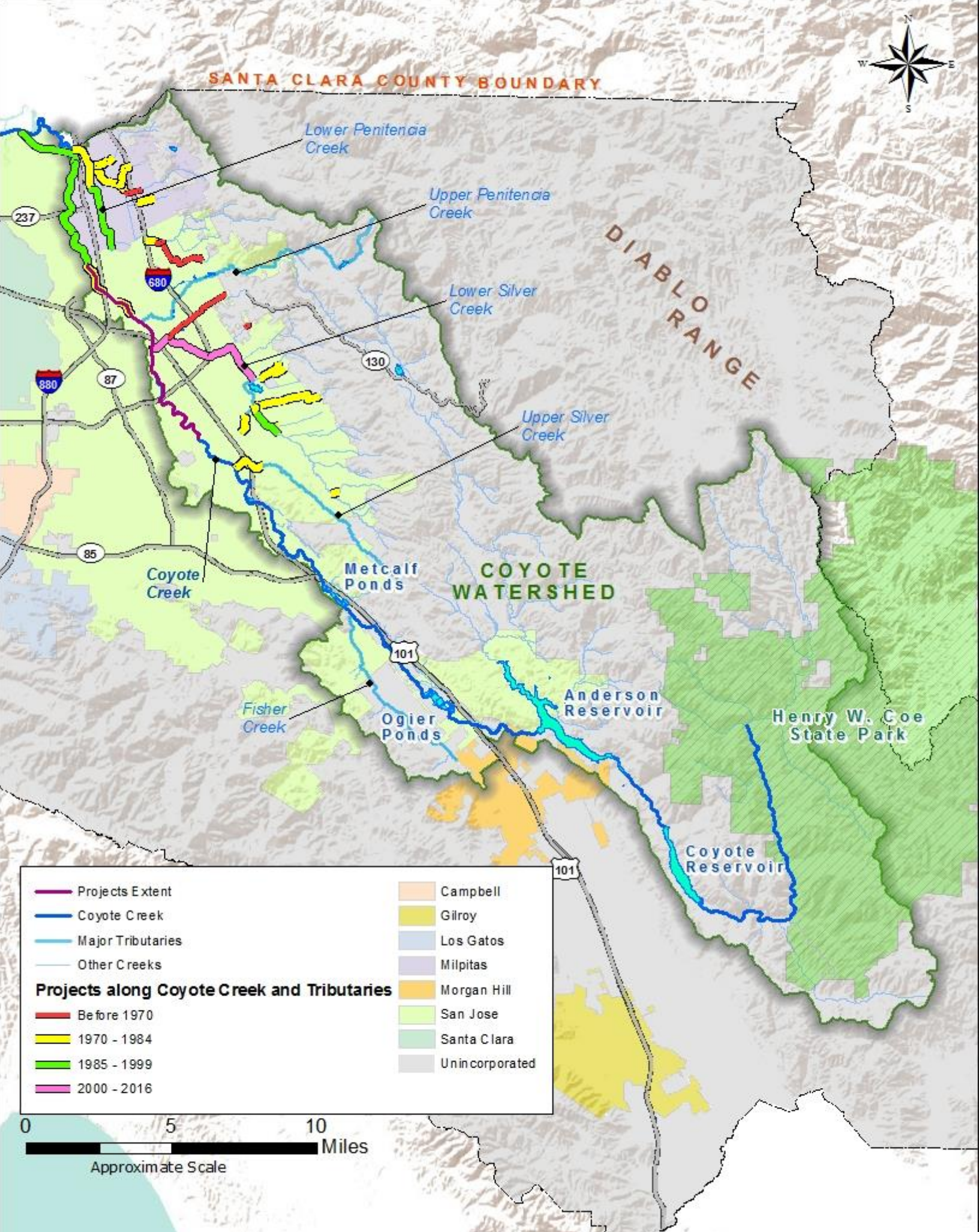


Figure 2.46. Previous Flood Protection Projects

Service Layer Credits: Sources: Esri, USGS, NOAA



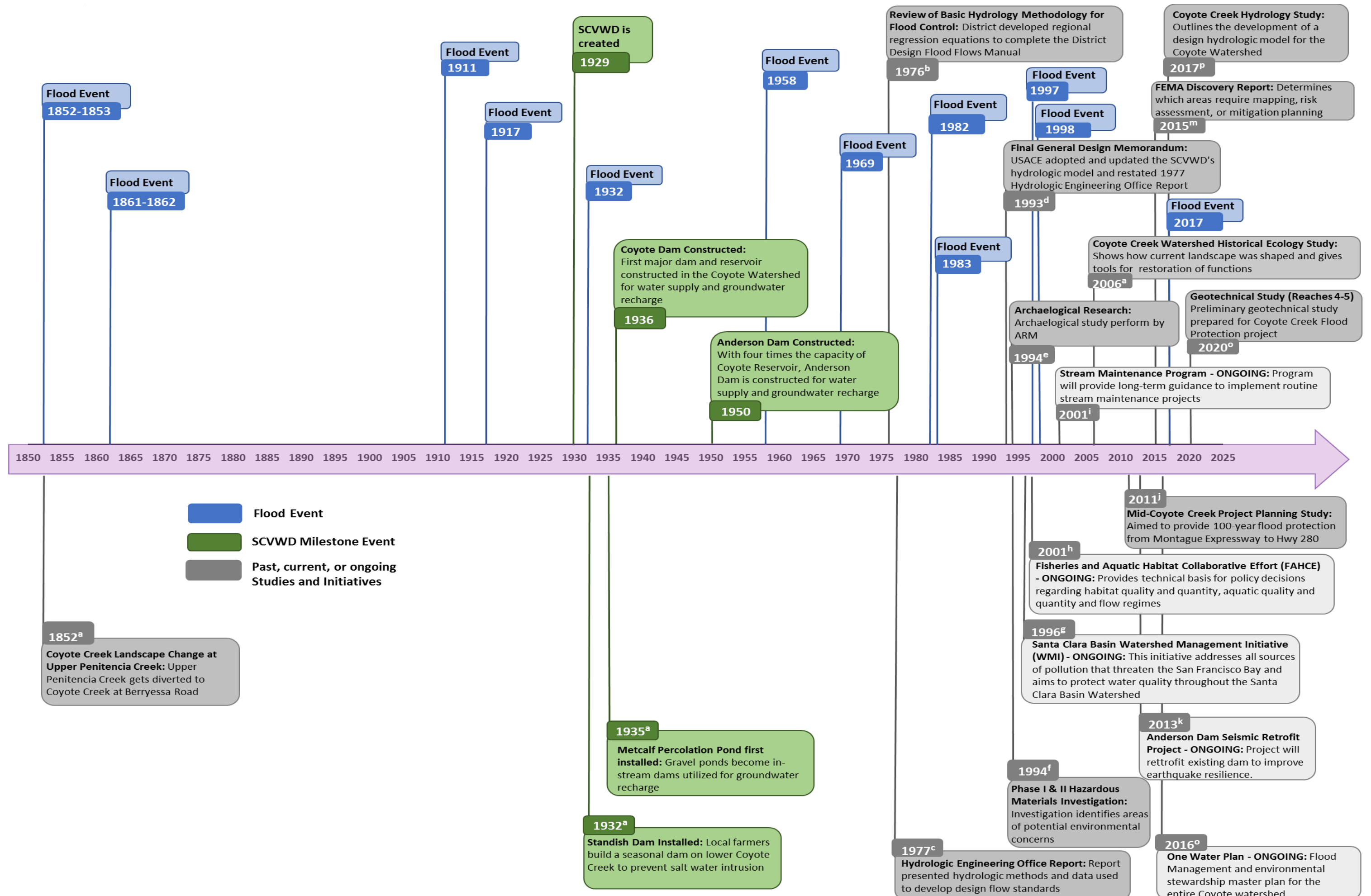


Figure 2.47 Completed or Ongoing Coyote Creek Watershed Studies and Initiatives



### Completed or Ongoing Coyote Creek Watershed Studies and Initiatives

- a. 2006 - Coyote Creek Watershed Historical Ecology Study: Historical Condition, Landscape Change, and Restoration Potential in the Eastern Santa Clara Valley, California. A Report of SFEI's Historical Ecology, Watersheds, and Wetlands Science Programs, SFEI Publication 426, San Francisco Estuary Institute, Oakland, CA.
- b. 1976 - Review of Basic Hydrology Methodology for Flood Control. Santa Clara Valley Water District, San Jose, CA.
- c. 1977 - U.S. Army Corps of Engineers (USACE). Hydrologic Engineering Office Report: Guadalupe River and Coyote Creek, Santa Clara County, California. San Francisco District, San Francisco, CA.
- d. 1993 - U.S. Army Corps of Engineers (USACE). Final General Design Memorandum, Chapter 12 - Hydrology, Coyote and Berryessa Creeks. Sacramento District, Sacramento, CA.
- e. 1994 - Archaeological Resource Management (ARM). Coyote Creek Flood Control Project (Reach 4-12). Santa Clara Valley Water District, San Jose, CA.
- f. 1994 - Kennedy/Jenks Consultants. Phase I Hazardous Materials Investigation (East Julian Street to East Santa Clara Street) and Phase II Hazardous Materials Investigation (Montague Expressway to East Santa Clara Street). Santa Clara Valley Water District, San Jose, CA.
- g. 2001 - Santa Clara Basin Watershed Management Initiative. Watershed Characteristics Report. Watershed Management Plan, Volume One (Unabridged). Prepared by the Santa Clara Basin Watershed Initiative, stakeholder group organized to protect and enhance the Santa Clara Basin Watershed.
- h. 1997 - Fisheries and Aquatic Habitat Collaborative Effort Summary Report (FAHCE): A Multi-agency fisheries plan for Coyote Creek, Stevens Creek, and Guadalupe River in Santa Clara County. Santa Clara Valley Water District, San Jose, CA. Available at <https://www.valleywater.org/project-updates/creek-river-projects/fahce-fish-and-aquatic-habitat-collaborative-effort>
- i. 2001 - Santa Clara Valley Water District Stream Maintenance Program. 2018. Available at <https://www.valleywater.org/flooding-safety/stream-maintenance-program>
- j. 2011 - Mid-Coyote Creek Project Planning Study, Montague Expressway to Interstate 280, Project No. 26174043. Prepared by the Capital Programs Services Division. Santa Clara Valley Water District, San Jose, CA.
- k. Anderson Dam Seismic Retrofit Project. Santa Clara Valley Water District. Information available at <https://www.valleywater.org/anderson-dam-project>
- l. 2015 - Discovery Report: Coyote Watershed, HUD-18050003, 3 June 2015, Santa Clara Valley Water District, San Jose, CA.
- m. 2016 - One Water Plan: A Roadmap to Manage our Water Resources. 2018. Santa Clara Valley Water District, San Jose, CA. Available at <https://www.valleywater.org/your-water/one-water-plan>
- n. 2017 - Coyote Creek Hydrology Study, Final (Addendum #1), Hydraulics, Hydrology and Geomorphology Unit. Santa Clara Valley Water District, San Jose, CA.
- o. 2020 - Preliminary Geotechnical Report, Coyote Creek Flood Protection Project, Reaches 4 and 5, STA 3+33 to STA 145+50. Prepared for Valley Water by Kleinfelder. 27 February 2020.



## 2.4 Historical Stream Channel

In its historical state, most of Coyote Creek was seasonally dry, which supported a riparian habitat in the form of open savanna or woodland, riparian shrub, and large unvegetated gravel creek bed areas, as illustrated in *Figure 2.49*.<sup>29</sup> Evidence suggests that the dominant riparian habitat within historical Coyote Creek was sycamore alluvial woodland which indicates a relatively large tree canopy with spaced-out sycamores. The valley oak savannas occupied the fertile alluvial fans which became very productive agricultural lands.<sup>29</sup>

The historical creek conditions reveal a sharp contrast to the currently dense canopy riparian forest observed along the creek. This change in creek conditions was brought about not only by the increase in drainage density to Coyote Creek from artificially connected tributary channels, but also by the conversion of the stream from intermittent to perennial flow due to the impoundment of the creek by Coyote and Anderson Dams, and managed flow releases from those dams.<sup>29</sup> After the construction of Coyote Dam in 1936, it was observed that peak flows for most of the watershed were reduced while summer flows were increased, as observed in *Figure 2.48*. This resulted in a significant increase in the number of trees growing within the active channel, eliminating the historically dry unvegetated gravel bars and the open riparian habitat.<sup>29</sup>

Historically, no direct natural tributaries to Coyote Creek existed downstream of Metcalf Road, and all the runoff the creek received was from areas located upstream of present-day Anderson and Coyote Dams as well as small eastside tributaries in the Coyote Valley. As a result, Coyote Creek's direct watershed connection was historically to the southern area of the watershed, as illustrated in *Figure 2.50* in the upper left watershed map.<sup>29</sup> In 1852, Upper Penitencia Creek was artificially connected to Coyote Creek to improve valley floor drainage. Lower Penitencia Creek, along with two of its tributaries – Arroyo de Los Coches and Calera Creek - was also connected to the Coyote Creek main stem by 1895. By 1940, disconnected subwatersheds farther south were artificially connected to the creek (see *Figure 2.50*).<sup>29</sup> Artificial connection of these subwatersheds increased the watershed area directly connected to Coyote Creek by more than 50%. At the same time, construction of the Coyote and Anderson Dams in the mid-20<sup>th</sup> century reduced direct upper watershed connectivity to the Coyote Creek mainstem, effectively shifting functional watershed connectivity to the northern part of the watershed, as illustrated in *Figure 2.50* in the lower right map.

In terms of the historical channel alignment, Coyote Creek tends to follow its historical route, escaping major straightening.<sup>29</sup>

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<sup>29</sup> Grossinger, Robin, et al. (2006). *Coyote Creek Watershed Historical Ecology Study: Historical Condition, Landscape Change, and Restoration Potential in the Eastern Santa Clara Valley, California*. Prepared for the Santa Clara Valley Water District. A Report of SFEI's Historical Ecology, Watersheds, and Wetlands Science Programs, SFEI Publication 426, San Francisco Estuary Institute, Oakland, CA.



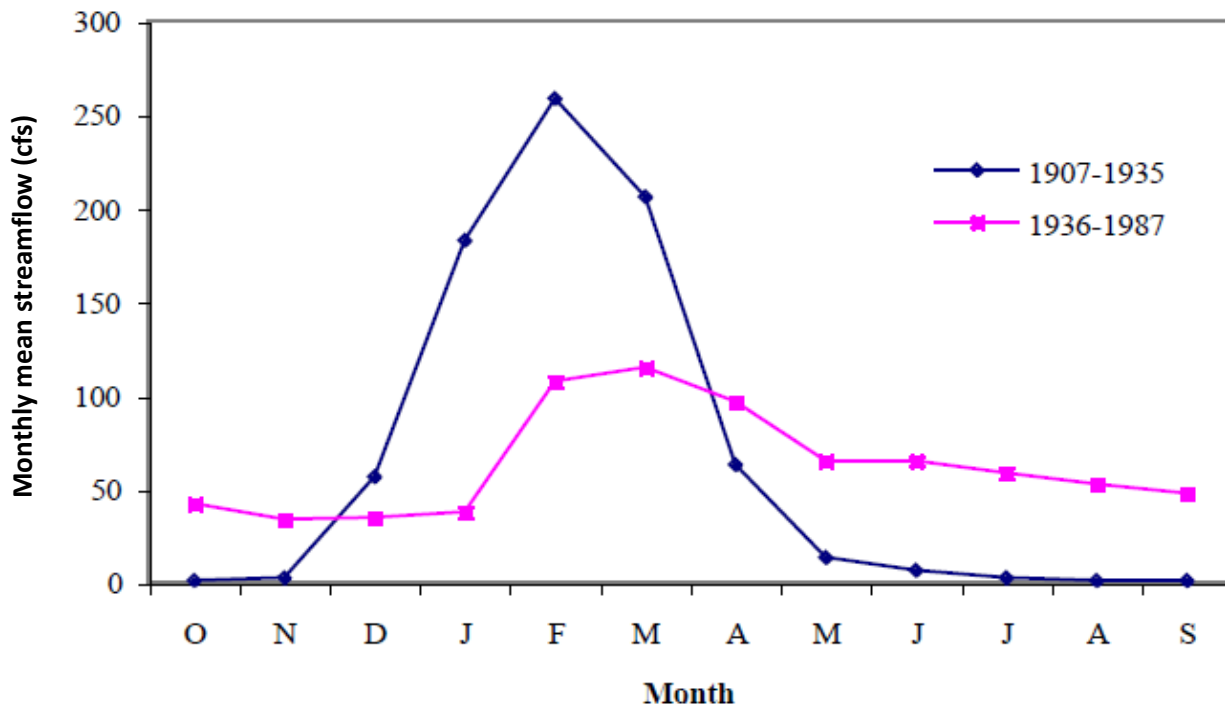
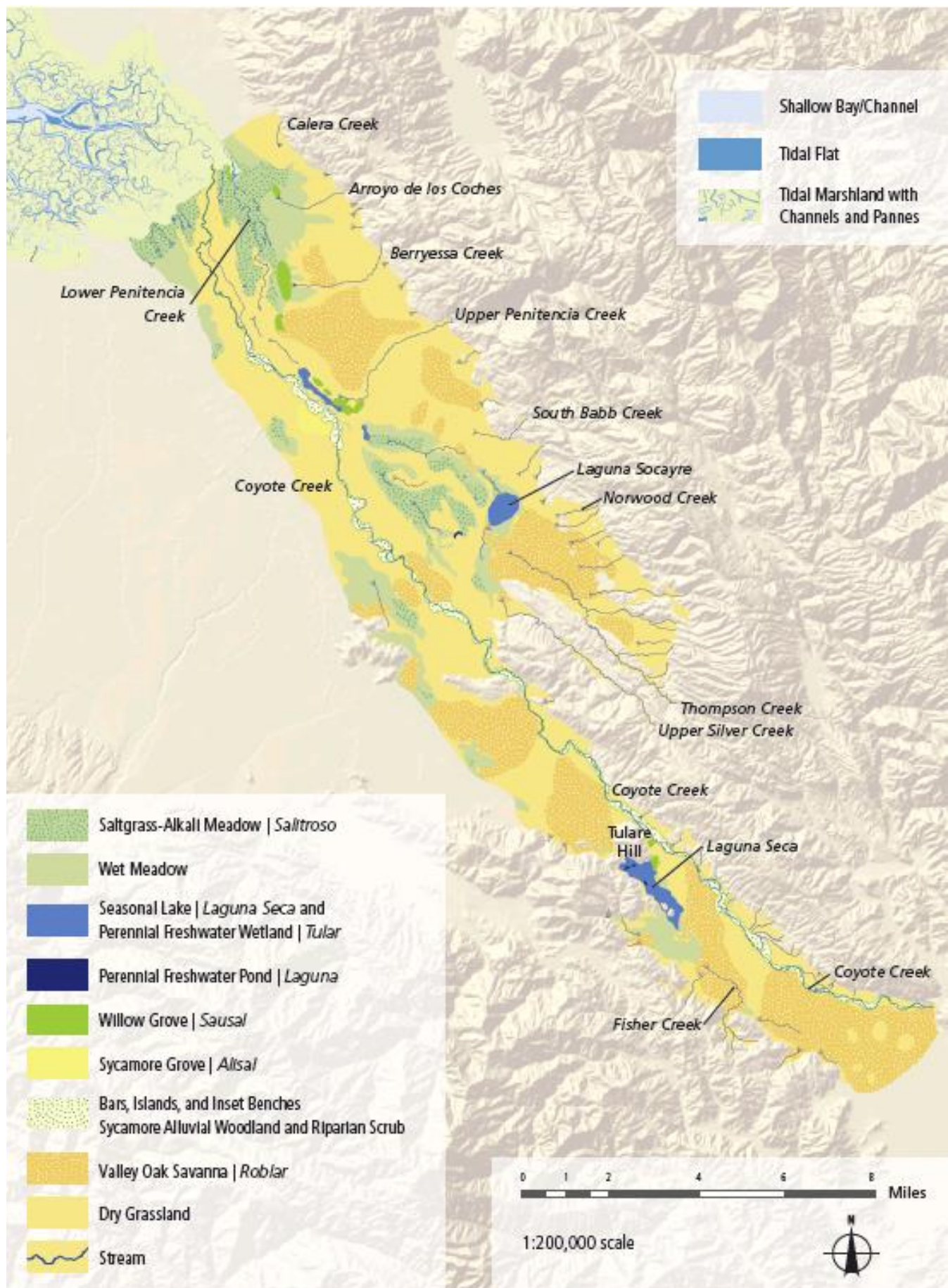


Figure 2.48. Change in Monthly Runoff Distribution for Coyote Creek (Madrone Stream Discharge Gauge Station). Figure reprinted and adapted from Grossinger, Robin, et al, p. IV-41.





**Figure 2.49. Historical Landscape Patterns Along Coyote Creek circa 1769-1850. Source: Grossinger, Robin, et al, p. II-3.**



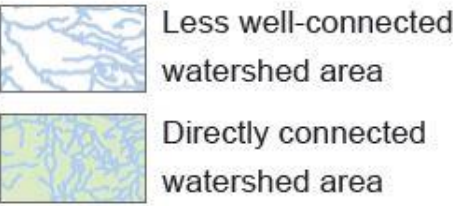
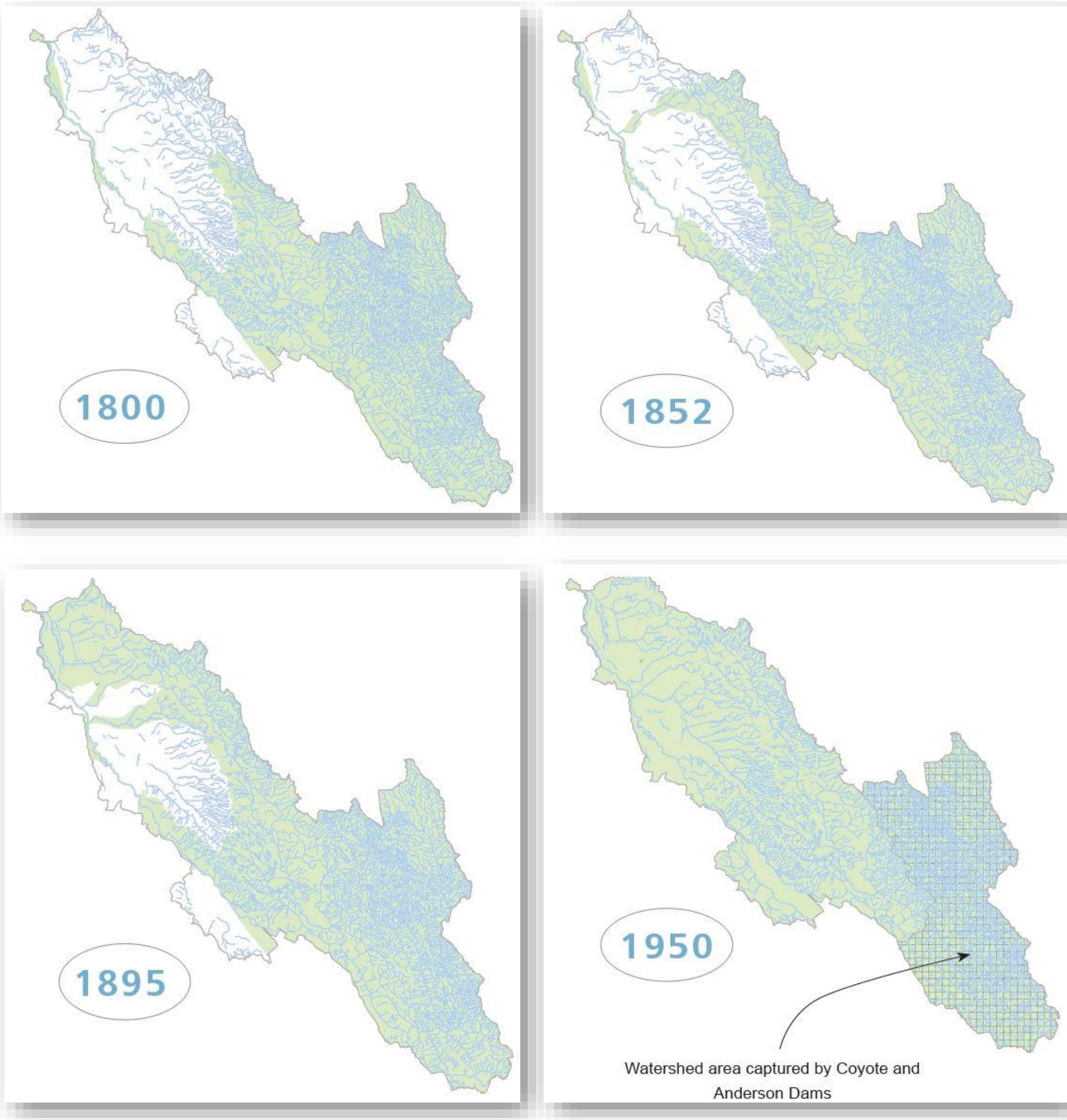


Figure 2.50. Functional watershed changes within Coyote Creek Watershed. Figure reprinted and adapted from Grossinger, Robin, et al, p IV-14.



## 2.5 Hydrology

The Coyote Creek watershed has warm, dry summers and mild, wet winters, which is typical of a Mediterranean climate. The mean annual precipitation ranges with elevation from a low of 14.5-inches near the San Francisco Bay to a maximum of 28.0-inches near Mount Sizer (elevation 3,217-feet), as observed in *Figure 2.51*. Indicated also in *Figure 2.51* are stream discharge gauging stations and rainfall gauging stations within the Coyote Creek Watershed.

Due to the hydromodification of the Coyote Creek Watershed, as described in *Section 2.4 Historic Stream Channel*, currently there can be two main flow contributions to Coyote Creek in response to a single rainfall event:

- Direct watershed input from lower watershed tributaries
- Upper watershed input (from Anderson Dam spilling)

*Table 2.6* lists flow distributions along Coyote Creek for the 0.5%, 1%, 2%, 4%, 10% and 20% events at several locations.<sup>30</sup> These flows assume that all flows are contained in channel with no spills. It should be emphasized that peak flow rates are subject to change overtime due to natural hydrologic changes and to climate change. This can result in past constructed channel improvements that may now be outdated.

*Table 2.6. Flow distributions for Coyote Creek for various recurring intervals*

Coyote Creek	Peak Flow (cfs)							
Location	Drainage Area (mi <sup>2</sup> )	20% (5 year)	10% (10 year)	4% (25 year)	2% (50 year)	1% (100 year)	0.5% (200 year)	0.2% (500 year)
Coyote Reservoir Inflow	120.4	7,290	10,350	14,480	17,620	20,920	23,860	27,890
Coyote Reservoir Outflow	120.4	5,110	6,910	9,220	10,920	12,650	14,170	16,200
Anderson Reservoir Inflow	195.1	7,090	9,650	12,950	15,380	17,880	20,070	23,010
Anderson Reservoir Outflow	195.1	3,610	5,410	7,960	9,970	12,150	14,140	16,910
Coyote D/S Madrone Gauge	197.1	3,660	5,480	8,050	10,090	12,280	14,280	17,080
Coyote U/S Fisher Creek	208.1	3,760	5,610	8,220	10,280	12,500	14,520	17,340
Coyote D/S Fisher Creek	222.8	4,040	5,980	8,700	10,840	13,130	15,210	18,110
Coyote at Edenvale Gauge	229.7	4,100	6,060	8,800	10,960	13,260	15,350	18,260
Coyote U/S Upper Silver	231.3	4,120	6,080	8,830	10,980	13,290	15,380	18,290
Coyote D/S Upper Silver	237.0	4,180	6,160	8,930	11,110	13,430	15,540	18,470
Coyote at I-280	248.4	4,260	6,280	9,110	11,320	13,690	15,840	18,820
Coyote at East Williams St	249.3	4,260	6,280	9,110	11,330	13,700	15,850	18,840
Coyote U/S Lower Silver	249.6	4,190	6,200	9,010	11,210	13,570	15,710	18,690
Coyote D/S Lower Silver at US 101	292.7	4,580	6,760	9,810	12,190	14,750	17,070	20,290
Coyote U/S Upper Penitencia	293.0	4,580	6,760	9,810	12,190	14,750	17,070	20,290
Coyote D/S Upper Penitencia at Berryessa	316.7	4,820	7,080	10,220	12,670	15,280	17,650	20,920
Coyote at I-880	320.4	4,830	7,100	10,260	12,720	15,350	17,730	21,030
Coyote at 237	321.7	4,820	7,090	10,250	12,720	15,360	17,750	21,070

<sup>30</sup> SCVWD (2017). *Design Flood Flow Manual for All District Watersheds*. Prepared by Jack Xu, P.E. and Robert Chan, E.I.T. Hydraulics, Hydrology and Geomorphology Unit. December 2017. Santa Clara Valley Water District. San Jose, CA.



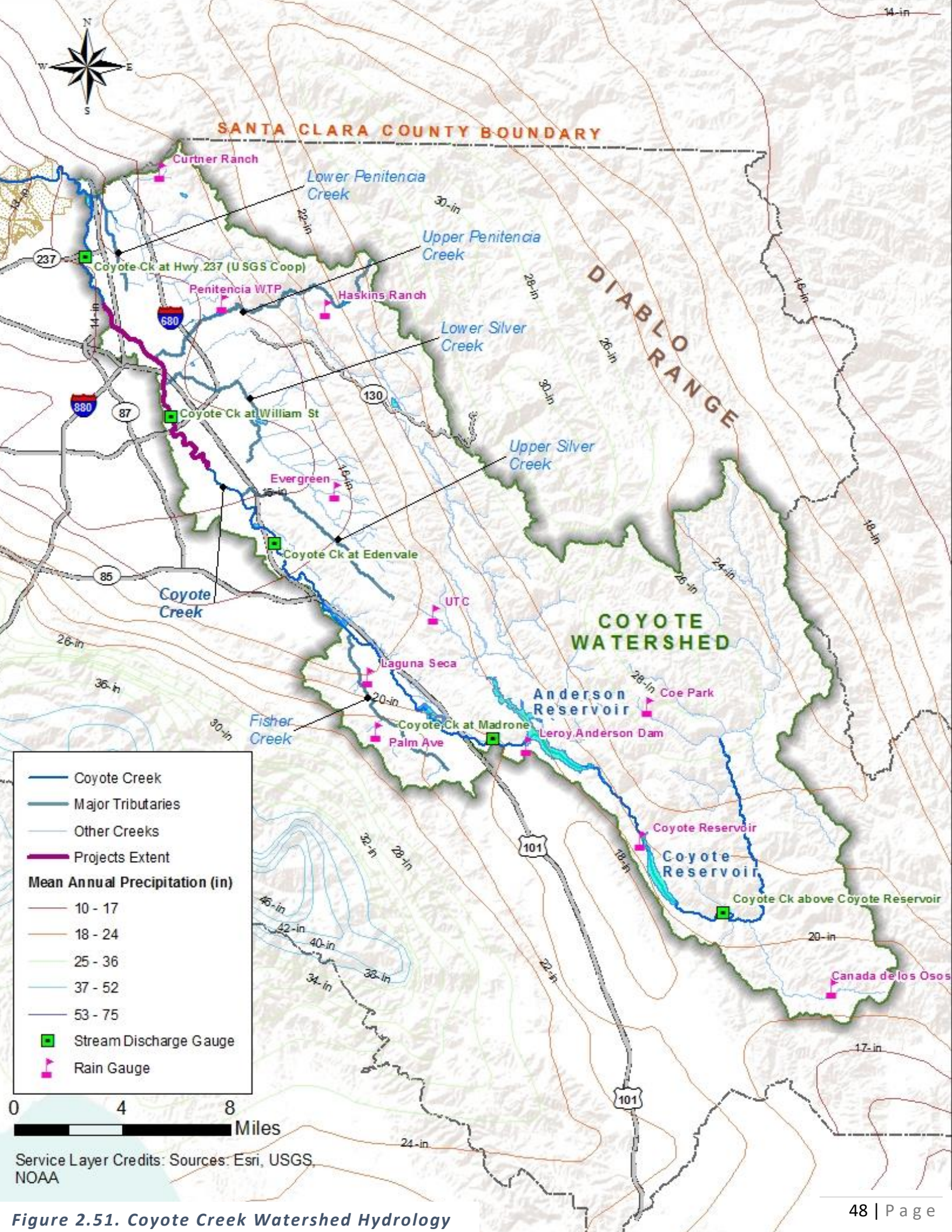


Figure 2.51. Coyote Creek Watershed Hydrology



## 2.6 Geology

The site of the Project is the Santa Clara Valley, specifically situated within the San Jose West and Milpitas 7.5-minute Quadrangles. Various studies done by the California Geological Survey (CGS), Dibble and Minch, and Witter et al., place the general area of the Project underlain by Quaternary age alluvial deposits (younger than approximately 2.6 million years old) consisting of gravel, sand and clay.<sup>31,32,33,34,35</sup>

In addition, the stream channel deposits were found to be locally underlain by Holocene Age (about 11,700 years or younger) alluvial fan levee deposits, and Holocene stream terrace deposits.<sup>31,32,35</sup> Holocene stream terrace deposits are described to be latest Holocene (<1,000 year) deposits based on records of historical inundation, the identification of meander scars and braid bars on aerial photos or orthophoto quadrangles, and/or geomorphic position close to the stream channel, and they are deposited as point bar and overbank deposits by streams.<sup>36</sup>

The CGS and Witter et al. also indicate historical artificial fill has been placed in select locations along the scope of the Project.<sup>31,32,35</sup> Historical artificial landfill is fill material, being engineered or not, deposited by humans. Most of the landfill found within the scope of the Project is located in large highway and railroad embankments and was found based on interpretations of topographic contours of recent 7.5-minute U.S. Geological Survey (USGS) topographic maps.<sup>36</sup>

Current soil distribution within the Coyote Creek Watershed, as compiled from the United States Department of Agriculture (USDA), the Natural Resources Conservation Service (NRCS) and the Soil Survey Geographic (SSURGO) database, is illustrated in *Figure 2.52*. In addition, three mineral springs are located within the Coyote Creek Watershed. These are the Gilroy Hot Springs, Madrone Springs and Core Springs, with locations shown in *Figure 2.52*. As published by the California Coastal Commission in the database titled Santa Clara County Mines in 1998, there were at least 57 abandoned mines within the watershed, 3 idle, 4 producing quarry mines, and 1 proposed (see *Figure 2.52*).

The Hayward and Calaveras faults are major active earthquake faults that cross the Coyote Creek Watershed. Other potentially active earthquake faults within the Coyote Creek Watershed include the Berryessa, Crosley, Clayton, Quimby, Shanon, Evergreen and Silver Creek Faults. The Silver Creek fault crosses Coyote Creek once at Reach 7, between the Lower Silver Creek confluence and the Western Pacific Railroad as observed in *Figure 2.52*.

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<sup>31</sup> California Division of Mines and Geology Staff (2001), Seismic Hazard Zone Report for the Milpitas 7.5-minute quadrangle, Santa Clara County, California: California Division of Mines and Geology, Seismic Hazard Zone Report 051, scale 1:24,000.

<sup>32</sup> California Division of Mines and Geology Staff (2002), Seismic Hazard Zone Report for the Milpitas 7.5-minute quadrangle, Santa Clara County, California: California Division of Mines and Geology, Seismic Hazard Zone Report 058, scale 1:24,000.

<sup>33</sup> Dibblee, T.W. and Minch, J.A. (2005) Geologic Map of the Milpitas quadrangle, Alameda & Santa Clara Counties, California: Dibblee Geological Foundation, Dibblee Foundation Map DF-153, SCALE 1:24,000

<sup>34</sup> Dibblee, T.W. and Minch, J.A. (2007) Geologic Map of the Cupertino and San Jose West quadrangles, Santa Clara and Santa Cruz Counties, California: Dibblee Geological Foundation, Dibblee Foundation Map DF-351, SCALE 1:24,000

<sup>35</sup> Witter, R.C., Knudsen, K.L., Sowers, J.M., Wentworth, C.M., Koehler, R.D., Randolph, C.E., Brooks, S.K., and Gans, K.D. (2006), Maps of Quaternary Deposits and Liquefaction Susceptibility in the Central San Francisco Bay Region, California: U.S. Geological Survey, Open-File Report OF-2006, scale 1:200,000.

<sup>36</sup> Kleinfelder (2020), Preliminary Geotechnical Report, Coyote Creek Flood Protection Project, Reaches 4 & 5, STA 3+33 to STA 145+50.17. 27 February 2020. Prepared for Santa Clara Valley Water District, San Jose, California.



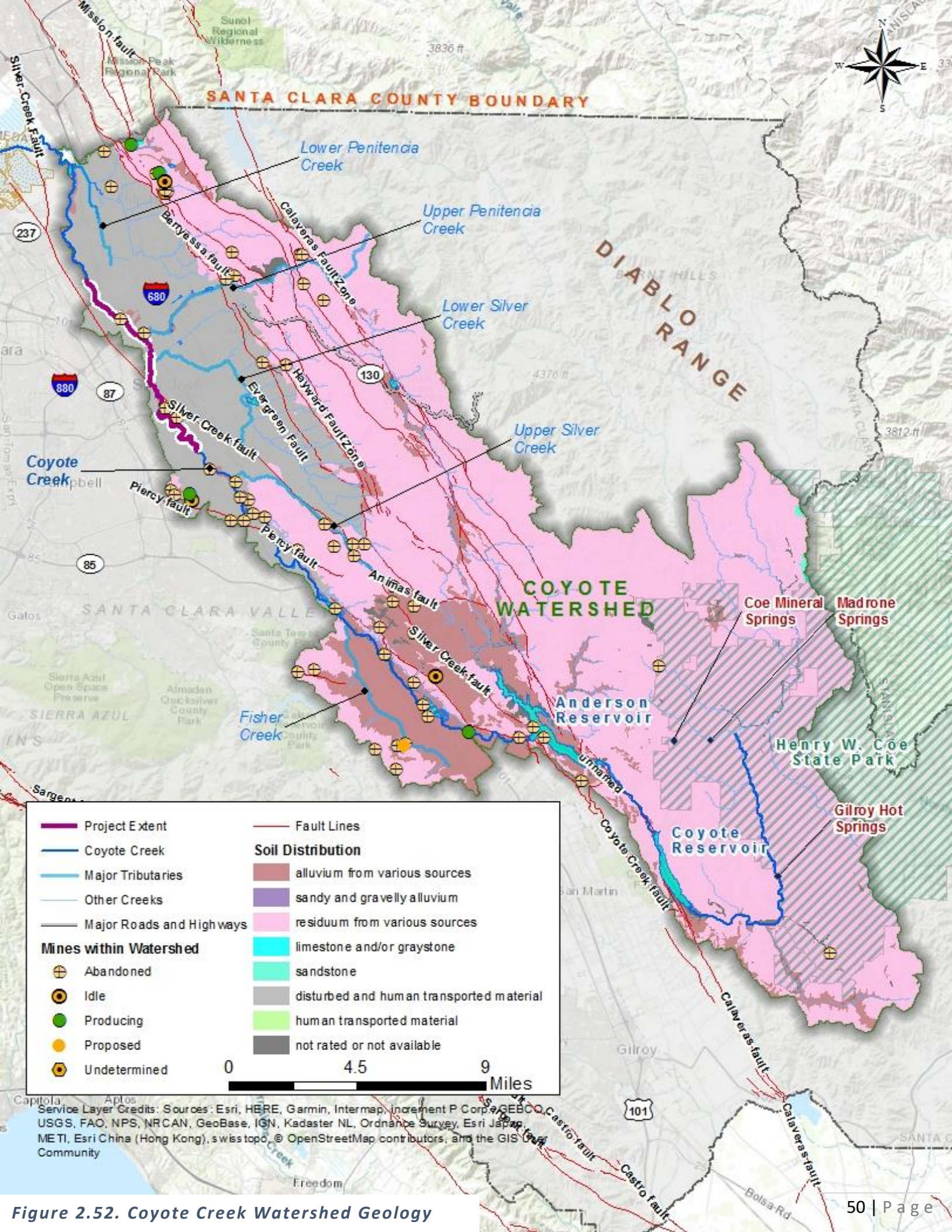


Figure 2.52. Coyote Creek Watershed Geology



## 2.7 Groundwater

The Coyote Creek Watershed overlies the eastern and southern portions of the Santa Clara Subbasin (California Department of Water Resources Basin 2-9.02), as illustrated in *Figure 2.53*. Due to different hydrogeologic, land use and water supply management characteristics, Valley Water subdivides the Santa Clara Subbasin into two groundwater management areas: the Santa Clara Plain and the Coyote Valley.

The Santa Clara Subbasin is a trough-like depression bounded by the Santa Cruz Mountains to the west and the Diablo Mountain Range to the east. It is filled with unconsolidated gravels, sands, silts, and clays eroded from adjacent mountains and deposited into the valley. Groundwater flow in the subbasin generally follows topographical and surface water patterns, flowing to the north/northwest toward the interior of the subbasin and San Francisco Bay. Locally, groundwater also moves toward areas of intense pumping. In these groundwater recharge areas, illustrated in *Figure 2.53*, permeable, coarse-grained sediments predominate. Natural recharge sources include rainfall, seepage through creeks, inflows from adjacent mountains, and return flows from irrigation and septic systems.<sup>37</sup>

Valley Water conducts managed aquifer recharge using local and imported surface water to ensure sustainability. Both in-stream and off-stream groundwater recharge facilities can be found within the watershed. In-stream Valley Water recharge facilities in the watershed include Penitencia and Coyote Creeks as well as the Coyote Percolation Pond. The Penitencia recharge system is predominately served by imported water from the State Water Project, with some contributions from watershed runoff. Sources for the Coyote recharge system include local water from the large Coyote Creek watershed and imported water from the federal Central Valley Project.<sup>37</sup>

Off-stream Valley Water recharge facilities in the Coyote Creek Watershed consist of various percolation ponds in series, off Upper Penitencia Creek, as shown in *Figure 2.53*. These recharge ponds are artificial excavations constructed to infiltrate water where permeable gravels and sands naturally occur in the watershed.<sup>37</sup>

Within groundwater recharge areas, groundwater generally occurs under unconfined conditions at different depths. Groundwater occurs under artesian conditions in the Santa Clara Plain confined aquifer area. Groundwater is very shallow under much of Coyote Valley, with seasonal high groundwater often within ten feet of the land surface. It is typically most shallow at the northwestern end of the valley, near the confluence of Fisher and Coyote Creeks and in the Laguna Seca area. In these areas, groundwater discharge to the land surface and creeks is commonly observed.<sup>37</sup>

The Santa Clara Subbasin serves municipal, industrial, agricultural, and domestic uses, and supports groundwater dependent ecosystems. Valley Water collects annual groundwater quality samples throughout the subbasin. These samples are analyzed for a variety of constituents, including metals, major ions, and nutrients to evaluate current conditions and long-term trends. Valley Water also collects monthly groundwater level measurements from wells distributed throughout the subbasin. Recent groundwater conditions are described in detail in Valley Water's Annual Groundwater Report.<sup>37</sup>

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<sup>37</sup> SCVWD (2019). *2019 Annual Groundwater Report*. Santa Clara Valley Water District, San Jose, CA. Available at [https://www.valleywater.org/sites/default/files/2020-09/2019\\_Annual\\_Groundwater\\_Report\\_Web\\_Version.pdf](https://www.valleywater.org/sites/default/files/2020-09/2019_Annual_Groundwater_Report_Web_Version.pdf)



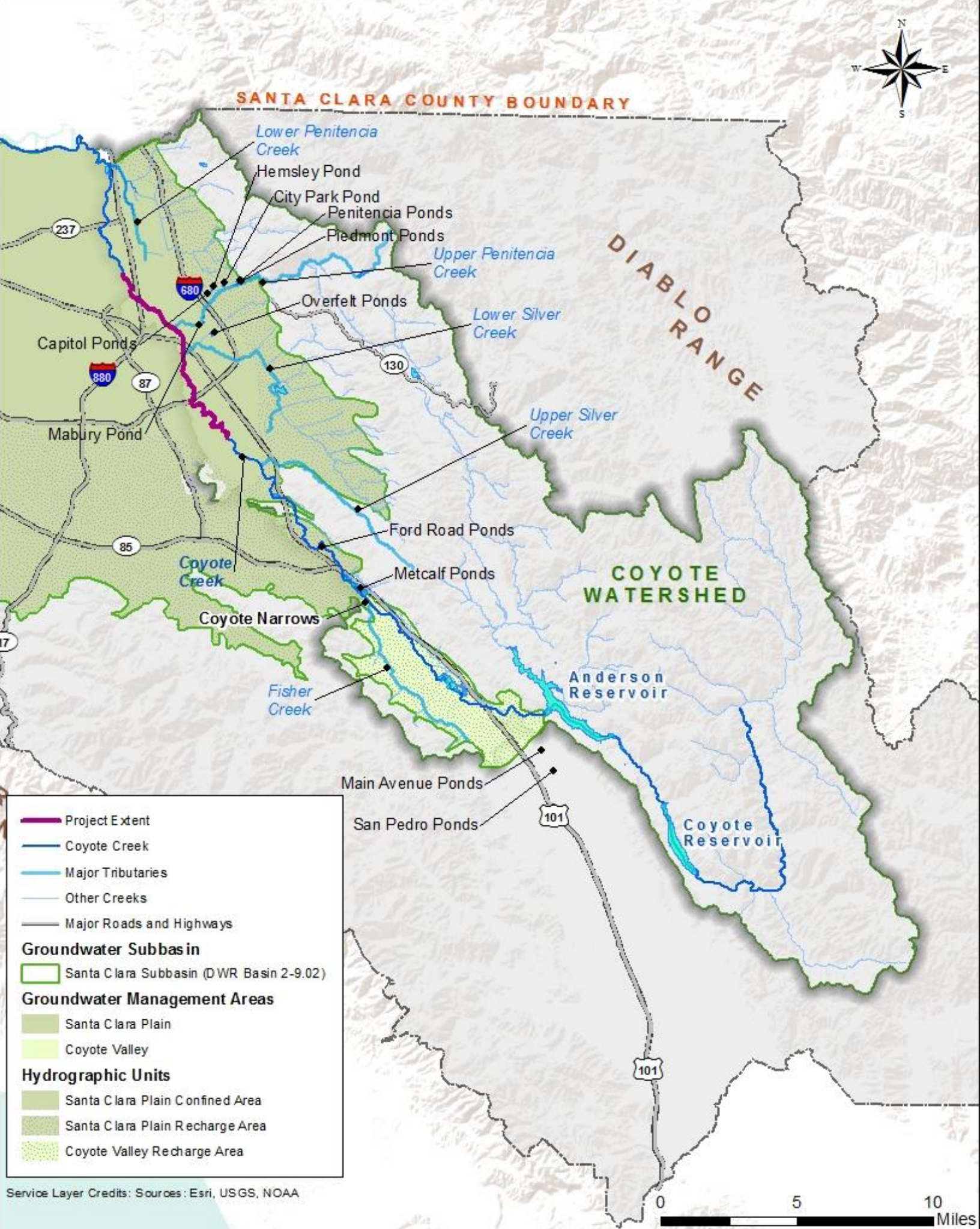


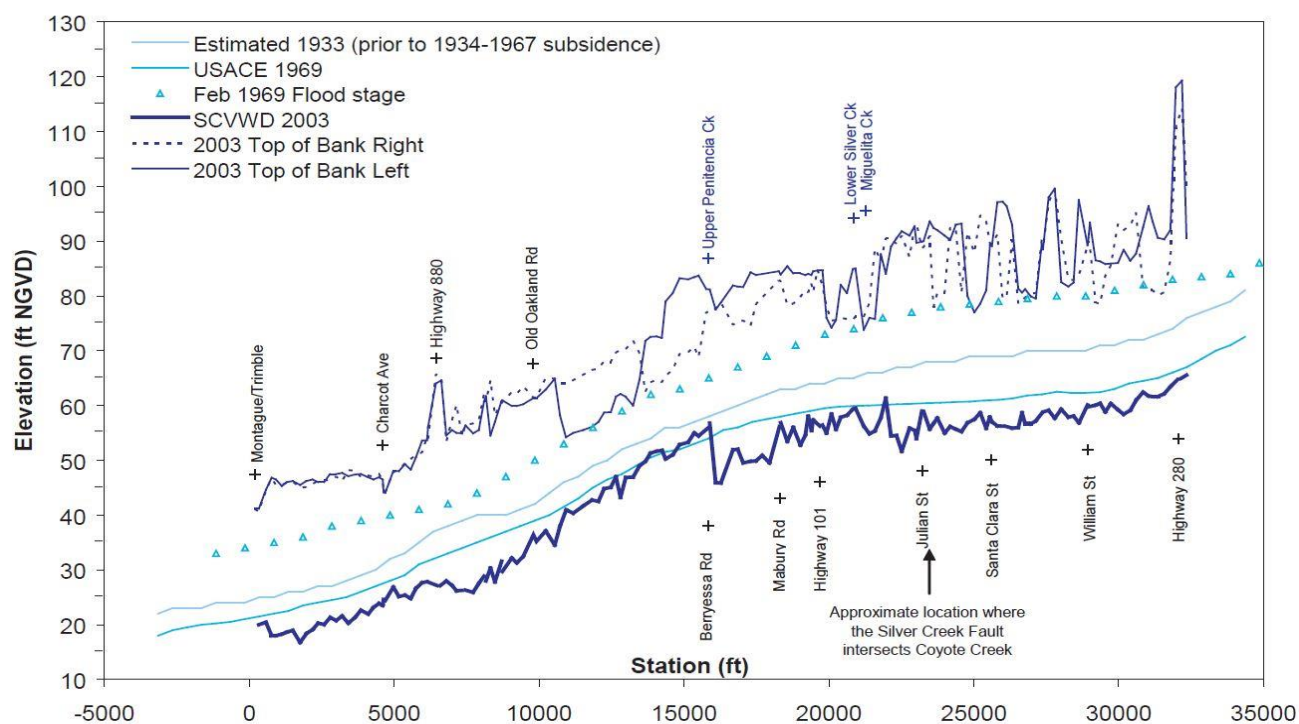
Figure 2.53. Coyote Creek Watershed Groundwater Basin



## 2.8 Land Subsidence

Land subsidence in San José and northern Santa Clara County was first noticed in 1919 by the US Coast and Geodetic Survey, and continued at least until 1967.<sup>29</sup> As groundwater production for agricultural irrigation increased, the water table began to decline. A decline in the artesian pressure resulted in compaction of aquifer zone sediments and eventual land subsidence. In downtown San José, the land subsided by as much as 13-feet. The importation of surface water allowed Valley Water to greatly expand the ground water recharge program, leading to the substantial recovery of groundwater levels and cessation of overdraft. Permanent land subsidence was effectively halted by about 1969 from the recovery of groundwater levels and artesian pressures in the lower aquifer zone. However, ground surface elevations within large areas of the basin have not recovered to their pre-overdraft levels because the consolidation of clay underlying the Santa Clara Subbasin that occurred historically is irreversible.

Within the extent of the projects, historic land subsidence negatively impacted the creek. *Figure 2.54* illustrates changes to the creek invert since 1933. In 1933, the average slope of the creek invert from Berryessa Road to Interstate 280 was approximately 0.09%. In 1969, the slope became 0.06%. Subsidence has effectively flattened the creek profile within the extent of the projects which has reduced the creek's hydraulic capacity and caused low flow water ponding to occur.



*Figure 2.54. Land Subsidence Impact on Coyote Creek Invert Profile. Figure Reprinted and Adapted from Grossinger, Robin, et al, p. IV-33*

## 2.9 Environmental Setting

This section summarizes the Coyote Creek Watershed's current natural and human environment, with a focus on the conditions within the study limits. The intent of this section is to present the environmental

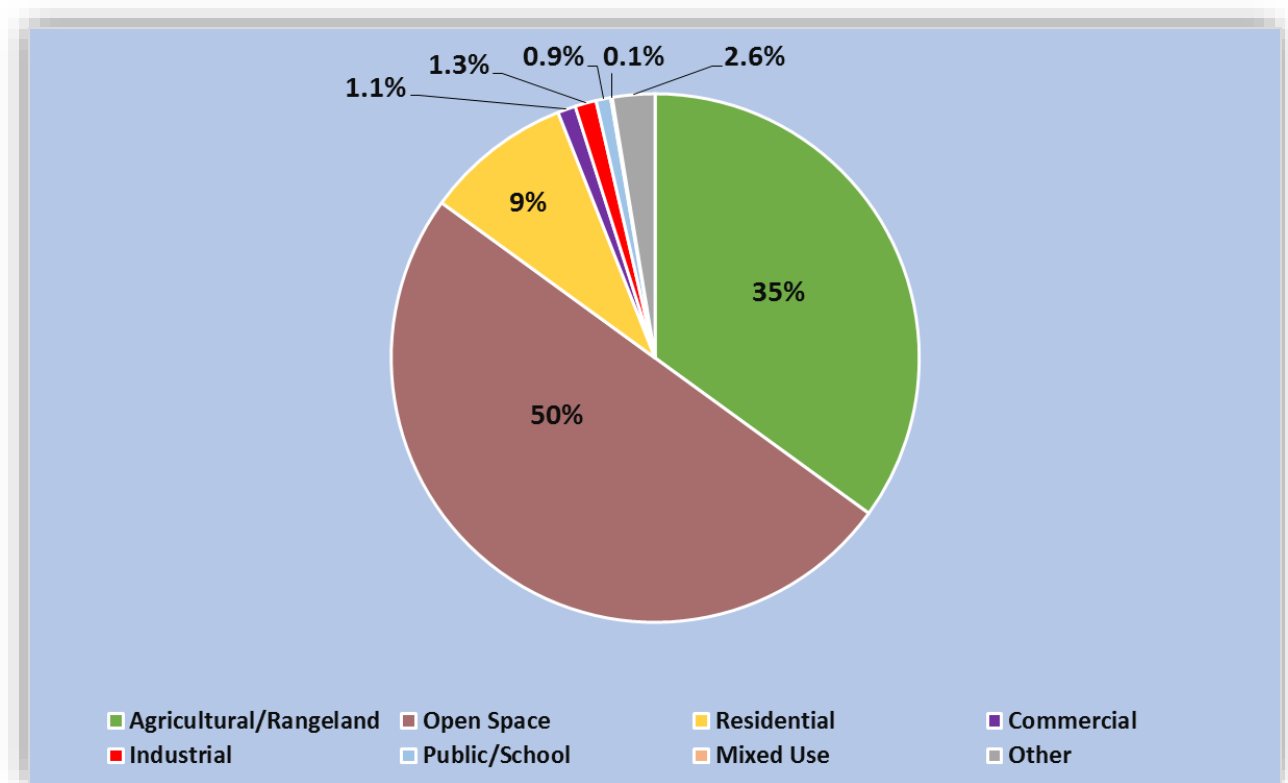


and land use conditions that serve as opportunities and/or constraints to the Project design, begin to understand the Project’s potential effects on the environment, and to help inform strategies to prevent negative impacts of Project construction or mitigate impacts that cannot be prevented.

### 2.9.1 Land Use

As mentioned in *Section 2.1 Coyote Creek Watershed Description*, the upper Coyote Creek Watershed is comprised mainly of agricultural land, rangeland, and open space. Urbanized residential, industrial, and commercial land uses are primarily confined to the downstream region of the lower watershed, as illustrated in *Figure 2.56*. A breakdown of current land use within the entire Coyote Creek Watershed is shown in *Figure 2.55*.

Within the extent of the Project, Reaches 4 and 5 are mostly surrounded by industrial land use, Reaches 6 and 7 are mainly within residential areas, and Reach 8 is mostly parkland and open space in the northern half of the reach, where Coyote Meadows and Kelley Park are located, and residential and industrial land use in the southern half of the reach (see *Figures 2.6, 2.15, 2.25, 2.36 and 2.45* for reference).



*Figure 2.55. Land Use Distribution within the Coyote Creek Watershed*



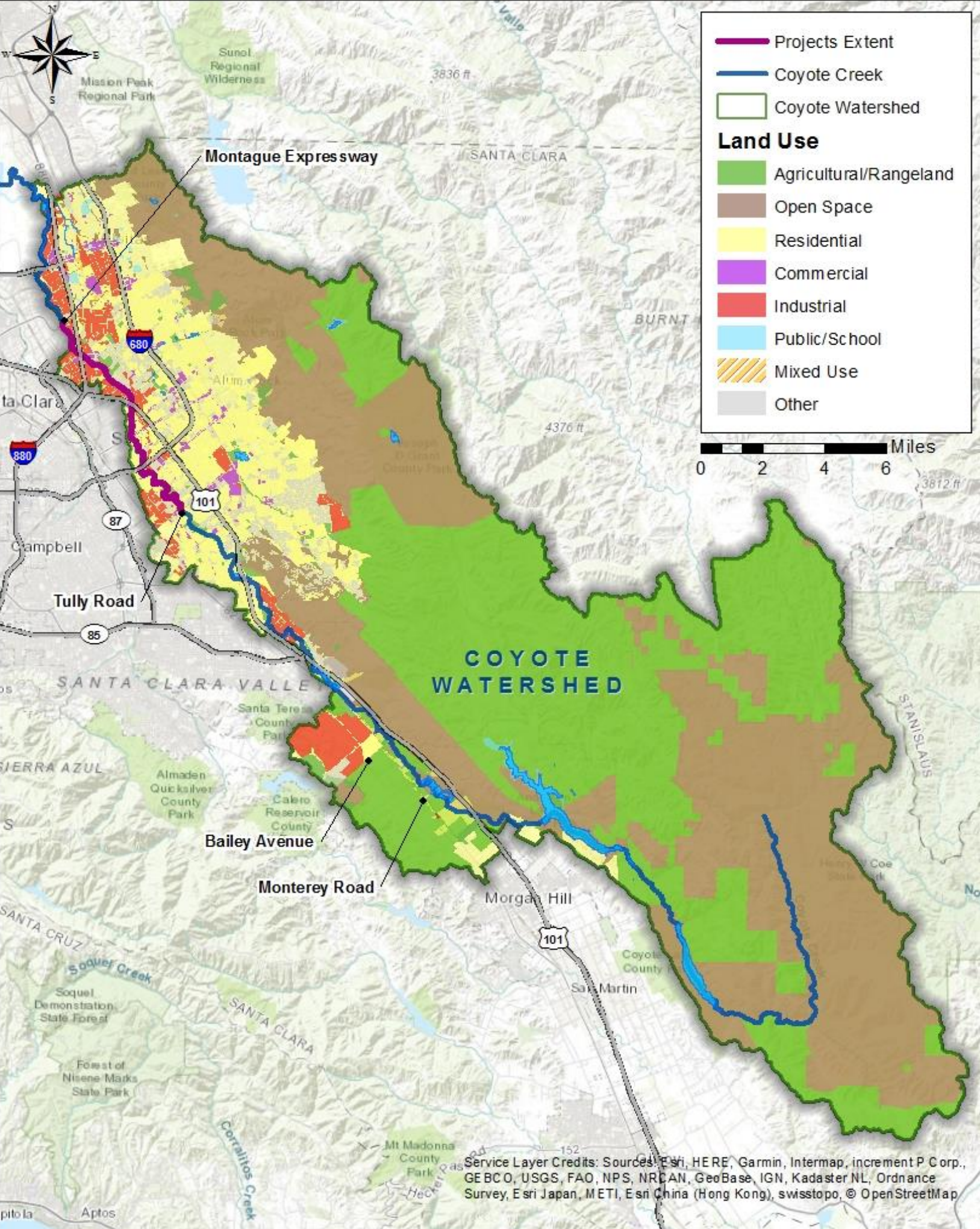


Figure 2.56. Coyote Creek Watershed Land Use Distribution



### 2.9.2 Trails and Parks

There are a number of parks, open space areas, and trails within the Coyote Creek Watershed and the Project reaches specifically. These open space areas are managed by various agencies, and their locations are illustrated in *Figure 2.57*.

This section includes a detailed description of each park and open space area within the extent of the Project. *Figure 2.58* includes all of the parks located within the scope of the Project and *Figures 2.59* through *2.67* serve to illustrate the specific parks and open space areas. *Figure 2.58* also shows the alignment of the City of San José existing and planned Coyote Creek Trail network within the scope of the Project as outlined in the Coyote Creek Trail Master Plan. The Coyote Creek Trail Master Plan defines the City of San José proposed trail alignment to be planned, designed and constructed, as funding becomes available. The Geographic Information System (GIS) trail data shown in *Figure 2.58* was last updated in October 2020 by City of San José staff.<sup>38</sup>

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<sup>38</sup> GIS Open Data (2020). City of San José. Retrieved from <https://gisdata-csj.opendata.arcgis.com/datasets/trail>



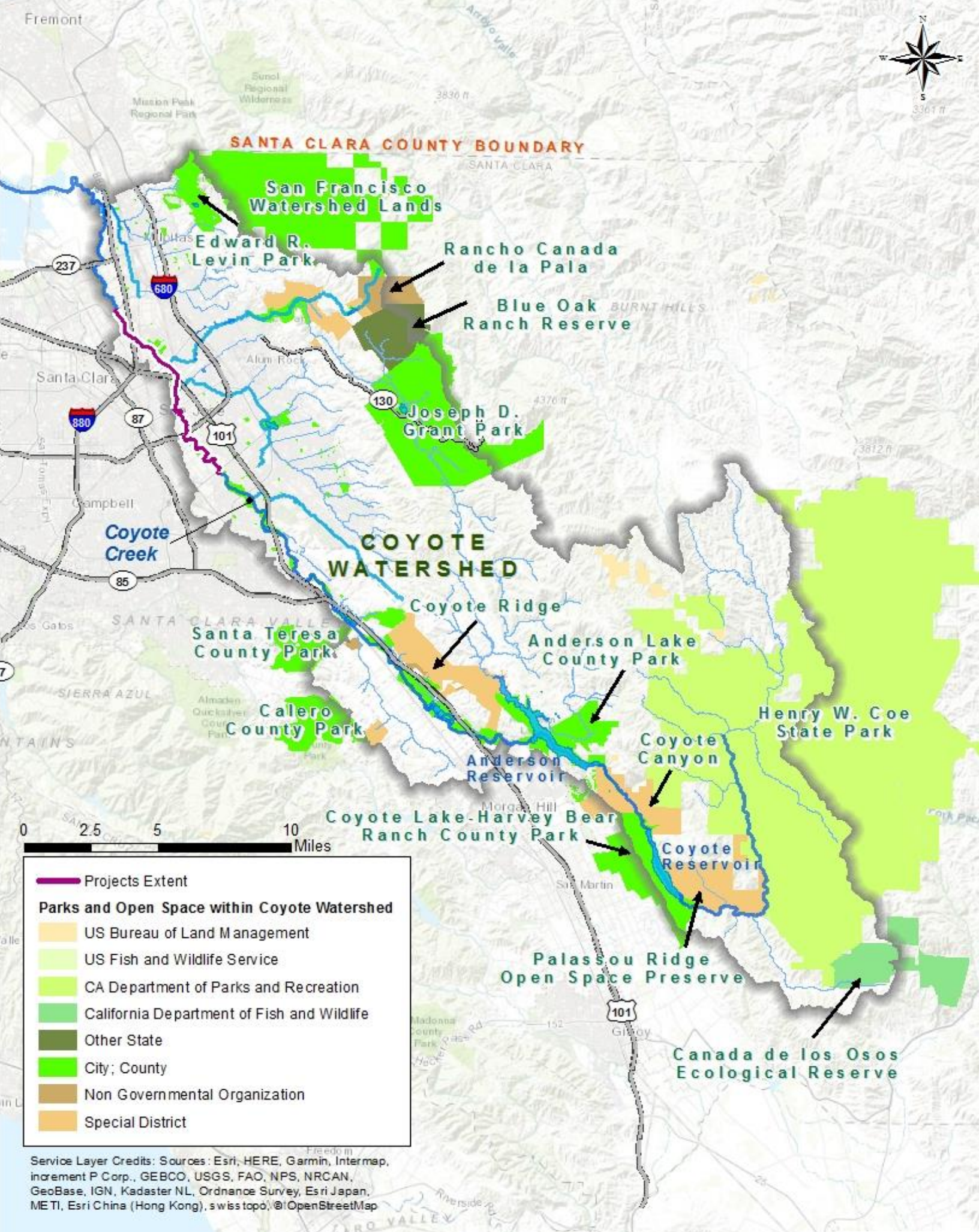


Figure 2.57. Parks and Open Space Areas within the Coyote Creek Watershed



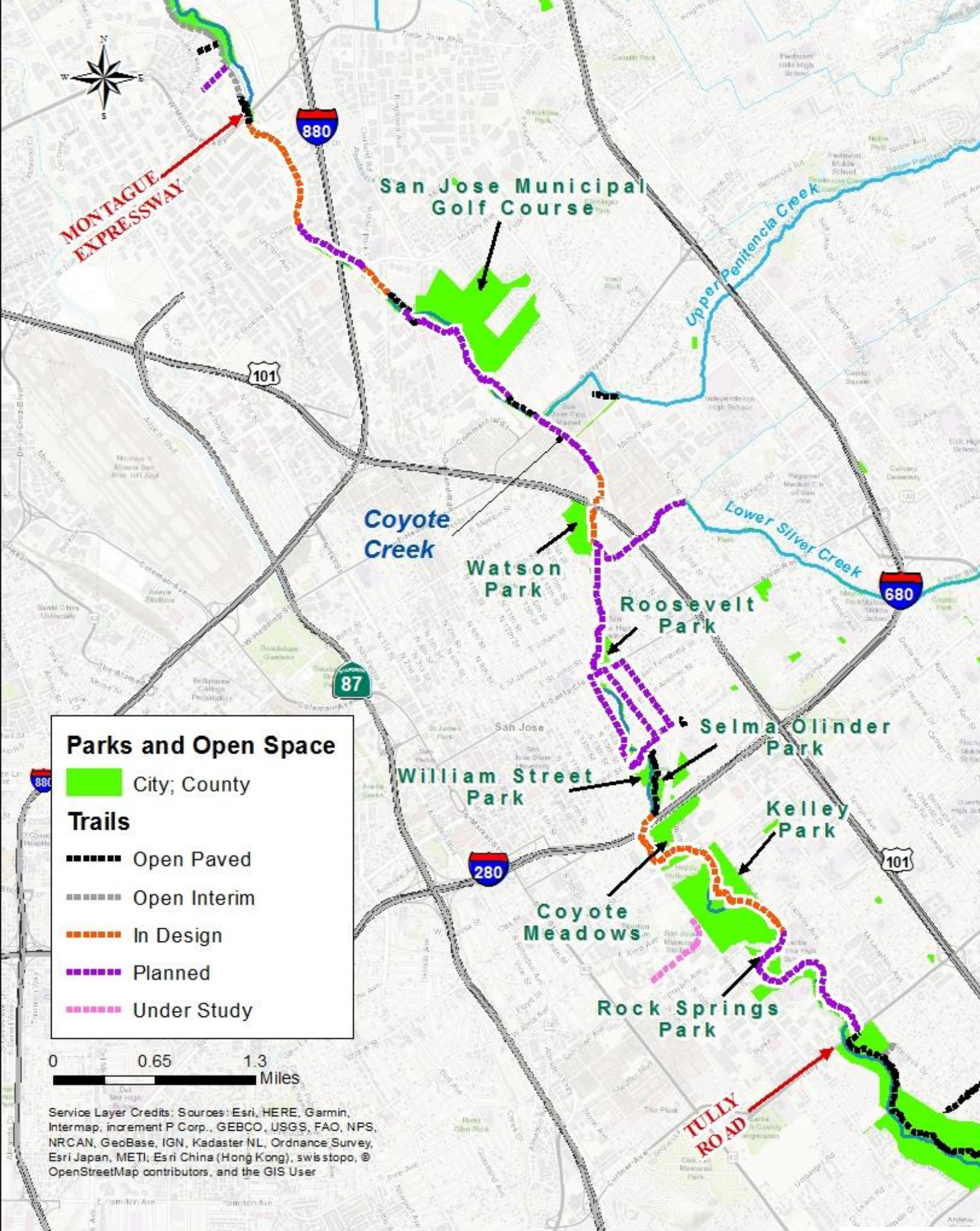


Figure 2.58. Parks and Open Space Areas within the extent of the Project



### San Jose Municipal Golf Course



**Figure 2.59. Aerial View of the San Jose Municipal Golf Course**

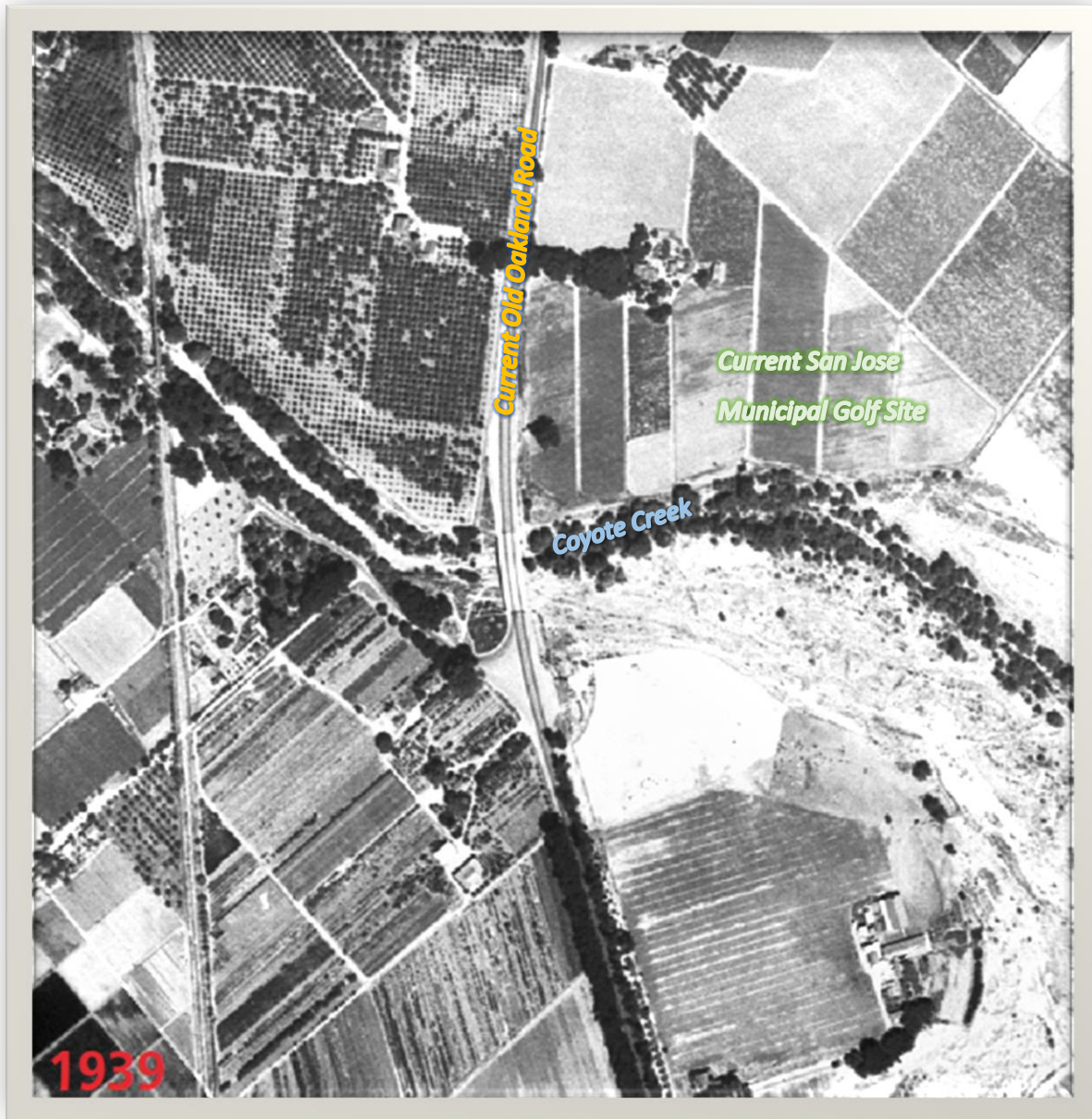
The San Jose Municipal Golf Course is an approximately 177-acre public facility located at 1560 Oakland Road in San José (illustrated in *Figure 2.59*). It is owned by the City of San José and is bounded by Old Oakland Road in the north, Coyote creek in the west, Hazlett Way and Sierra Road in the south and residential properties to the east. It opened in 1968 and was designed by Robert Muir Graves, an American landscape and golf course architect who designed over 75 golf courses all over the United States and internationally.<sup>39,40</sup> The golf course sits on an area previously used for agriculture, as indicated by *Figure*

<sup>39</sup> Golf California.com (2021). San Jose Municipal Golf Course. Retrieved from <http://www.golfcalifornia.com/courses/san-jose/san-jose-municipal-gc/>

<sup>40</sup> ThruTheGreen. *Respected Golf Course Architect, Author and Educator Dies at 72*. Archive.lib.msu.edu. Retrieved 1 January 2021



2.60, which shows an aerial photograph circa 1939.<sup>41</sup> The San Jose Municipal Golf Course is located within Reach 5 of the Project.



**Figure 2.61. Aerial view of Old Oakland Road circa 1939. Source: Grossinger, Robin, et al, p. III-30.**

<sup>41</sup> Grossinger, Robin, et al. (2006). *Coyote Creek Watershed Historical Ecology Study: Historical Condition, Landscape Change, and Restoration Potential in the Eastern Santa Clara Valley, California*. Prepared for the Santa Clara Valley Water District. A Report of SFEI's Historical Ecology, Watersheds, and Wetlands Science Programs, SFEI Publication 426, San Francisco Estuary Institute, Oakland, CA.



### Watson Park



**Figure 2.61. Aerial View of Watson Park**

Watson Park, illustrated in *Figure 2.61*, is an approximately 26.6-acre park owned, operated, and maintained by the City of San José. It is located to the east of the intersection of Jackson Street and 22<sup>nd</sup> Street in the north-central area of the City of San José, approximately two miles northeast of downtown San José.<sup>42</sup> Its boundaries include East Taylor Street (Mabury Road) to the north, Highway 101 to the northeast, Coyote Creek to the east, Empire Gardens Elementary School to the south and North 22<sup>nd</sup> Street and residential properties to the west. The park includes picnic areas, a soccer field, two basketball courts, a dog play area, a parking lot and restroom facilities.<sup>42</sup> The park sits on a historical municipal waste incinerator site, in operation from 1914 until 1934. Prior to the site becoming a public park in 1961, parts of the land were utilized as a garbage dump as well as an agricultural field and a strawberry farm. In 2004, during an excavation for a future skate park, ash and dump debris with elevated levels of lead were discovered in the area. As a result, construction of the new skate park was halted.<sup>43</sup> Currently, the park is

<sup>42</sup> City of San José. *Parks and Trails, Watson Park*. Retrieved from <https://www.sanjoseca.gov/Home/Components/FacilityDirectory/FacilityDirectory/2697/2002?npage=10>

<sup>43</sup> Department of Toxic Substances Control (September 2008). *Draft Remedial Action Plan Proposed for the Watson Park Site*. Retrieved from [https://dtsc.ca.gov/wp-content/uploads/sites/31/2017/11/Watson\\_Park\\_FS\\_RAP\\_0908.pdf](https://dtsc.ca.gov/wp-content/uploads/sites/31/2017/11/Watson_Park_FS_RAP_0908.pdf)



an active cleanup site overseen by the Department of Toxic Substances Control (DTSC) where various land use restrictions are currently listed.<sup>44</sup> Watson Park is located within Reach 6 of the Project.

### Roosevelt Park



**Figure 2.62. Aerial View of Roosevelt Park**

Roosevelt Park is an approximately 11-acre park which is owned, maintained and operated by the City of San José (see *Figure 2.62*). It is located northeast of the intersection of East Santa Clara Street and North 17<sup>th</sup> Street, approximately 1.25-miles east of downtown San José. Its limits include East Santa Clara Street to the south, Coyote Creek to the west, San José High School to the north and residential properties and North 24<sup>th</sup> Street to the east. The park includes a skating area, a basketball court, a softball field, two handball courts, a youth playground area, a parking lot, and restroom facilities. The Roosevelt Community

<sup>44</sup> Department of Toxic Substances Control (2020). *EnvironStor. Watson Park (70000112)*. Retrieved from [https://www.envirostor.dtsc.ca.gov/public/profile\\_report?global\\_id=70000112](https://www.envirostor.dtsc.ca.gov/public/profile_report?global_id=70000112)



Center is located in the southeast portion of the park.<sup>45</sup> Roosevelt Park is located within Reach 6 of the Project.

### William Street Park & Selma Olinder Park



**Figure 2.63. Aerial View of East William Street and Selma Olinder Parks**

William Street Park is an approximately 15-acre park located southeast of the intersection of East William Street and South 16<sup>th</sup> Street within the historical Naglee Park neighborhood (see *Figure 2.63*). Its boundaries include Coyote Creek to the east, East William Street to the north, South 16<sup>th</sup> Street to the west and residential properties to the south. It includes picnic areas but no other amenities.<sup>46</sup> This park is

<sup>45</sup> City of San José. *Parks and Trails, Roosevelt Park*. Retrieved from <https://www.sanjoseca.gov/Home/Components/FacilityDirectory/FacilityDirectory/2357/34?npag=18>

<sup>46</sup> City of San José. *Parks and Trails, William Street Park*. Retrieved from <https://www.sanjoseca.gov/Home/Components/FacilityDirectory/FacilityDirectory/2705/>



located on the historical Coyote Creek floodplain in a site that was used for agricultural land use, mainly orchard growth, as indicated by the aerial photograph shown in *Figure 2.64*.<sup>47</sup>



***Figure 2.64. Aerial view of East William Street Park and Selma Olinder Parks sites circa 1939. Source: Grossinger, Robin, et al, p. IV-30.***

Selma Olinder Park is an approximately 13-acre park located southwest of the intersection of East William Street and South 18<sup>th</sup> Street (see *Figure 2.63*). Its boundaries include East William Street to the north, Olinder Elementary School to the northeast, Woodborough Drive to the east, and Interstate 280 to the south. It includes picnic areas, a softball field, two tennis courts, a dog park and restroom facilities. Similar

<sup>47</sup> Grossinger, Robin, et al. (2006). *Coyote Creek Watershed Historical Ecology Study: Historical Condition, Landscape Change, and Restoration Potential in the Eastern Santa Clara Valley, California*. Prepared for the Santa Clara Valley Water District. A Report of SFEI's Historical Ecology, Watersheds, and Wetlands Science Programs, SFEI Publication 426, San Francisco Estuary Institute, Oakland, CA.



to William Street Park, this park is also located on the historical Coyote Creek floodplain in a site that was used for agricultural land use, as indicated by the aerial photograph shown in *Figure 2.64*.<sup>47</sup> William Street Park and Selma Olinder Park are both located within Reach 7 of the Project.

### Coyote Meadows



**Figure 2.65. Aerial View of Coyote Meadows**

Coyote Meadows is an open space area covering approximately 50-acres and owned by the City of San José (see *Figure 2.65*). The site includes the former Story Road Landfill, a section of the Coyote Creek riparian corridor, the grade of the former Western Pacific Railroad line including a 260-foot long trestle bridge that crosses Coyote Creek, and a parcel near the intersection of Story Road and Senter Road. Coyote Meadows is bounded by Interstate 280 to the north, Story Road to the south, Coyote Creek to the west and Remillard Court Business Park to the east. The Story Road Landfill former site currently includes



several facilities such as a stormwater drain at the center of the site, a groundwater treatment site, methane systems and a stormdrain trash collector facility at the corner of Remillard Court.<sup>48</sup>

The Story Road Landfill was owned and operated by the City of San José until its closure in 1970. The landfill was originally the site of the Remillard-Dandini Brick Company owned and operated by the Remillard family from 1891 to 1957. The brickyard company produced approximately 10 million bricks per year from clay mined along the east bank of Coyote Creek. Once the brickyard closed, the clay pit left was utilized for refuse disposal as a private landfill. In 1961 the San José City Council established a municipal landfill at the site, the Story Road Landfill. Approximately 500,000 cubic yards (cy) of refuse were disposed of at the former landfill but no records have been found regarding the type of refuse. The landfill was closed and covered with soil in 1970.<sup>49</sup>

In 2016, a group called the Coyote Meadows Coalition was formed which looks to activate the site as a natural park. However, due to the potential contaminants found at the site, such as petroleum fuel hydrocarbons and chlorinated volatile organic compounds (CVOCs) among others as a result of the previous uses of the site, an approved post-closure plan is needed before any excavation can happen.<sup>48</sup> Coyote Meadows is located within Reach 8 of the Project.

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<sup>48</sup> Coyote meadows Coalition (2018). *Coyote Meadows Redevelopment Concept Plan*. Retrieved from [http://coyotemeadowssj.org/wp-content/uploads/2018/07/WW\\_Coyote\\_Creek\\_report\\_single-page-4.26.2018.pdf](http://coyotemeadowssj.org/wp-content/uploads/2018/07/WW_Coyote_Creek_report_single-page-4.26.2018.pdf)

<sup>49</sup> California Regional Water Quality Control Board, San Francisco Bay Region (2007). Adoption of the Site Cleanup Requirements for City of San Jose, Acosta Properties, LLC., Danna Properties, Kelley Park Community Resource Center and Johnson and Marylou Russell for the Story Road Landfill, San Jose, Santa Clara County. [https://www.waterboards.ca.gov/rwqcb2/board\\_decisions/adopted\\_orders/2007/R2-2007-0049.pdf](https://www.waterboards.ca.gov/rwqcb2/board_decisions/adopted_orders/2007/R2-2007-0049.pdf)



### Kelley Park



**Figure 2.66. Aerial View of Kelley Park**

Kelley Park, located at 1300 Senter Road in San José, is an approximately 172-acre park owned and operated by the City of San José (see *Figure 2.66*). It is bounded by Story Road to the north, Senter Road to the west, Roberts Avenue to the east and Phelan Avenue and Coyote Creek to the south. It includes various picnic areas, Happy Hollow Park and Zoo, the Leininger Community Center, the Japanese Friendship Garden, a golf course, various parking lots, History Park, and the Kelley Amphitheater. Coyote Creek meanders through Kelley Park from Phelan Avenue in the south to Story Road in the north.<sup>50</sup>

<sup>50</sup> City of San José. *Parks and Trails, Kelley Park*. Retrieved from <https://www.sanjoseca.gov/Home/Components/FacilityDirectory/FacilityDirectory/2245/2028>



Kelley Park sits on land previously owned by Judge Lawrence Archer, former mayor of San José, who purchased the land in 1861 mainly to grow cherry, apricot and prune trees and where he built his estate house.<sup>51</sup> Judge Archer named his estate Lone Oak. After Judge Archer's death in 1910, his wife, Louis Archer who inherited Lone Oak, married Frank Kelley.<sup>52</sup> In 1951, the land was sold to the City of San José to be used as a public park with the condition that Louise Kelley be allowed to live there for the rest of her life. Louise Kelley died in February 1952 at the age of 89.<sup>52</sup> The original 1910 built house as well as a carriage remain at the park, although in a deteriorated condition.<sup>53</sup> Kelley Park is located within Reach 8 of the Project.

### Rocksprings Park



**Figure 2.67. Aerial View of Rocksprings Park**

<sup>51</sup> Foote, H.S., ed (1888). *Pen Pictures from the "Garden of the World" or Santa Clara County, California Illustrated*. Chicago: The Lewis Publishing Company, pp. 90-91. Retrieved 1 January 2021.

<sup>52</sup> Dobkin, Marjorie; Hill, Ward (1994). *Kelley House in Kelley Park*. Jones & Stokes Associates. Retrieved 1 January 2021.

<sup>53</sup> The Mercury News (February 2012). *San Jose: Two Alarm Fire Damages Historical Kelley House*. Retrieved on 1 January 2021 from <https://www.mercurynews.com/2012/02/16/san-jose-two-alarm-fire-damages-historic-kelley-house/>



Rocksprings Park is an approximately 2-acre park maintained by the City of San José (see *Figure 2.67*). It includes a playground, two small picnic areas and a basketball court. It is located just east of the intersection of Needles Drive and Rock Springs Drive. It also includes an approximately 400-ft long vinyl sheet pile wall just at the east boundary of the park which was built by Valley Water in December 2017 after the February 2017 flood event. The small park is bounded by residential homes to the north, Rock Springs Drive to the west, Coyote Creek to the east and a Coyote Creek riparian area to the south. Rocksprings Park is located within Reach 8 of the Project.

### 2.9.3 Cultural Resources

An archival and records search completed in February 2020 by Pacific Legacy, Inc. determined that six cultural resources have been previously recorded within the extent of the Project. These include five historic period resources and one multi-component resource which contains both prehistoric and historic period materials. The multi-component resource was determined to be eligible for listing in the National Register of Historic Places (NRHP) and is listed in the California Register for Historical Resources (CRHR).<sup>54</sup> Due to the confidential nature of the cultural resources found within the site of the Project, *Table 2.7* below includes only a summary description and general location of each of the six resources identified in the most recent cultural resources report.<sup>54</sup> Pacific Legacy, Inc. also made contact with the Native American Heritage Commission (NAHC) which resulted in the identification of one or more Native American cultural resources listed in the Sacred Lands File within the area of the Project.<sup>54</sup>

*Table 2.7. Known Cultural Resources Within Study Area*

Resource Designation	Resource Type	Age	Description	Approx. Location
P-43-000922 Berryessa Road/Coyote Creek Bridge #37C-0156	Structure	Historic	Concrete vehicle and pedestrian bridge over Coyote Creek at Berryessa Road, built in 1971	Berryessa Road Bridge
P-43-000927 Charcot Avenue/Coyote Creek Bridge #37C-0727	Structure	Historic	Concrete vehicle bridge over Coyote Creek at Charcot Avenue, built in 1971	Charcot Avenue Bridge
p-43-001010 CA-SCL-000438H ARS 76	Building, Structure, Site	Historic	Historic period domestic refuse deposit linked to farm/ranch operation	Downstream of Mabury Road bridge
P-43-003130 San Jose Flea Market	Building, Site	Historic	Site of the San Jose Flea Market, which dates to 1960; most of the current vendor stalls, restaurants, and other structures likely postdate 1960	San Jose Flea Market
P-43-003902 Map Reference #ADD13-01	Building, Site	Historic	Maintenance yard used by the City of San Jose Department of Transportation	Mabury Service Yard Site
P-43-000087 CA-SCL-70/H 10-17-73-1; WVC-19	Site	Prehistoric, Historic	Multi-component site with prehistoric lithic scatter and fire altered rock, as well as a historic period farming debris deposit. Determined eligible for listing in the National Register of Historic Places by consensus through the Section 106 process; listed in the California Register of Historical Resources (code 2S2).	Downstream of Tully Road Bridge

<sup>54</sup> Pacific Legacy, Inc. (2020) Historic Preservation. *Santa Clara Valley Water District Cultural Resources On-Call, Coyote Creek Flood Protection Project, San Jose (PL-3039-01, Task 10)*. 14 April 2020. Cultural Resources Report.



The archive and record search found that numerous archaeological surveys have been done in the past ten years within the vicinity of the Project. As a result, these sites likely would not need to be re-examined as part of this Project.<sup>54</sup>

#### 2.9.4 Biological Resources

##### *Terrestrial Habitat*

Although the channel, riparian corridor, and floodplain have been dramatically narrowed and otherwise altered from historical conditions, Coyote Creek continues to provide important habitat for a variety of wildlife. In the Project reaches this is, in part, due to the chain of public parks that extend through sections of the urbanized area.<sup>55</sup> Trees that are common in the riparian corridor and considered important for wildlife use include: Fremont cottonwood, sycamore, boxelder, elderberry, oaks, and willows. Important wildlife cover, nesting, and roost sites are provided by large canopy trees and dense mid-canopy growths of willows. Important sources of food for birds and mammals in the Project area include: elderberry, blackberry, oaks, and poison oak, as well as deciduous trees that support large populations of insects for insectivorous wildlife species.<sup>55, 56</sup> The Project reaches also provide habitat in the form of fallen trees and branches, creating mesic microhabitat for amphibians and reptiles. Snags and snag-topped trees, which are common in the area, can provide habitat for cavity-nesting birds as well as dens for small and medium-sized mammals. In-channel large woody debris is also a common feature in the area and can provide perching locations for piscivorous birds, basking sites for reptiles and amphibians, and cover and refuge opportunities for fish.

In some parts of the Project reaches, non-native vegetation contributes significantly to the canopy layer and understory vegetation. Most of these introduced plants have low wildlife value compared to native vegetation, although a few exotic species are known to support some wildlife use in the vicinity of the Project's extent.<sup>56</sup> Notably, occurrences of non-native and highly invasive giant reed (*Arundo donax*), are present along the channel and banks in the Project reaches. This species rapidly replaces native vegetation and associated habitat, can encroach into the creek channel and impede flows, and spreads rapidly from root fragments that may be transported from upstream.

Earlier environmental assessments of the middle portions of Coyote Creek identified 208 species of known, predicted, or potential wildlife users of the reaches. These included 9 amphibians, 13 reptiles, 148 birds, and 38 mammals.<sup>56</sup>

Based on existing habitat conditions, species ecology, and professional biologist judgment following a site visit on November 18, 2017, special-status species that are likely to occur in the Project reaches include western pond turtle and steelhead, with great blue heron rookeries, tricolored blackbird, California red-legged frog, hoary bat, pallid bat, and Townsend's big-eared bat having less potential to occur. As a result of the existing habitat and potential wildlife uses, protection of the aforementioned species and habitat will be important elements of Project permitting, design, and construction. Steelhead, and other special-status fish species, are discussed in greater detail in the *Aquatic Habitat* Section below.

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<sup>55</sup> SCVURPPP (2001). *Stormwater Environmental Indicators Demonstration Project – Final Report*. San Jose: Prepared for the Water Environment Research Foundation, Project 96-IRM-3, USEPA Cooperative Agreement #CX 823666-01-2, 2001.



### Aquatic Habitat

Coyote Creek historically supported the most diverse fisheries assemblage in South San Francisco Bay. At least sixteen native fish occur in the historic records for the Coyote Creek Watershed, including estuarine species.<sup>56</sup>

Deterioration of habitat quality as early as the late 1940s, when extensive urbanization and water management began, has resulted in the local extirpation of some native fish in the Coyote Creek Watershed. Currently, special-status fish species with potential to occur in Coyote Creek include: Pacific lamprey, Central California Coast (CCC) steelhead, Chinook salmon (though historically not present in the watershed), Sacramento hitch, and riffle sculpin (only found upstream of Anderson Dam). Currently, Valley Water has also confirmed the presence of 21 non-native fish species utilizing various habitats in the watershed.<sup>57</sup>

Coyote Creek supports CCC steelhead, which are listed as threatened under the Endangered Species Act. The entire Project area falls within the National Marine Fisheries Service (NMFS) boundary of critical habitat for CCC steelhead. The steelhead in Coyote Creek are considered winter-run since they typically enter the stream from the ocean when winter rains provide adequate flow for upstream migration and spawning. Steelhead can be expected to begin their freshwater upstream journey from December through April, in association with winter rain and flow events. Steelhead typically spend the first 1-2 years of life in cool, clear, fast-flowing permanent streams then out-migrate to the ocean during winter and spring flows.

Steelhead are still found in the Coyote Creek Watershed. Juvenile rearing assessments conducted by Valley Water in 2018 and 2019 indicated that juvenile steelhead are present but in low densities. During past out-migrant trapping efforts, Valley Water captured out-migrating smolts, indicating that there is successful spawning, rearing, and migration opportunities for steelhead in the watershed. Upper Penitencia Creek is the only other creek system within the Coyote Creek Watershed that supports steelhead and is also considered critical habitat for the species.

Chinook salmon have been observed in Coyote Creek since the 1980s. Valley Water sponsored a genetic study to determine the origin of these fish. The results of that genetic analysis for 459 samples from Coyote and Guadalupe watersheds demonstrated that the Chinook were of hatchery origin and were part of the Central Valley fall-run.<sup>58</sup> It is not known if Chinook have naturalized in the watershed; however, during past upstream migrant trapping operations and field observations, Valley Water staff documented fish with clipped adipose fins, indicating hatchery origin. Hatchery production is still contributing to the persistence of the run of these fish.<sup>59</sup>

<sup>56</sup> Leidy, R.A. *Distribution and Ecology of Stream Fisheries in the San Francisco Bay Drainage*. Hilgardia Volume 52. Number 8. Agriculture and Natural Resources Publication, University of California, Berkeley, CA. 1984

<sup>57</sup> SCVWD (2005). *Santa Clara Valley Water District Fisheries Surveys, 1995-2005*. Santa Clara Valley Water District, San Jose, CA.

<sup>58</sup> Hedgecock, D. *Provenance Analysis of Chinook Salmon (*Oncorhynchus tshawytscha*) in the Santa Clara Valley Watershed*. Bodega Marine Laboratory, University of California, Davis, n.d. 25.

<sup>59</sup> SCVWD (2005). *Santa Clara Valley Water District Fisheries Surveys, 1995-2005*. Santa Clara Valley Water District, San Jose, CA.



### *2.9.5 Utilities*

Due to the 9-mile extent of the Project, various utilities have been initially identified within its scope. The agencies with potential utilities crossing the extent of the Project are listed below. Many of these utilities have been initially notified about the extent of the Project during the planning phase. However, once the Project is in design, the utility list conflicting with the Project elements will be further refined and those utilities will be notified for Project coordination and/or minimization of any utility disruption.

- Chevron Pittsburg
- City of San José
- Comcast – San José
- Crown Castle
- Kinder Morgan
- MasTec North America
- MCI WorldCom California
- Pacific Bell (PACBELL)
- Pacific Gas & Electric (PGE) – District San José
- Royal Dutch Shell
- San Jose Water Company (SJWC)
- Terradex, Inc (TERDEX)
- Valley Transportation Authority (VTA)
- Valley Water
- Zayo California (ZAYOCA)



# *CHAPTER 3*

## *PROBLEM DEFINITION*





### 3. Problem Definition

This chapter describes the problems identified within the scope of this study which prompted the initiation of a capital improvement project. In addition, this chapter identifies and describes any additional issues found within the Coyote Creek Watershed during the planning phase of the Project.

#### 3.1 Flooding

Valley Water records indicate flooding has occurred along portions of Coyote Creek since 1852<sup>1</sup>, with the largest flow recorded in 1911<sup>1,11</sup>. However, construction of Coyote and Anderson Dams during the mid-20<sup>th</sup> century, which was done primarily to capture seasonal stream flow for groundwater recharge and water supply storage, resulted in incidental flood reduction.<sup>11</sup> This is reflected in the reduction of maximum peak discharge magnitudes observed in the flood events following the construction of the dams (see *Table 1.1* and *Figure 1.1* in *Section 1.1 Project Origin*). Prior to the February 2017 flood event, which saw the largest flows on Coyote Creek since the construction of Anderson Dam, the largest flood event observed along Coyote Creek happened during January 1997 with an observed peak flow estimated at 6,280 cfs.<sup>14</sup> During the January 1997 flood event, Coyote Creek overtopped its banks at several locations and caused damage to private and public property and transportation routes.<sup>14</sup> *Figures 3.1* through *3.4* show photos of past flooding events along Coyote Creek.



*Figure 3.1. Santa Clara Street during 1890 flood event. Source: Loomis, P., Signposts, [Limited 1st Edition]. San José Historical Museum Association. San José, California, 74p.*





Figure 3.2. Monterey Road during 1911 flood event. Source: Valley Water Records

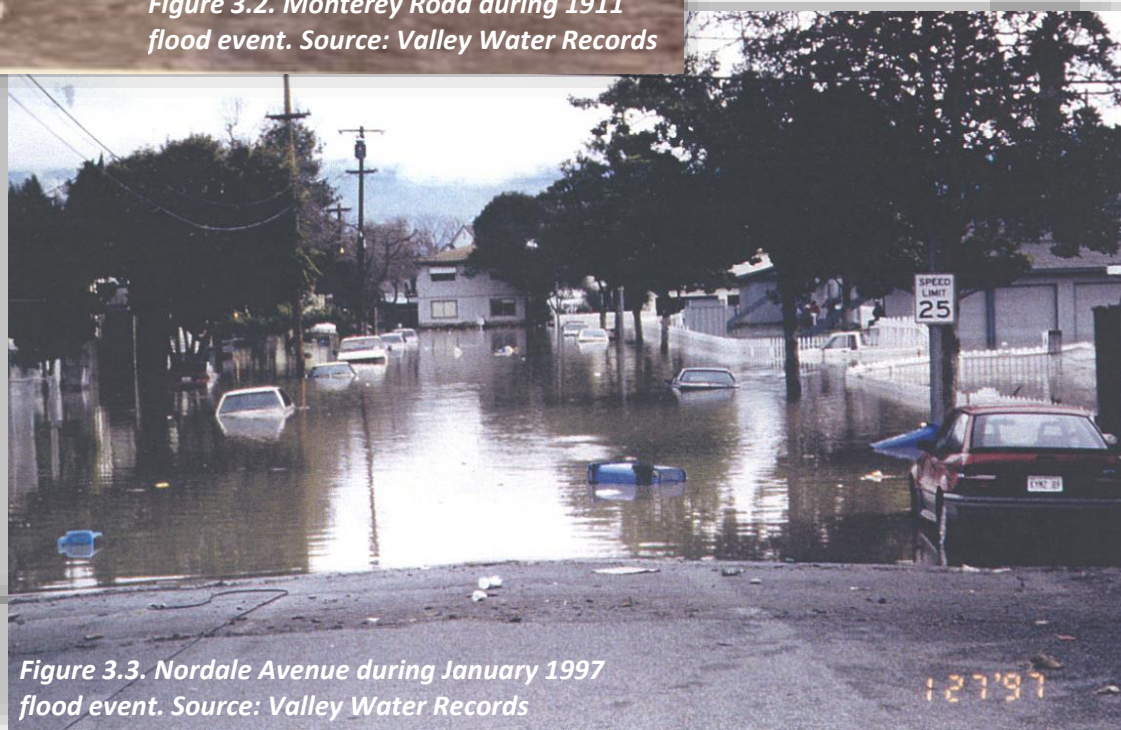


Figure 3.3. Nordale Avenue during January 1997 flood event. Source: Valley Water Records

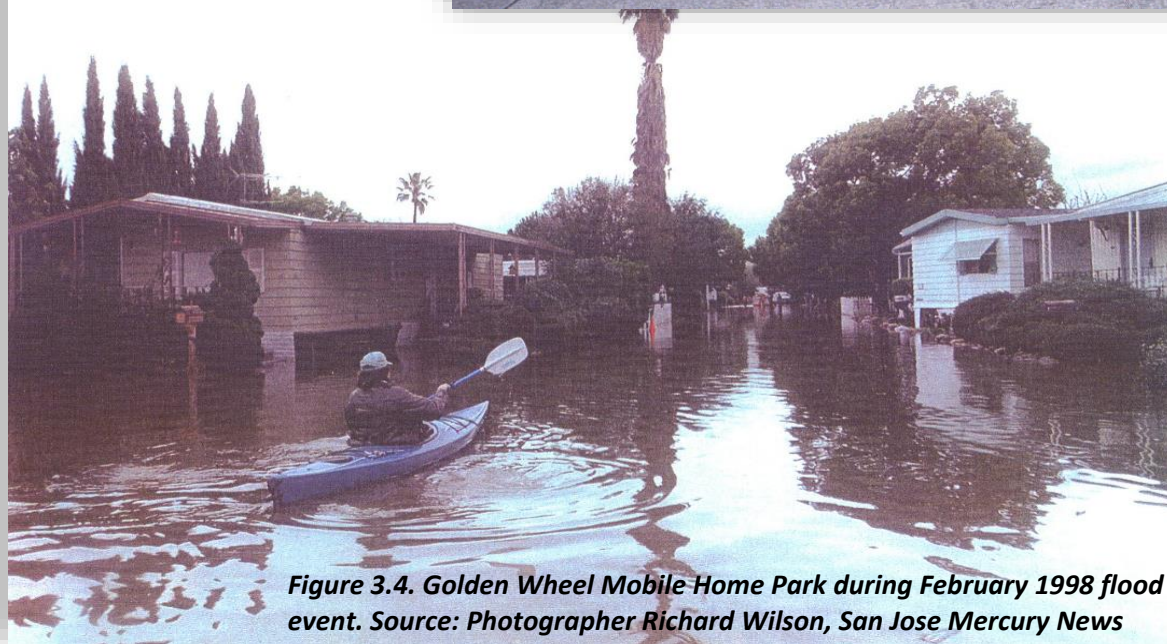


Figure 3.4. Golden Wheel Mobile Home Park during February 1998 flood event. Source: Photographer Richard Wilson, San Jose Mercury News

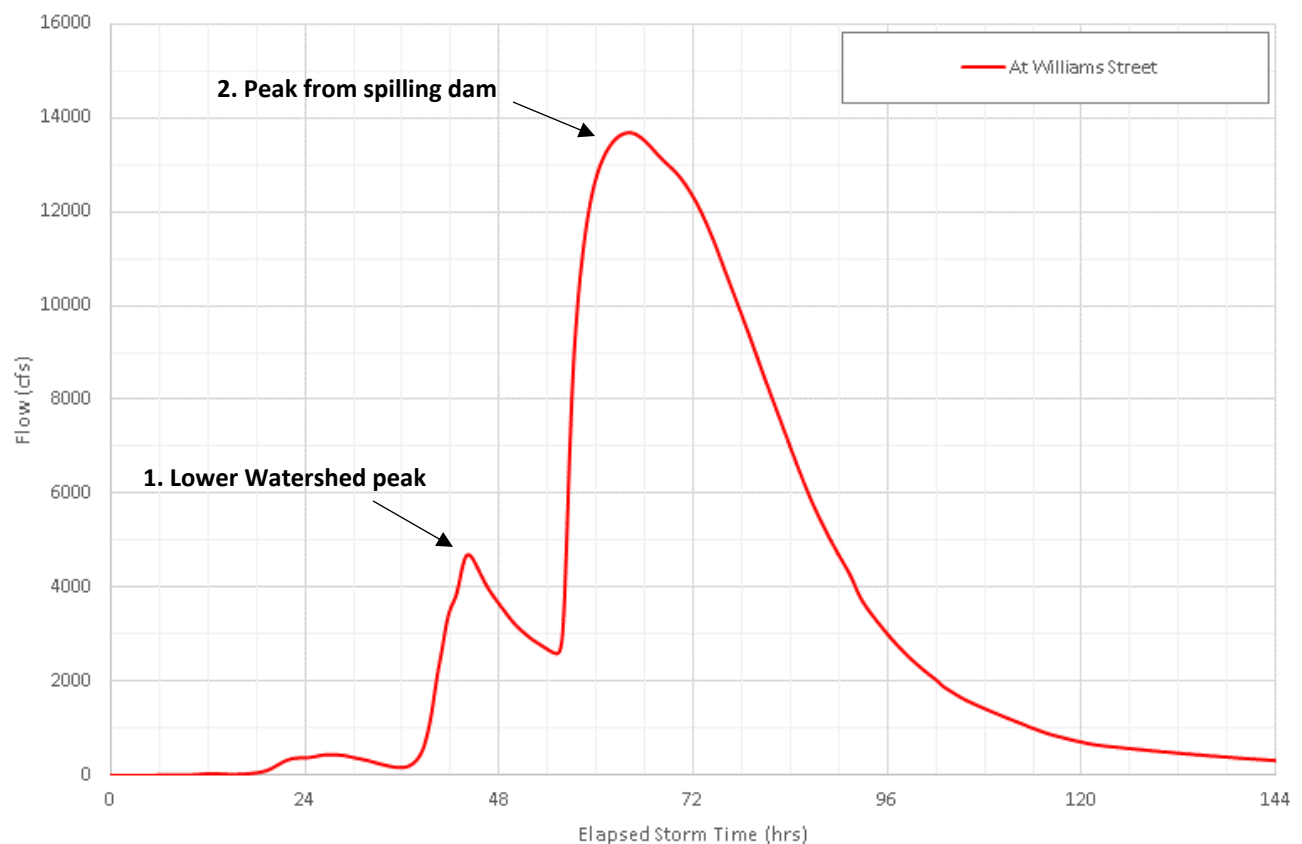


Due to the historic hydromodification of the Coyote Creek Watershed, as described in [Section 2.4 Historic Stream Channel](#), currently there can be two main flow contributions to Coyote Creek in response to a single rainfall event:

1. Direct watershed input from lower watershed tributaries
2. Upper watershed input (from Anderson Dam spilling)

These two main flow contributions to Coyote Creek as a response to a single rainfall event are represented by a two-peak hydrograph, as illustrated in [Figure 3.5](#). The two peaks can vary in height, depending on the storm event, the pre-storm volume in the upstream reservoirs, and the location along the creek. [Figure 3.5](#) shows a 72-hr storm, 1% flow event hydrograph, for William Street. The first peak in [Figure 3.5](#) includes the flow contribution to Coyote Creek from the lower watershed input while the second peak includes the flow contribution from Anderson Dam when spilling.

During the 2016-2017 winter season, the entire State of California saw precipitation at 190% of average.<sup>6</sup> In Santa Clara County, various storm systems regularly moved through the area, keeping the soil saturated and causing significant flooding events and unprecedented reservoir spills. During the 2017 flood event, flooding along Coyote Creek was exacerbated by the second peak, due to the spilling of Anderson Dam. The February 2017 flood event was approximately a 20-year flood event.



*Figure 3.5. Estimated 100-year hydrograph at William Street neighborhood*



Figures 3.6 through 3.9 show photos of the February 2017 flood at various locations. On February 21, 2017, the neighborhood of Rock Springs was first flooded as Coyote Creek overtopped its west bank along Rock Springs Drive near Needles Drive (see Figure 3.6). In this area, firefighters evacuated a total of 276 residents in the neighborhood, sometimes by boat. As flood waters moved downstream, Kelley Park and then the apartment buildings on South 12<sup>th</sup> Street, just north of Keyes Street were also flooded. Flooding was then observed along East William Street at William Street Park and Selma Olinder Park (see Figure 3.7) with flooding continuing in the Olinder, Brookwood Terrace, Naglee Park, and Five Wounds neighborhoods due also in part to an overwhelmed storm drain system and to backflow. In this area, the fire department rescued by boat 96 residents during the evening of February 21<sup>st</sup>.<sup>60</sup>

Flooding was then observed at Watson Park and the surrounding residential neighborhood. Further downstream, the South Bay Mobile Home Park, the River Bend Mobile Home Park and the Golden Wheel Mobile Home Park were also inundated with flood contributions from various sources. The South Bay Mobile Home Park was first flooded on February 20<sup>th</sup>, when its privately owned and maintained stormwater system was unable to drain stormwater falling into its streets. On February 21<sup>st</sup>, flooding in the South Bay Mobile Home Park was compounded when Coyote Creek topped its banks just south of the park, though the flooding observed in the area was less than three feet in depth due in part to a floodwall constructed just south of the South Bay Mobile Home Park by Valley Water after the 1997 flood event.

At the Golden Wheel Mobile Home Park, the City of San José's storm drain system



Figure 3.6. Looking north towards Rocksprings Park and Needles Drive during February 2017 flood event



Figure 3.7. Looking east towards William Street Park during February 2017 flood event



that drains the park and several surrounding streets, was disabled on February 21<sup>st</sup> when the electrical service from PG&E malfunctioned and no emergency portable generator was stationed on-site. As Coyote Creek flood waters entered the mobile home park and overwhelmed the storm drain system, the area eventually flooded. The three mobile home parks were eventually evacuated in their entirety. By midnight, on February 21<sup>st</sup>, the City of San José had issued mandatory evacuation orders for approximately 14,000 residents and an additional 22,000 residents were advised to evacuate.<sup>60</sup>

The flood damages following the February 2017 flood event were approximated to be roughly \$50 million to private property and \$23 million to public property.<sup>60</sup> Per the City of San José's *Preliminary After Action Report*, there was no loss of life and no residents injured due to the flood event. However, one firefighter sustained minor injuries while performing rescuing operations and few other firefighters reported intestinal issues thought to be associated with the exposure to contaminated flood water.<sup>63</sup>

Following the 2017 flood event, Valley Water's Hydrology, Hydraulics and Geomorphology Unit calibrated a HEC-RAS model to the February 2017 storm event and Coyote Creek channel conditions using gauge data and collected high water marks. This model was used to better determine locations where flood water overtops Coyote Creek's banks as well as to determine the alternatives to reduce the risk of flooding.

Flows observed during the 2017 flood event for various locations within the extent of the projects, along with the estimated existing flow conveyance capacities before flooding begins to occur, are shown in *Table 3.1*. *Table 3.1* also includes the design flows as estimated in the Technical Memorandum titled *Design*

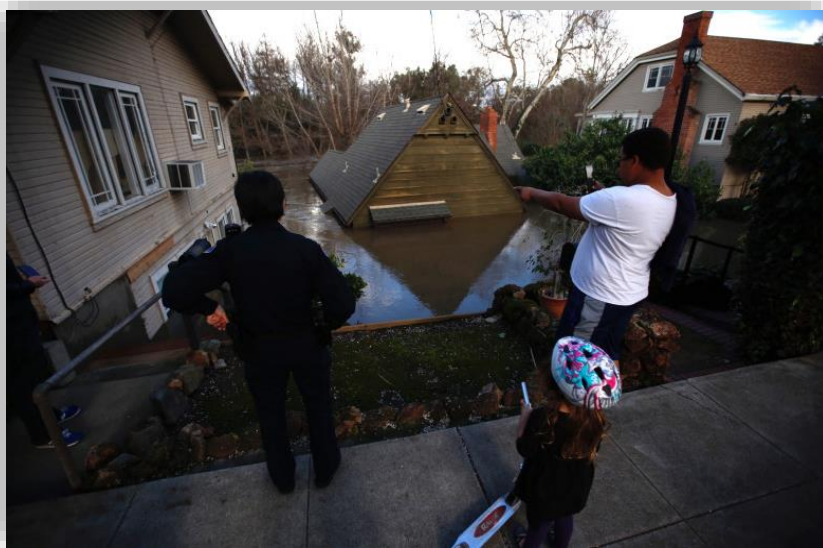


Figure 3.8. Looking east at flooded home on South 17<sup>th</sup> Street during February 2017 flood event



Figure 3.9. Horses at Cooksy Family Stables impacted during February 2017 flood event

<sup>60</sup> Dueñas, Norberto, L. (March 2017) *Coyote Creek Flood Preliminary After Action Report. Public Notification, Storm Monitoring, and Flood Prevention and Protection: Initial Lessons Learned and Next Steps*. City of San José, San Jose, CA.



*Flows for Mid-Coyote Project Team (Addendum 1)* prepared by the Valley Water Hydrology, Hydraulics and Geomorphology Unit on October 7<sup>th</sup>, 2019.<sup>61</sup> The design flows are based on the 72-hour, 20-year event resulting from a spill from Anderson Dam targeting 7,400 cfs just below the dam and include coincident flows from the major tributaries (Fisher Creek, Lower Silver Creek, and Upper Penitencia Creek). These flows were the most conservative (i.e. highest) when compared to the flows on Coyote Creek, with local 24-hour, 100-year event centered on each the three major tributaries (see *Table 3.4* for local storm flows).

*Table 3.1* identifies all areas or facilities which do not have enough capacity to contain the flowrates observed during 2017. These areas were flooded during the 2017 event. Note that the creek capacity for the Rocksprings neighborhood reflects the interim berm and sheetpile wall constructed in December 2017 (the Rocksprings community was flooded during February 2017, before the floodwall construction as shown in *Figure 3.6*). *Figures 3.10* to *3.12* illustrate the inundation extent and breakout locations observed during the February 2017 flood event.

*Table 3.1. Existing, Observed and Design Flows for the CCFMMP and the CCFPP*

General Location	Facility/Area	Approx. Existing Creek Capacity (cfs)	February 2017 Observed Flows (cfs) <sup>a</sup>	72-Hr Design Flow – Approx. 20-year storm (cfs)
Downstream of Upper Silver Creek	Cooksy Family Stables	2,500	7,300	8,300
	Rocksprings Neighborhood	7,400		
	Japanese Friendship Garden	4,000		
	Happy Hollow Park and Zoo	3,500		
East William Street	Selma Olinder Park	3,000	7,200	8,400
	Upstream East William Street (park)	2,500		
	William Street	6,500		
	William Street Homes	4,000		
Upstream of Lower Silver Creek	South 17 <sup>th</sup> Street	1,600	7,200	8,400
	Arroyo Way	3,200		
Downstream of Lower Silver Creek	Watson Park	2,000	7,250	9,100
	Jackson Street	6,500		
	RV Storage Lot	4,500		
	Mabury Service Yard	7,200		
Upstream of Upper Penitencia Creek	Industrial Area U/S Berryessa Rd Bridge	4,100	7,250	9,100
Berryessa Road	Industrial Area D/S Bridge	1,300	7,550	9,500
	SPRR Tracks	2,000		
	Mobile Home Parks	7,000		
I-880	Charcot Avenue Bridge	7,200	7,400	9,500

**Notes:**

a. Includes spilling and overtopping due to existing creek conditions

<sup>61</sup> Xu, Jack. (October 2019). *Technical Memorandum: Design Flows for Mid-Coyote Project Team (Addendum 1)*. Hydrology, Hydraulics and Geomorphology Unit. Valley Water, San Jose, CA.



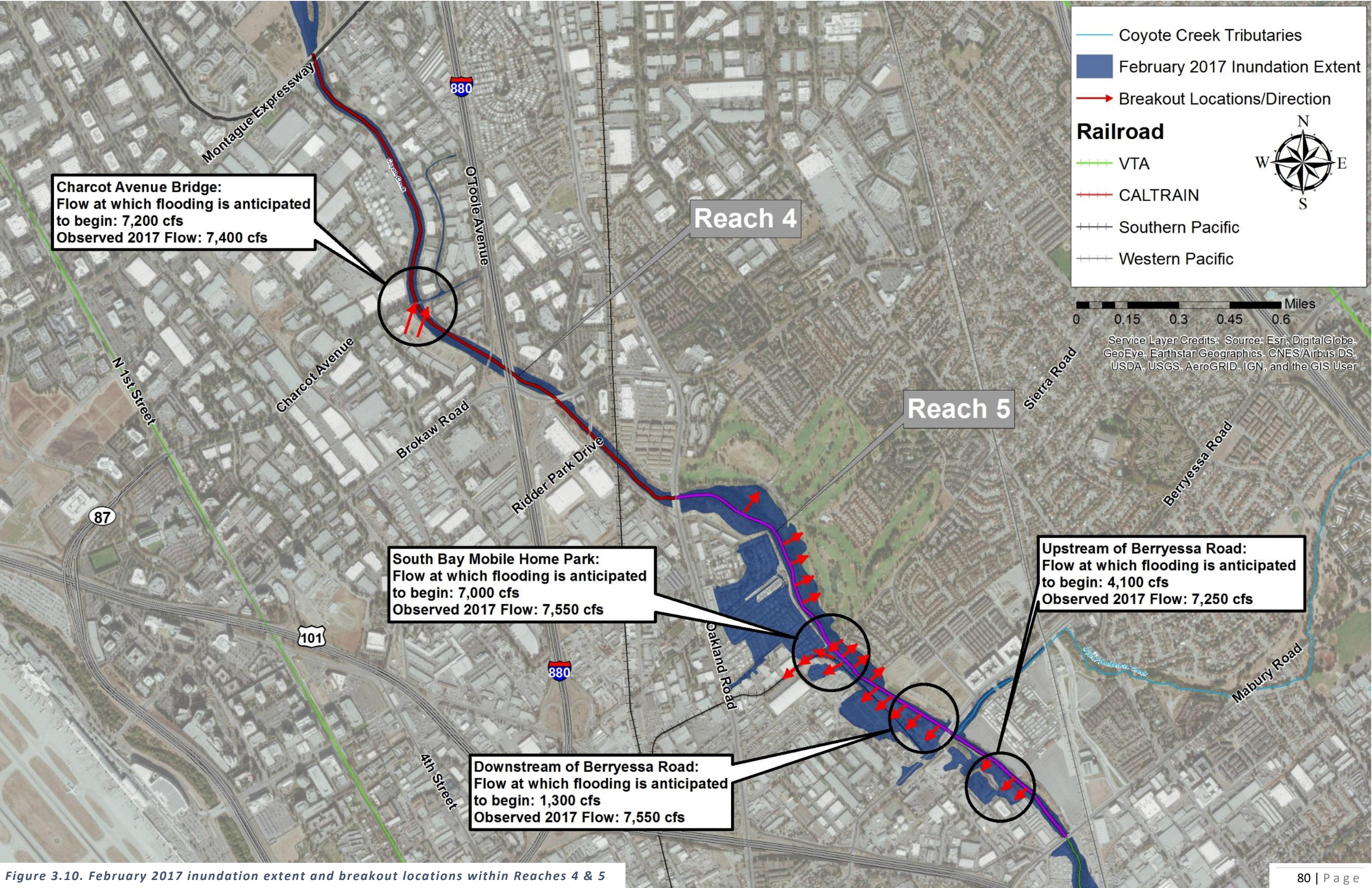


Figure 3.10. February 2017 inundation extent and breakout locations within Reaches 4 & 5



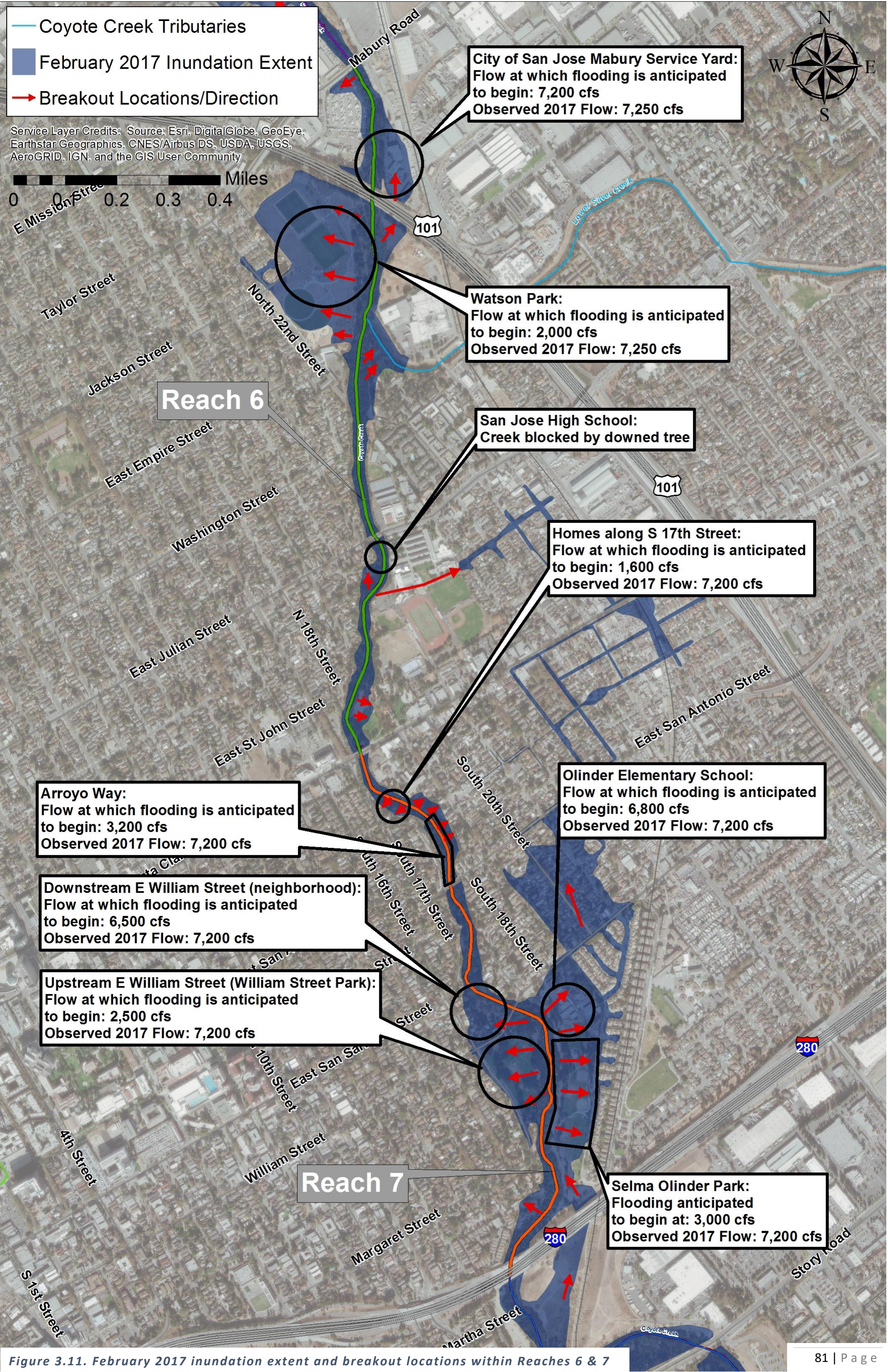


Figure 3.11. February 2017 inundation extent and breakout locations within Reaches 6 & 7



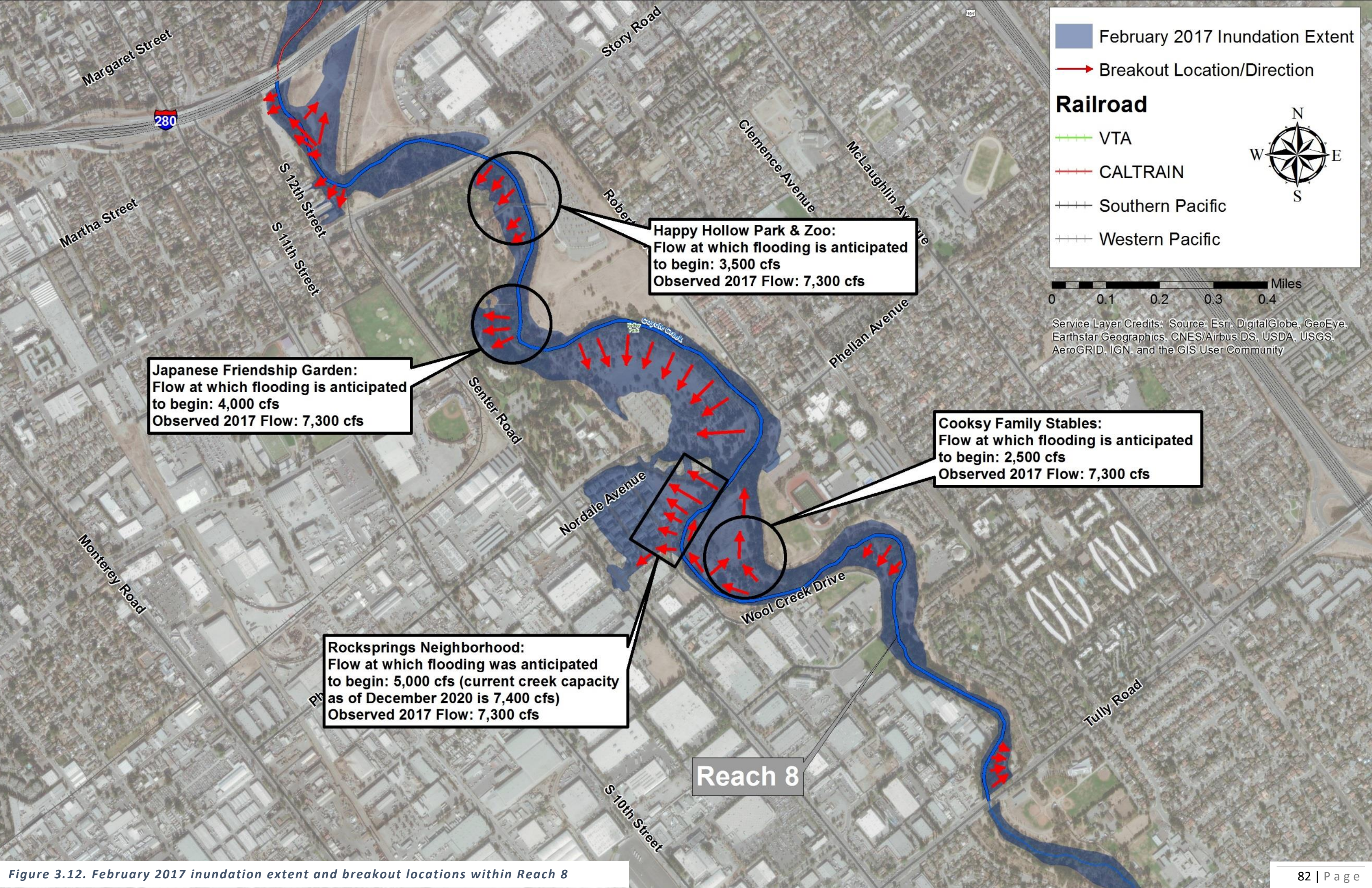


Figure 3.12. February 2017 inundation extent and breakout locations within Reach 8



### *3.1.1. Federal Energy Regulatory Commission Order for the Anderson Dam Seismic Retrofit Project and Potential Flooding Issues*

As mentioned in *Section 2.2 Coyote Creek Description*, Anderson Dam impounds Coyote Creek in the upper watershed just east of the City of Morgan Hill. Currently, Valley Water is working on the design of the Anderson Dam Seismic Retrofit Project (ADSRP). As a result of the ongoing ADSRP, on February 20, 2020 the Federal Energy Regulatory Commission (FERC), one of several agencies overseeing the dam retrofit project, directed Valley Water to begin lowering Anderson Dam to an elevation of 488-ft, or what is referred to as deadpool, which is the lowest attainable water level in a reservoir using the outlet works. This direction came in an effort to reduce the risk to public safety in the event of a major earthquake combined with high reservoir storage levels.<sup>62</sup>

To comply with the order of maintaining Anderson Dam at deadpool, FERC also directed Valley Water to expedite construction of the Anderson Dam Tunnel Project (ADTP), a diversion tunnel system and a component of the ADSRP, that would allow for a quick draw down of the reservoir, should it be needed.<sup>62</sup> This interim operation of the ADTP would substantially increase the amount of time, particularly in wet weather, that Valley Water can maintain the reservoir at elevation 488-ft (i.e. deadpool), as directed by FERC. This would not be possible by using the existing outlet structure alone. The ADTP is scheduled to start construction in July 2021 and complete construction by the end of 2023. Once Anderson Dam is constructed, its operation will likely differ from the one just described.

The ADTP tunnel system is being designed for a maximum discharge capacity of 2,000-cfs in the event that an emergency drawdown is needed. This maximum discharge capacity is based on the practical size of the tunnel and the minimum emergency drawdown requirements set by the Division of Safety of Dams (DSOD). This requirement is to be able to draw down 10% of the maximum reservoir head within seven days. Based on the most recent bathymetric and topographic survey of Anderson Dam, this translates to a volume of approximately 22.8-TAF (Thousand Acre-Feet) for the 20-feet of storage just below the spillway. It will take approximately 5.7 days to release 22.8-TAF at 2,000-cfs.<sup>65</sup>

In addition to the ADTP, the existing outlet with a maximum capacity of 500-cfs will remain operational after the completion of the tunnel system. Depending on operational needs, there could be instances when both the ADTP tunnel system and the existing outlet are operational together at their maximum capacities and, in these instances, the discharge from the reservoir could be as high as 2,500-cfs. This combined maximum flow of 2,500-cfs will be possible upon completion of the tunnel system (December 2023) and the potential for this maximum flow of 2,500-cfs will remain until the second winter after the continuation of the ADSRP (estimated ADSRP completion in October 2026).<sup>65</sup>

It is also anticipated that downstream local tributary runoff would contribute to downstream flow during large rain events. *Table 3.2* summarizes a higher-end, typical local tributary inflow scenario on Coyote Creek, based on a 10-year return period for the downstream tributaries, as well as potential total flows

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<sup>62</sup> SCVWD (2020). *Approve the preliminary Project Description for the Anderson Dam Federal Energy Regulatory Commission Order Compliance Project and find that the requirements of the Federal Energy Regulatory Commission Order Compliance Project are consistent with Santa Clara Valley Water Resolution No. 605*. Santa Clara Valley Water District, 26 May 2020. <https://scvwd.legistar.com/LegislationDetail.aspx?ID=4544457&GUID=90C04448-3866-4CEF-93D1-7A7222AC65B7&Options=&Search=&FullText=1>



observed along Coyote Creek, assuming full ADTP releases. The values in *Table 3.2* present a conservative estimate, as it is unlikely that a 2,500-cfs release from Anderson Dam and 10-year peak flows on all tributaries would occur at the same time. However, it is advised that any flood mitigation project use these conservative values, as hydrologic and hydraulic uncertainties are always present in natural urban channels where debris and vegetation growth can impede flow.<sup>65</sup>

*Table 3.2. Coyote Creek local inflow scenario and total maximum flows anticipated after ADTP operation*

Location along Coyote Creek	Additional Local Tributary Inflow (cfs) <sup>a</sup>	Total Maximum Flow in Coyote Creek during ADTP Operation – local tributary + ADTP operation (cfs)
Downstream Anderson Dam	0	2,500
Downstream Fisher Creek	1,100	3,600
Downstream Upper Silver Creek	400	4,000
Downstream Lower Silver Creek	1,600	5,600
Downstream Upper Penitencia Creek	900	6,500

**Notes:**

a. Fisher Creek and Upper Silver Creek flows based off 2016 District Coyote Creek Hydrology. Lower Silver Creek based off 2014 FEMA CTP Project. Upper Penitencia based on 2016 District Coyote Hydrology and associated spilling upstream. 10-year return period.

Once ADTP is operational, flood risk would change in downstream areas of Coyote Creek due to the increased outlet capacity of the new diversion tunnel system. The general locations and specific areas or facilities that may flood due to operation of the future tunnel diversion system are highlighted in red in *Table 3.3* and are shown together with their respective current capacity, anticipated Anderson Dam flow, anticipated tributary flow and total maximum ADTP operational flow. As observed in *Table 3.3*, all of the areas at risk of flooding due to the operation of the ADTP were already part of the Board directed June 13, 2017 CCFPP as described in *Section 1.1 Project Origin*.<sup>9</sup> Therefore, it was determined that flood risk reduction solutions in those identified areas within the CCFPP (as identified in *Table 3.3*) were necessary as avoidance and minimization measures for the ADTP to protect against flooding as a result of utilization of the diversion tunnel system. The prioritized areas are collectively called Coyote Creek Flood Management Measures for the FERC Order Compliance Project or Coyote Creek Flood Management Measures Project (CCFMMP) for short. Flood risk reduction measures within the CCFMMP scope would need to be constructed by December 2023 to coincide with operations of the ADTP. The rest of the project elements not included in the CCFMMP - still known as the Coyote Creek Flood Protection Project (CCFPP) - are scheduled to be completed at the end of 2025. *Figure 1.3* in *Section 1.1 Project Origin* shows a scope overview for both projects. Because the design condition for the CCFPP is higher than the CCFMMP in all reaches, the ultimate design flow for both projects is the 20-year flood event (see *Table 3.1*).



Table 3.3. Flow thresholds to determine flood management measures for the FERC Order Compliance Project

Reach	General Location	Facility/Area <sup>a</sup>	Approx. Existing Creek Capacity (cfs)	Total Anticipated Dam Flow (Tunnel + Existing Outlet, cfs)	Anticipated Tributary Flow (cfs)	Maximum Combined Flow during ADTP Emergency Operation (cfs)
8	Downstream of Upper Silver Creek	Cooksy Family Stables <sup>b</sup>	2,500	2,500	1,500	4,000
		Rocksprings Neighborhood	7,400			
		Japanese Friendship Garden <sup>b</sup>	4,000			
		Happy Hollow Park and Zoo <sup>b</sup>	3,500			
7	East William Street	Selma Olinder Park	3,000	2,500	1,500	4,000
		Upstream East William Street (park)	2,500			
		William Street	6,500			
		William Street Homes	4,000			
	Upstream of Lower Silver Creek	South 17 <sup>th</sup> Street	1,600	2,500	1,500	4,000
		Arroyo Way	3,200			
6	Downstream of Lower Silver Creek	Watson Park	2,000	2,500	3,100	5,600
		Jackson Street	6,500			
		RV Storage Lot	4,500			
		Mabury Service Yard	7,200			
5	Upstream of Upper Penitencia Creek	Industrial Area U/S Berryessa Rd Bridge	4,100	2,500	3,100	5,600
	Berryessa Road	Industrial Area D/S Berryessa Rd Bridge	1,300	2,500	4,000	6,500
		SPRR Tracks	2,000			
		Mobile Home Parks	7,000			
4	I-880	Charcot Avenue Bridge	7,200	2,500	4,000	6,500

**Notes:**

a. Facilities/areas highlighted in red are those where current capacities are less than or equal to the estimated total maximum combined flow during ADTP emergency operation

b. Even though these areas or facilities have current capacities less than or equal to the estimated total maximum combined flow during ADTP emergency operation, they were not included in the CCFMMP since they were not determined to be critical facilities and/or City of San José staff did not want modifications to these facilities.



### 3.2 Local Drainage Conditions

Coyote Creek Watershed drainage water that does not percolate into the Santa Clara Subbasin, as described in [Section 2.7 Groundwater](#), finds its ultimate discharge point via Coyote Creek. However, due to historic hydromodification and to urbanization within the watershed, as described in [Section 2.4 Historic Stream Channel](#) and [Section 2.9 Environmental Setting](#), the major local drainage routes to Coyote Creek are via tributary flow and through the storm drain system.

There are at least a dozen tributaries draining into Coyote Creek from headwaters to mouth, but three major tributaries contribute the greatest flow: Fisher Creek, Lower Silver Creek and Upper Penitencia Creek.<sup>64</sup> For reference, [Table 3.4](#) shows the flow contribution to Coyote Creek for each of the major tributaries for 100-year storms centered within each of the sub-watersheds (24-hr storm). These tributary flows were obtained from data included in the Hydrology, Hydraulics and Geomorphology Unit's Technical Memorandum prepared for the project team in October 2019 titled *Design Flows for Mid-Coyote Project Team (Addendum 1)*.<sup>61</sup> The flows listed in [Table 3.4](#) do not include contribution from the upper watershed (Anderson Dam). [Table 3.4](#) also lists the existing creek capacities for each location, with those areas/facilities that currently do not have enough capacity to contain the maximum 100-year local flow indicated in red (maximum local flows are shown in bold numbers).

*Table 3.4. 100-year Local Storm Design Flow Summary values for Coyote Creek Tributaries*

General Location along Coyote Creek	Facility/Area	Approx. Current Creek Capacity (cfs) <sup>a</sup>	Fisher Creek 100-year Storm (cfs) <sup>a</sup>	Lower Silver Creek 100-year Storm (cfs) <sup>a</sup>	Upper Penitencia Creek 100-year Storm (cfs) <sup>a</sup>
Downstream of Upper Silver Creek	Cooksy Family Stables	2,500	<b>2,850</b>	2,570	2,390
	Rocksprings Neighborhood	7,400			
	Japanese Friendship Garden	4,000			
	Happy Hollow Park and Zoo	3,500			
East William Street	Selma Olinder Park	3,000	<b>3,630</b>	3,480	3,250
	Upstream East William Street (park)	2,500			
	William Street	6,500			
	William Street Homes	4,000			
Upstream of Lower Silver Creek	South 17 <sup>th</sup> Street	1,600	<b>3,590</b>	3,470	3,240
	Arroyo Way	3,200			
Downstream of Lower Silver Creek	Watson Park	2,000	6,400	<b>7,030</b>	6,530
	Jackson Street	6,500			
	RV Storage Lot	4,500			
	Mabury Service Yard	7,200			
Upstream of Upper Penitencia Creek	Industrial Area U/S Berryessa Rd Bridge	4,100	6,410	<b>7,050</b>	6,550
Berryessa Road	Industrial Area D/S Bridge	1,300	7,750	<b>8,450</b>	8,380
	SPRR Tracks	2,000			
	Mobile Home Parks	7,000			
I-880	Charcot Avenue Bridge	7,200	7,840	<b>8,570</b>	8,210

<sup>a</sup>Data Source: Xu, Jack. (October 2019). *Technical Memorandum: Design Flows for Mid-Coyote Project Team (Addendum 1)*. Hydrology, Hydraulics and Geomorphology Unit. Valley Water, San Jose, CA.

<sup>b</sup>Capacities highlighted in red indicate those areas/facilities that currently do not have enough capacity to contain the maximum 100-year local flows.



Within the City of San José, there are approximately 143 stormwater city owned outfalls that discharge into Coyote Creek with additional stormwater outfalls which are privately owned, and which may or may not be permitted. During the February 2017 flood event, it was observed that the stormdrain system filled by backflow from the outfall pipe at various locations within Coyote Creek where no flap gate was present, intensifying the flooding observed with urban shallow flooding due to stormdrain overflow. In addition, where flap gates were present at the outfalls, the stormdrain collection system closed, but overbanked creek flow entered the stormdrain system from street inlets and intensified urban flooding.<sup>63</sup>

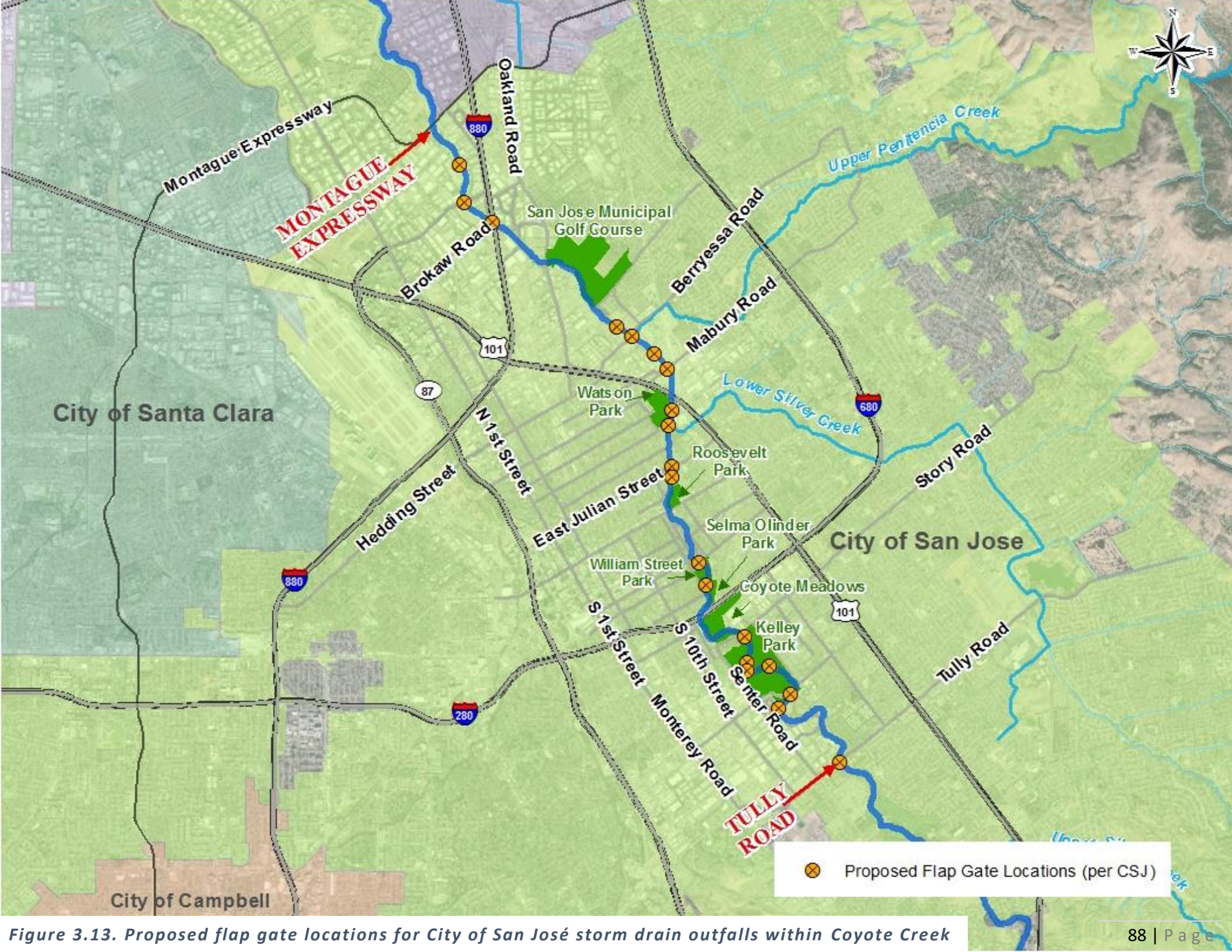
Due to the urban drainage issues, the City of San José completed a backwater flood risk assessment at the beginning of 2018 where they identified 20 storm drain outfalls which are in need of flap gates to reduce the risk of backwater flow (approximate outfall locations are illustrated In *Figure 3.12*). To date, the City of San José has completed the installation of 2 out of the 20 identified flap gates: an 18-in flap gate at East Julian Street (January 2018) and a 60-in flap gate at Needles Drive (May 2019).<sup>64</sup> However, the risk of urban flooding due to the backwater effect still exists which would increase during a future significant flood event or during an intense precipitation event.

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<sup>63</sup> Dueñas, Norberto, L. (March 2017) *Coyote Creek Flood Preliminary After Action Report. Public Notification, Storm Monitoring, and Flood Prevention and Protection: Initial Lessons Learned and next Steps*. City of San José, San Jose, CA.

<sup>64</sup> Mai, Michael. "Re: Storm drain – flap gate work." Message to Damaris Villalobos-Galindo. 4 December 2019. E-mail





○ Proposed Flap Gate Locations (per CSJ)

Figure 3.13. Proposed flap gate locations for City of San José storm drain outfalls within Coyote Creek



### 3.3 Maintenance Concerns and Limited Rights-of-Way

Generally, maintenance for flood protection purposes is conducted to reestablish a defined capacity or as-built design condition where land rights are acquired as part of a project. As most of the creek length between Montague Expressway and Tully Road is not a constructed flood channel with a defined flow capacity, routine maintenance is not conducted. Instead, specific constructed facilities like levees and access roads are maintained, invasive non-native vegetation is opportunistically managed where possible, and channel blockages are addressed on a case-by-case basis. In addition, because the amount of land Valley Water owns along Coyote Creek is very small and accessibility might be difficult, Valley Water is not responsible for maintaining most of the channel.

A review of the maintenance records from 2002 to the present indicates maintenance work performed along various sections of Coyote Creek included removing fallen trees, clearing overhanging vegetation along limited maintenance roads, invasive plant removal, hand mowing, riparian planting, and emergency mowing. The largest recent maintenance project was completed in fiscal year 2016, with an approximate cost of \$233,000, and included invasive plant removal downstream of Charcot Avenue.

After the February 2017 flood event, significant work was completed in certain areas. However, this work was done in response to the flooding emergency, subject to right of entry, and under cost reimbursement from the City of San José, and not as part of a regular stream maintenance program. Trash as well as fallen trees were removed at various locations along the creek. In addition, an earthen levee located south of the South Bay Mobile Home Park, which was damaged during the 2017 flood event, was repaired.

During fiscal year 2018, maintenance work included trash raft removal at Santa Clara Street crossing, revegetation at East Williams Street, invasive plant removal at Old Oakland Road, clearing flow conveyance impediments at various areas along the extent of the projects, and fence repair for creek access control at various locations. Most of the maintenance work that has been completed by Valley Water is between Montague Expressway and I-880, and in areas where Valley Water is responsible for doing so, access and resources are available, and the area is covered by the Stream Maintenance Program (SMP).<sup>65</sup>

Following is a reach-by-reach description of the current Coyote Creek maintenance access conditions within the Project. For reference, all photography illustrating current creek conditions included in this report were taken from 2018 to 2020. *Figure 3.32* shows an overview of Valley Water's current limited easement and fee title areas within the scope of the Project. For a reach-by-reach view of the fee and easement areas, see *Section 2.2.1 Coyote Creek Description within Projects Extent*.

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<sup>65</sup> SCVWD (2001). *Santa Clara Valley Water District Stream Maintenance Program*. 2018, <https://www.valleywater.org/flooding-safety/stream-maintenance-program>



### 3.3.1 Reach 4 Maintenance Access Conditions: Montague Expressway to Old Oakland Road

Downstream of Interstate 880, Reach 4 has well-defined access roads at the top of both east and west banks of the creek (see *Figures 3.14 and 3.15*). These roads are either gravel or dirt roads free of obstructions where access is defined by marked steel chain-link fencing with no access to the public. The access roads within Reach 4 are approximately 20-feet wide and are located within Valley Water owned property at the top of the creek embankments. *Figure 2.7 in Section 2.2.1 Coyote Creek Description within Projects Extent* includes a close-up view of current fee and easement areas located within Reach 4.

Upstream of Interstate 880, access to the creek is limited since adjacent properties are owned by private entities and, as a result, maintenance roads are either non-existent or limited to Valley Water easements. Upstream of Interstate 880, no defined maintenance access is located on the west bank of the creek and the east bank is accessible via easement through a dirt road and embankment (see *Figure 3.16*).



*Figure 3.15. Upstream of Charcot Avenue bridge, west bank, walking south along west creek embankment on gravel road*



*Figure 3.14. Upstream of Charcot Avenue bridge, west bank, driving south along west creek embankment on gravel road*



*Figure 3.16. Under Interstate 880 bridge, east Coyote Creek bank. Looking northwest towards O'Toole Avenue bridge, on dirt access road.*



### 3.3.2 Reach 5 Maintenance Access Conditions: Old Oakland Road to Mabury Road

Reach 5 has limited Valley Water fee or easement areas. *Figure 2.16 in Section 2.2.1 Coyote Creek Description within Projects Extent* includes a close view of current fee and easement areas located within Reach 5. The main informal access to the west bank of this reach is through Corie Court off Old Oakland Road which is the entrance to a segment of the planned Coyote Creek trail as observed in *Figure 3.17*. The parcels near the Corie Court access are owned by the City of San José.



*Figure 3.17. At Corie Court, looking east towards Coyote Creek and trail*

The west bank access off Corie Court consists of a gravel road, approximately 12-ft wide, that runs from Corie Court to the south end of the South Bay Mobile Home Park. From there, the access turns into a dirt road running parallel to the UPRR tracks, as illustrated in *Figure 3.18*. In this area, the dirt road width varies between 12-ft and 20-ft, approximately, and it ends at the north boundary of the Graniterock property where no formal access road exists and the creek can only be inspected via



*Figure 3.18. Looking southeast along top of west bank and UPRR*



*Figure 3.19. On west creek bank, looking southeast, walking next to Graniterock barrier*

pedestrian access on rough heavily vegetated terrain, as shown in *Figure 3.19*.

Between Berryessa Road and Mabury Road, on the west bank of the creek, no maintenance road exists, except for a narrow Valley Water easement corridor located approximately 1,200-ft upstream from Berryessa Road which can be accessed either through Yard Court or



Mabury Road and its typical conditions are shown in *Figures 3.20 and 3.21*.



*Figure 3.20. On west creek bank, walking southeast towards Mabury Road through narrow corridor*



*Figure 3.21. On west creek bank, walking northwest on Valley Water narrow easement, from Mabury Road towards Berryessa Road*

Along the east bank of Reach 5, the northern half of the reach is bounded by the San José Municipal Golf Course and no formal maintenance access road exists. In this area the creek can only be accessed through the golf course. South of Hazlett Way, the east bank of the creek can only be accessed via Notting Hill Drive, where a Valley Water easement exists. Further upstream, along the east bank, access can be found just north of Mabury Road via a chain-link fenced enclosed area and gate which lead to a Valley Water easement along a gravel road (see *Figure 3.22*).



*Figure 3.22. At Mabury Road intersection with Coyote Creek, east bank, looking southeast towards damaged security fence*



### 3.3.3 Reach 6 Maintenance Access Conditions: Mabury Road to Santa Clara Street

Reach 6 has limited Valley Water fee or easement areas. *Figure 2.26 in Section 2.2.1 Coyote Creek Description within Projects Extent* includes a close-up view of current fee and easement areas located within Reach 6. The main maintenance access for the east bank of Coyote Creek within this reach is through a Valley Water fee title area located on the west top of bank of Lower Silver Creek right at the confluence with Coyote Creek. This area can be accessed via Wooster Avenue through the Parkside Terrace Apartments (see *Figure 3.23*). This access consists of an approximately 12-ft wide gravel road that runs from the confluence with Lower Silver Creek, moving upstream along the top of the east Coyote Creek bank to Coyote Creek Place, as shown in *Figure 3.24*.



*Figure 3.23. At confluence between Coyote Creek and Lower Silver Creek, east bank, looking west towards Coyote Creek*

From there on, the access turns into a dirt road with the Valley Water fee area ending just at the northwest boundary of the ACE Inspire Academy. Continuing upstream, the east bank of the creek has no formal access and the area



*Figure 3.24. On top of Coyote Creek east bank, walking north from close to west end of Coyote Creek Place. Gravel access road can be seen from this viewpoint.*

becomes a Valley Water easement area that ends just at the northeast corner of Sunrise Middle School. The access to the creek in this area is a very narrow corridor through a San José High School easement and continuing via a very narrow pedestrian access as shown in *Figure 3.25*.



*Figure 3.25. Coyote Creek, east bank, walking north towards confluence with Lower Silver Creek along narrow dirt corridor*

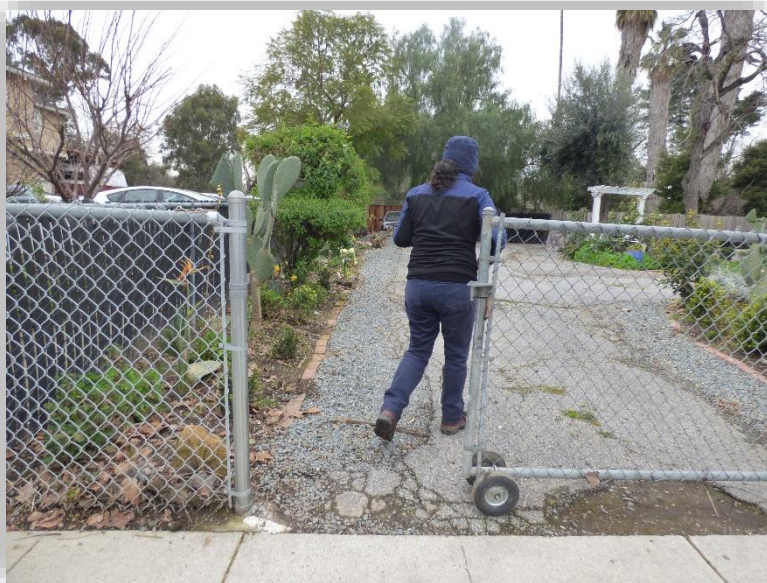


Along the west side of Coyote Creek, Reach 6 has no formal maintenance access roads since most of the creek adjacent properties consist of private property or City of San José property (Watson Park), where Valley Water has no obligations or jurisdiction (see *Figure 2.26 in Section 2.2.1 Coyote Creek Description within Projects Extent* ).

### 3.3.4 Reach 7 Maintenance Access Conditions: Santa Clara Street to Interstate 280

Reach 7 has very limited Valley Water fee or easement areas which are not continuous but spread out throughout the reach. *Figure 2.37 in Section 2.2.1 Coyote Creek Description within Projects Extent* includes a close-up view of current fee and easement areas located within Reach 7.

through residential property with address 835 East San Antonio Street, limited access to the west bank of the creek via two Valley Water parcels located at 328 and 344 South 17<sup>th</sup> Street (see *Figure 3.27*), a fee title area located at 791 William Street ( Coyote Outdoor Classroom) illustrated in *Figure 3.28*, and additional limited easement and fee areas spread out throughout the reach and accessed via the driveway located next to 698 Orvis Avenue (see *Figure 3.29*) which provide limited access to the west bank.



*Figure 3.26. 95 South 19<sup>th</sup> Street Valley Water easement entrance through residential property*

Because most of the reach is surrounded by residential areas, the limited fee or easement areas that exist are mainly through residential properties. These areas include: a 20-ft wide easement area accessed through a residential property with address 95 South 19<sup>th</sup> Street (see *Figure 3.26*) which provides limited access to the east bank of the creek, a limited access area to the east bank of the creek via a Valley Water easement off of East San Antonio Street



*Figure 3.27. Looking northwest towards Fee title Valley Water properties at 328 and 344 South 17<sup>th</sup> Street*





*Figure 3.28. At 791 William Street, Coyote Outdoor Classroom, looking southwest towards park/outdoor classroom*



*Figure 3.29. At Valley Water fee area accessed via driveway located next to 698 Orvis Avenue, looking northwest towards property located at 710 Margaret Street*



### 3.3.5 Reach 8 Maintenance Access Conditions: Interstate 280 to Tully Road

Most of the maintenance access to Reach 8 is in the south half of the reach and is in the form of easements and limited Valley Water fee title areas (see *Figure 2.46 in Section 2.2.1 Coyote Creek Description within Projects Extent*). The only access areas currently found in the north half of the reach are located along the east end of two parcels with addresses 1020 and 1030 South 12<sup>th</sup> Street which provide limited access to an approximately 200-ft long segment of the west bank of the creek.

South of Needles Drive, access to the west bank of Coyote Creek is mainly via a Valley Water easement located just east of Rock Springs Drive and Wool Creek Drive with current conditions shown in *Figures 3.30 and 3.31*. However, no actual maintenance road exists within the riparian corridor.



*Figure 3.30. Looking east along Wool Creek Drive, northeast of George Shirakawa Sr. Elementary School*

South of Wool Creek Drive, access to the west bank of the creek is via pedestrian access through a narrow, approximately 2,200-ft long, Valley Water easement which is densely vegetated with no clear pathway and, at various

locations, no access is possible since passage is blocked by the dense riparian vegetation as illustrated in *Figure 3.32*.



*Figure 3.31. On Wool Creek Drive, looking northwest towards Coyote Creek west top of bank and riparian vegetation*



*Figure 3.32. On Valley Water easement, right behind property with address 695 Quinn Avenue*

Downstream of Tully Road, along the east bank of the creek, Valley Water owns an approximately 1,800-ft long riparian corridor which can be accessed via Galveston Avenue. There is also an additional access east bank via an easement on Jeneane Marie Circle. However, within the Valley Water owned riparian corridor, no formal access road exists.





- Coyote Creek
- Coyote Creek Tributaries
- Valley Water Fee
- Valley Water Easement

0 0.45 0.9 1.35 1.8 Miles

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



Figure 3.33. Overview of current Valley Water Right of Way (Fee and Easement) within extent of projects



### 3.4 Erosion and Sediment Problems

#### 3.4.1 Erosion

A winter 2019 visual inspection found bank erosion along various locations within the scope of the Project. Within Reach 4, erosion was found along the west bank of the creek between the Southern Pacific Railroad bridge and the Old Oakland Road bridge. Erosion control areas were identified in the area including a group of large rocks that were placed in the channel beneath Ridder Park Drive bridge, as illustrated in *Figure 3.34*, and a concrete weir located just upstream from the Southern Pacific Railroad bridge as shown in *Figure 3.35*.



*Figure 3.34. Underneath Ridder Park Drive bridge, upstream side, looking towards west bank of the creek*



*Figure 3.35. Southern Pacific Railroad, looking upstream towards creek and concrete weir along the bottom right side of the image (west bank)*

Continuing along Reach 4, downstream of Old Oakland Road, locations of sacked concrete were identified along the east bank of the creek possibly to arrest the progression of erosion in the area (see *Figure 3.36*).

Within Reach 5, evidence of erosion was observed approximately 500-ft downstream of the Mabury Road intersection, along the west bank of the creek. The erosion in this area is exacerbated by the removal of riparian vegetation by others and the introduction of encampments within the banks of the creek as illustrated in *Figure 3.37*.





*Figure 3.36. Walking towards downstream Old Oakland Road, east bank, looking at erosion control measures*



*Figure 3.37. Downstream of Mabury Road, looking west towards Coyote Creek west bank and encampment*

Along Reach 6, erosion areas were observed on the east bank of the creek, both downstream and upstream of East Julian Street. Downstream of East Julian Street localized erosion seems to be caused by a storm drain outfall which has likely been getting exposed due to the lack of erosion control best management practices around it (see *Figure 3.38*). Upstream of East Julian Street, just west of San José High School, significant evidence of bank erosion is observed as indicated in *Figure 3.39*. The erosion in the area is so significant that part of the San José High School paved surface is collapsing into the creek. There is evidence of minimal erosion control structures in the area such as sacked concrete as illustrated in *Figure 3.40*. However, erosion control devices in this area are proven insufficient to halt erosion.



*Figure 3.38. East bank Coyote Creek, north of East Julian Street, exposed storm drain outfall and observed erosion*



*Figure 3.39. East bank Coyote Creek, south of East Julian Street, exposed storm drain outfall and observed erosion*





*Figure 3.40. East bank Coyote Creek, south of East Julian Street, sacked concrete observed to halt evidence of erosion on the area*

Within Reach 7, erosion was observed upstream of East Santa Clara Street along the east bank of the creek beginning just behind the San José Fire Department Station 8, located at 802 East Santa Clara Street, as illustrated in *Figure 3.41*. This Fire Station was approved for relocation in the summer of 2019 due to evidence of land erosion which could compromise the building structure.<sup>66</sup> However, as of January 2021 the station has not been relocated.



*Figure 3.41. East bank Coyote Creek, south of East Santa Clara Street, evidence of erosion behind San José Fire Department Station 8*

<sup>66</sup> Hase, Grace (2019). San Jose Oks Three New Fire Stations, Relocating Two Existing Stations. San Jose Spotlight, 18 June 2019. <https://sanjosespotlight.com/san-jose-oks-three-new-fire-stations-relocating-two-existing-stations/>. Accessed 15 January 2021.



Along Reach 8, erosion was observed mainly south of Wool Creek Drive, along the west bank of the creek. Erosion in this area seems to be exacerbated by the removal of riparian vegetation by individuals when building their encampments and pathways within the creek banks, as observed in Figures 3.42, 3.43 and 3.44. In addition, there is evidence of encampments built by digging into the banks of the creek in the form of shallow caves as illustrated in *Figure 3.43*. There was also a significant quantity of burned tree trunks in the area as shown in *Figures 3.45* and *3.46*.



*Figure 3.42. West bank Coyote Creek, south of Wool Creek Drive, lack of riparian vegetation and encampments observed to be exacerbating erosion on the area*



*Figure 3.44. West bank Coyote Creek, south of Wool Creek Drive, lack of riparian vegetation within the creek banks, vegetation removed to build informal access pathways to encampments*



*Figure 3.43. West bank Coyote Creek, south of Wool Creek Drive, evidence of shelters built by digging into the creek bank*





*Figure 3.45. West bank Coyote Creek, south of Wool Creek Drive, burned trees, riparian vegetation and trash in the area*



*Figure 3.46. West bank Coyote Creek, south of Wool Creek Drive, burned eucalyptus trees*



### 3.4.2 Sedimentation

In 2006, Valley Water conducted a sediment study between Montague Expressway and Interstate 280.<sup>67</sup> A total of nine pebble count measurements were collected at riffles. Based on the results from the pebble counts, it was determined that Upper Penitencia Creek was likely responsible for transporting relatively large sediments into the Project reach. Sediment input from Lower Silver Creek was determined to be insignificant.

During the winter 2019 visual inspection, the size of sediment along the channel bottom was noted to change gradually from small gravels near Montague Expressway to large gravels near the Berryessa Road Bridge (see *Figure 3.47*). Upstream from the Berryessa Road bridge, Coyote Creek exhibited deep pools with silt/clay channel bottom conditions that continued upstream to the Highway 101 bridge. Small gravels were again noted upstream from the Highway 101 bridge and continued to just upstream of the Lower Silver Creek confluence where deep pools with silt/clay channel bottom sediments and continued upstream to the William Street bridge. Small gravels were noted from the William Street bridge to the Interstate 280 bridge. The initial visual inspection of bed materials was useful to determine locations for pebble count investigations.

To analyze changes to Coyote Creek's channel dimensions through the years, cross section monitoring stations were established in 2003 to observe changes to the creek over time. These sections were surveyed periodically from 2003 to 2017, and the results were compared to the 1970 and 1989 cross section data obtained from previous studies. The results show sedimentation in certain reaches of the creek, but overall do not seem to indicate that much deposition is occurring in the channel. These monitoring sections only cover the reach between Montague Expressway and I-280, as those were the established limits of the project at the time of the surveys.



*Figure 3.47. Large gravel observed on creek bed downstream of Berryessa Road*

<sup>67</sup> SCVWD (2007). *HEC-6T Sediment Transport Study. Mid-Coyote Creek Project. Montague Expressway to Interstate 280*. Santa Clara Valley Water District, San Jose, CA.



### 3.5 Water Quality Problems

In urban areas, Coyote Creek suffers from many of the water quality challenges faced by other urban streams including trash, pesticides, fertilizers, hazardous wastes in the form of syringes, animal and human waste, and encampments, which are detrimental to the aquatic ecosystem and human health. In addition, the creek is susceptible to flashy flows that rapidly transmit rain runoff and urban pollutants over paved surfaces and through storm drains to the creek. Some of the most important factors that impact water quality throughout Coyote Creek are explained in more detail in the following subsections.

#### 3.5.1 Trash and Debris

As described in *Section 2.9.1 Land Use*, downstream areas of Coyote Creek are encroached by urban land use. As a result, the creek is subject to a large accumulation of litter and trash from pathways including storm drains, illegal dumping, windblown litter, and encampments, as illustrated in *Figures 3.48 and 3.49*. Moreover, Coyote Creek is listed under the Federal Clean Water Act, Section 303(d) List of Water Quality Limited Segments, as impaired due to trash. This listing indicates that Coyote Creek currently does not meet the recreational beneficial use standards for visual impacts.<sup>68</sup>

At several locations within Coyote Creek, natural obstructions in the channel such as fallen trees, woody debris, and accumulated concrete and asphalt retain trash as it flows downstream towards the Bay. Often, these natural obstructions become the site of large trash deposits known as trash rafts, which are detrimental to the creek's water quality and are difficult and dangerous to remove (see *Figures 3.50 and 3.51*).

In addition, Coyote Creek provides a location for individuals to inhabit off the urban streets and in a semi-hidden location. People have established living areas within the dense canopy of riparian vegetation that Coyote Creek provides. Much of the trash and debris is left behind by individuals who inhabit and pass time on the banks or beneath bridges (see *Figures 3.52 and 3.53*).



*Figure 3.48. West bank of Coyote Creek, downstream of Berryessa Road, looking northeast towards trash left along creek bank and across creek*

<sup>68</sup> State of California San Francisco Bay Regional Water Quality Control Board. California 303 (d) List of Water Quality Limited Segments. 25 October 2017.

[https://www.waterboards.ca.gov/water\\_issues/programs/tmdl/2010state\\_ir\\_reports/category5\\_report.shtml](https://www.waterboards.ca.gov/water_issues/programs/tmdl/2010state_ir_reports/category5_report.shtml)





*Figures 3.49, 3.50 and 3.51 depict current trash issues observed within Coyote Creek along the extent of the Project. Figures 3.49 and 3.50 were observed within Reach 5, just downstream of Berryessa Road and Figure 3.51 was observed within Reach 8, south of Wool Creek Drive*





Figure 3.52. On west bank of Coyote Creek, downstream of Berryessa Road, looking southeast towards encampment and invasive vegetation



Figure 3.53. On east bank of Coyote Creek, lower creek bench, looking southwest towards encampment and riparian vegetation



### *3.5.2 Temperature*

Critical life history variables (i.e. reproduction, growth) of plants and animals in flowing water habitats are regulated by stream temperature.<sup>69</sup> Temperatures within the extent of the projects are seasonably variable. In a natural river system, cool water from headwater streams flows downstream and gradually warms. Stream temperatures within the Project reaches exhibit this trend but are also affected by the presence of both Coyote and Anderson reservoirs and the in-channel ponds upstream. The temperatures during the summer and fall are more conducive to species that can tolerate warm water temperatures, and cool in the winter and spring months.

### *3.5.3 Pathogen Levels*

Previous water quality studies have determined elevated pathogen levels at multiple locations within Coyote Creek which are likely caused by a combination of resident waterfowl populations, human or animal (pet) waste or leaking sanitary sewer pipelines.

### *3.5.4 Sediment*

Due to upstream impoundment of the Coyote Creek by Coyote and Anderson Dams, as well as Ogier and Metcalf ponds, most of the sediment historically carried by the Coyote Creek headwaters to the rest of the creek is settled within the reservoirs and ponds. It has been found that the lack of sediments downstream from each of the reservoirs may cause downstream channel instability (i.e. headcuts and lateral migration).

### *3.5.5 Pesticides and Herbicides*

Detection of organophosphorus pesticides, specifically Chlorpyrifos, Diazinon, and Malathion, are relatively common in Santa Clara Valley streams, including Coyote Creek. The entire length of Coyote Creek is on the Federal Clean Water Act, Section 303(d) List of Water Quality Limited Segments, as impaired due to Diazinon.<sup>70</sup> Past sampling found 57 of 112 samples contained detectable levels of these pesticides.<sup>71</sup> Concentrations of Diazinon should decrease over time because use of the chemical has been banned in California.

### *3.5.6 Anions*

Areas with primarily agricultural land uses contribute to an increased amount of anion pollutants. Anions such as chloride, phosphate, nitrite, nitrate and sulfate are greater in agricultural land use areas as compared to more urbanized or mixed-use areas. A relatively constant contribution of these pollutants

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<sup>69</sup> Horvart, TG., G.A. Lamberti, D.M. Lodge, and W.L. Perry (1996). Zebra mussels in lake-stream systems: sources-sink dynamics. *Journal of the North American Benthological Society* 15:564-575

<sup>70</sup> State of California San Francisco Bay Regional Water Quality Control Board. California 303 (d) List of Water Quality Limited Segments. 25 October 2017.

[https://www.waterboards.ca.gov/water\\_issues/programs/tmdl/2010state\\_ir\\_reports/category5\\_report.shtml](https://www.waterboards.ca.gov/water_issues/programs/tmdl/2010state_ir_reports/category5_report.shtml)

<sup>71</sup> Soller, J. Stephenson, J. Olivieri, K. Downing, J. Olivieri, A.W. (2004) "Evaluation of First Flush Pollutant Loading and Implications for Water Resources and Urban Runoff Management." 2004.



can be expected from agricultural areas draining to Coyote Creek in the upland areas of the Coyote Creek Watershed.

### *3.5.7 Metals*

The Basin Plan for the San Francisco Bay is the master policy document that contains descriptions of the legal, technical, and programmatic basis of water quality regulation in the San Francisco Bay region (California Regional Water Quality Control Board, San Francisco Bay Region). The Basin Plan contains water quality standards for ten metals: arsenic, cadmium, chromium, copper, lead, mercury, nickel, selenium, silver, and zinc. Concentrations of these metals in Coyote Creek are inversely proportional to water hardness (caused by dissolved calcium, magnesium and other metals) which decreases with distance from the San Francisco Bay. In general, metals do not contribute to the impairment of water quality within Coyote Creek.<sup>72</sup>

### *3.5.8 Dissolved Oxygen*

It has been observed that downstream of Upper Penitencia Creek, Coyote Creek has relative high flow, high dissolved oxygen, and low turbidity due to flow augmentation from the tributary and from groundwater return flows. Dissolved oxygen in this section ranges from 5.6 mg/L to 10.1 mg/L.<sup>73</sup> Between Berryessa Road and William Street, the creek has high turbidity and nutrient concentrations. Dissolved oxygen in these areas can range from 0.0 mg/L to 7.7 mg/L.<sup>76</sup> The lowest measured dissolved oxygen values are at Watson Park, which has average values from 2.2 mg/L to 3.3 mg/L.<sup>76</sup> These values are well below the San Francisco Bay Basin Water Quality Control Plan (Basin Plan) requirement of 5.0 mg/L for warm water streams. The area near Watson Park also had the highest concentrations of ammonia, total dissolved solids and dissolved organic carbon. Water temperature and pH were lower at Watson Park compared to other sampling sites. Upstream of William Street, where flow velocities are lower, turbidity is low and dissolved oxygen ranges from 2.6 mg/L to 7.6 mg/L with an average between 5.7 mg/L and 6.1 mg/L.<sup>76</sup>

## **3.6 Hazardous Materials Concerns**

Due to current and historical land use types within the Coyote Creek Watershed, such as former historical mining, past agricultural uses, various former landfill sites, and current industrial and commercial land use, it is likely that hazardous materials can be found within the watershed and along Coyote Creek. To this extent, general Phase I and Phase II preliminary Hazardous Substance Liability Assessment (HSLA)

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<sup>72</sup> Tetra Tech. *City of San Jose Environmental Enhancement Program Coyote Creek Streamflow Augmentation Pilot Project*. San Jose, 2001.

<sup>73</sup> SCVURPPP (2012). *Watershed Monitoring and Assessment Program. Interim Monitoring Project Report, Stressor/Source Identification Project (Coyote Creek)*. Santa Clara Valley Urban Runoff Pollution Prevention Program, September 2012.



reports for Coyote Creek were prepared in 1994 and 2004, respectively.<sup>74,75</sup> These documents were based on site reconnaissance inspections and review of Environmental Data Resources (EDR) documents.

More recently, Phase I and Phase II HSLAs were completed in May 2017 and November 2019, respectively, to assess two narrow parcels (approximately 2.9 acres total) bordering Coyote Creek and located between Brokaw Road and the Southern Pacific Railroad. The historical use of these two parcels consisted of agricultural land and during the Phase I HSLA no residual pesticides were found above regulatory screening levels.<sup>76</sup> Phase II HSLA findings indicated the presence of low levels of residual pesticide compounds and low to moderate levels of lead in the soil.<sup>77</sup>

In addition, as of January 2021, Phase I HSLA reports are currently being prepared for all the parcels impacted by the Coyote Creek Flood Management Measures Project (CCFMMP).

*Table 3.5* lists a sample of those facilities identified during a visual inspection that might have the potential of introducing soil and groundwater contaminants into the Coyote Creek Watershed as well as introducing hazardous materials into the creek. In addition to the locations listed in *Table 3.5*, the 2004 HSLA report also indicated that encampments near the creek and garbage collections or trash rafts located within the creek channel were sources of hazardous materials within the scope of the projects such as syringes, human feces and urine.<sup>78</sup> The 2004 EDR report examined environmental records within a one mile distance from both sides of Coyote Creek within the scope of the Project. Numerous surrounding sites were identified as additional potential sources of contamination and a sample of them is listed in *Table 3.6*. Details of the potentially contaminated sites that may have impacts on Coyote Creek can be found in the EDR report.<sup>81</sup>

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<sup>74</sup> Kennedy/Jenks Consultants. *Phase I Hazardous Materials Investigation (East Julian Street to East Santa Clara Street) and Phase II Hazardous Materials Investigation (Montague Expressway to East Santa Clara Street)*. 1994. Prepared for Santa Clara Valley Water District, San Jose, CA.

<sup>75</sup> SCVWD (2004). *Mid-Coyote Creek Preliminary Hazardous Substance Liability Assessment*. Santa Clara Valley Water District, San Jose, CA.

<sup>76</sup> Northgate Environmental Management, Inc. (May 2017) *Phase I Hazardous Substance Liability Assessment. Coyote Creek Parcels APN 237-05-057 and 237-05-058*. 2017. Prepared for Santa Clara Valley Water District.

<sup>77</sup> Northgate Environmental Management, Inc. (18 November 2019). *Phase II Hazardous Substance Liability Assessment (HSLA), Coyote Creek Flood Protection Project in San Jose, California (Project No. 26174043)*. Prepared for Santa Clara Valley Water District.

<sup>78</sup> SCVWD (2004). *Mid-Coyote Creek Preliminary Hazardous Substance Liability Assessment*. Santa Clara Valley Water District, San Jose, CA.







Table 3.5. Selected facilities located adjacent to Coyote Creek that have the potential for hazardous waste contamination of soil, surface water and groundwater






Name & Type of Facility	Address	Image	Description
Kinder Morgan San Jose Terminal, Oil and Natural Gas Company	2150 Kruse Drive, San Jose, CA		Large fuel tanks located on either side of Coyote Creek, subterranean fuel pipes that cross beneath the creek and a truck filling station
Pick-n-Pull, Self-service used auto parts	1065 Commercial Street, San Jose, CA		Parked used cars used for parts recycling, located along west bank
Graniterock, construction materials and contracting	11711 Berryessa Road, San Jose, CA		Facility manufactures: 3/4-in Class II base rock, 3/4-in recycled drain rock, 3/8-in recycled pea gravel, and sand
SRDC Recycling, Concrete and asphalt recycling center	11740 Berryessa Road, San Jose, CA		Concrete and asphalt recycling and base rock, drain rock and structural backfill manufacturing
Truck Maintenance Yard and Driving School, Truck maintenance yard, parking lot and driving school	1346 E Taylor Street, San Jose, CA		Trucking maintenance yard located on the west bank of the creek approximately 290-ft downstream from the highway 101 bridge crossing



Table 3.6. Potential Hazardous Material Sites identified in 2004 Phase I HSLA near Coyote Creek

Site Name	Location	Distance (miles)	Category
1. Lorentz Barrel & Drum Inc.	1515 South 10 <sup>th</sup> Street	0.7	NPL, multiple lists
2. Proto Mold Bayshore	1390 Old Bayshore Hwy.	0.7	Cal-Site
3. Van Waters & Rogers	2256 Junction Avenue	0.5	Potential NPL, multiple sites
4. Solvent Services Inc.	1021 Berryessa Road	1.0	Pesticide list
5. PCB Engineering Inc.	572 Charcot Avenue	0.1	Pesticide list
6. Quebecor Printing San Jose Inc.	696 East Trimble Road	0.5	Potential NPL, multiple lists
7. Auttek System Corp.	109 Bonaventura Drive	0.8	Potential NPL, multiple lists
8. Jennings A Div. of FI Ind. Inc.	109 Bonaventura Drive	0.8	Potential NPL, multiple lists
9. Inactive Story Road Landfill	Story Rd. at Remillard Road	0.4	Landfill
10. Green Team Service Yard	1333 Old Oakland Road	0.5	Landfill
11. Green Team MRF Direct Transfer	575 Charles Street	0.5	Landfill
12. Martin Park Landfill	Forestdale Avenue	0.5	Landfill
13. Coyote Meadows/Former Story Rd Landfill	Remillard Court	0.5	Landfill
14. Roberts Avenue. Landfill	Roberts Avenue	0.5	Landfill
15. Valley Automated Fuels	2132 O'toole Avenue	0.3	UST
16. Garden State International Trucks	1505 North 4 <sup>th</sup> Street	1.1	UST
17. Garden Valley Fertilizer	565 Charles Street	0.6	VCP (DTSC oversight)
18. Markovitz & Fox Inc.	1633 Old Oakland Road	0.1	VCP (DTSC oversight)
19. Montague Sealy	691 Montague Expressway	0.1	VCP (DTSC oversight)
20. G&K Services	2275 Junction Avenue	0.5	Dry Cleaner
21. 24 <sup>th</sup> Street Cleaners	1147 East Santa Clara Street	0.3	Dry Cleaner

**Notes:**

Distance: Refers to the linear distance as measured from the site to Coyote Creek.

Cal-Site: Formerly known as ASPIS. Data provided by the California Department of Toxic Substance Control

Dry Cleaner: Business activities may include the use of hazardous materials.

DTSC: Department of Toxic Substance Control

NPL: Also known as Superfund. Data provided by the United States Environmental Protection Agency.

UST: Underground Storage Tank. Data provided by the State Water Resources Control Board's Hazardous Substance Storage Container Database.

VCP: Voluntary Cleanup Program. Under the Department of Toxic Substance Control.



The background image shows a grassy area with a metal guardrail in the foreground. A chain-link fence is visible in the background, and a building is partially visible in the distance. The text is overlaid on a blue rectangular background.

## ***CHAPTER 4***

# ***FORMULATION OF ALTERNATIVES***



## 4. Formulation of Alternatives

Due to the demonstrated and repeated risk of flooding to urban communities adjacent to Coyote Creek, as described in *Section 3.1 Flooding* the Board has made completion of this Project a priority. To restate the accelerated timelines for the Project, the CCFMMP is anticipated to be completed at the end of 2023 to coincide with operations of the ADTP. The CCFPP is scheduled to be completed at the end of 2025, just ahead of the operation of the ADSRP's higher volume diversion system. The expedited schedules assume that the ultimate flood risk reduction alternative selected for implementation does not result in significant detrimental impacts to the environment.

The formulation of alternatives for the Project was completed prior to splitting up the original June 2017 Board accelerated Coyote Creek Flood Protection project. As a result, one single holistic formulation of alternatives will be described in this section for the entire Project.

In summary, the approach to the formulation of alternatives for the Project was as follows:

- Identify the project objectives and timeline
- Identify conceptual alternatives that meet the objectives and timeline
- Obtain public and stakeholder input on conceptual alternatives
- Refine conceptual alternatives and identify assessment criteria for feasible alternatives
- Identify feasible alternatives by applying assessment criteria and public input
- Obtain public and stakeholder input on feasible alternatives
- Apply Natural Flood Protection (NFP) evaluation to feasible alternatives and public input
- Identify Recommended alternative
- Inform public and stakeholder on recommended alternative

The following subsections describe in detail the formulation of alternatives for the Project.

### 4.1 Conceptual Alternatives

The expedited nature of the Project led the number of conceptual alternatives considered to be narrowed down. This was done by including in the initial conceptual menu of alternatives only those flood risk reduction options that were deemed to be able to be planned, designed and built within the limited timeframe provided. As a result, conceptual elements initially considered during the early stages of planning did not include elements with extensive modifications to the channel, such as creek widening and excavation, work which would result in years of extensive property acquisition, review and permitting. For the most part, the initial conceptual alternatives considered included work outside of the creek, following the historical Coyote Creek floodplain, whenever possible, while reducing the risk of flooding from an event similar to the 2017 flood event or approximately a 20-year flood event. Hence, flood risk reduction elements initially considered included:

- Set-back floodwalls, berms and levees (including passive barriers)
- Dry-proofing of repeatedly flooded properties (including structure elevation)
- Voluntary purchase of repeatedly flooded properties
- Off-stream flood detention
- Invasive vegetation removal



The initial menu of flood risk reduction elements when applied to the Project resulted in the development of 51 conceptual alternatives identified. A full list of all conceptual alternatives for each reach is provided in *Appendix A*. The conceptual alternatives developed were presented to the public and additional stakeholders on May 21<sup>st</sup>, May 30<sup>th</sup> and June 3<sup>rd</sup> of 2019. The input obtained during these public meetings is listed in *Appendix B*.

### 4.2 Feasible Alternatives Assessment Criteria

Following public and stakeholder input given during the Spring 2019 public meetings, the 51 conceptual alternatives were further refined into a set of feasible alternatives which not only incorporated the obtained public input, but also satisfied the assessment criteria developed by the planning project team. This assessment criteria is listed below and described in the following subsections. The application of this criteria to each of the 51 conceptual alternatives is included in *Appendix A*.

#### Feasible Alternatives Assessment Criteria

- A. Reduce risk of flooding to homes, schools, businesses and critical facilities from approximately a 20-year flood event
- B. Avoid or minimize detrimental impacts to the environment
- C. Enhance riparian corridor
- D. Provide for appropriate and equal public access
- E. Technical Feasibility
- F. Logistical Feasibility
- G. Financial Feasibility
- H. Has community support

#### *A. Reduce risk of flooding to homes, schools, businesses, and critical facilities from approximately a 20-year flood event*

Hydraulic modeling was conducted to show that the feasible alternatives meet the flood protection design criteria. Specifically, one-dimensional hydraulic models were created using HEC-RAS software Version 5.0.7 and using the 20-year flow distribution shown in *Table 4.1*. Where appropriate, one model was used for various alternatives if the difference in geometry was negligible. To be more conservative, the models were calibrated to the 2017 storm event, when the channel was fairly rough (dense vegetation and several downed trees). The calibrated models computed 20-year water surface profiles and demonstrated that each alternative would provide 20-year flow capacity. Features such as floodwalls were coded into the hydraulic model directly to ensure that the water surface elevation would remain below the top of floodwall during the 20-year design event.<sup>79</sup> Details of the modeling conducted are provided in *Appendix C*.

<sup>79</sup> Reardon, Melissa. (26 June 2020). *Technical Memorandum: Coyote Creek Steady State Model – Existing and Proposed Conditions (DRAFT)*. Hydrology, Hydraulics and Geomorphology Unit. Valley Water, San José, CA.



*Table 4.1. Design flow for CCFMMP and CCFPP*

Location along Coyote Creek	Design Flow (cfs) <sup>a</sup>
Tully Road	8,300
I-280	8,400
East William Street	8,400
U/S Lower Silver Creek	8,400
D/S Lower Silver Creek	9,100
U/S Upper Penitencia Creek	9,100
Berryessa Road	9,500
I-880	9,500
Montague Expressway	9,500

**Notes:** a. Assumes flow is contained within channel or within designated floodplain areas.  
(Approx. 20 year-event)

### *B. Avoid or minimize detrimental impacts to the environment*

According to Valley Water Board's Ends Policy E-3, a flood protection project needs to have an integrated watershed management approach that balances environmental quality and flood protection. As a result, a feasible project alternative needs to consider the extent of any adverse environmental impacts and minimize them as much as possible.

### *C. Enhance riparian corridor*

Coyote Creek supports a diversity of aquatic and riparian flora and fauna. As a result, preservation and maintenance of intact riparian areas, management of invasive species, and other enhancement measures should be considered a high priority for the Project (see *Figure 4.1*). Feasible alternatives need to provide opportunities for riparian corridor enhancement, protection and preservation.

### *D. Provide for appropriate and equal public access*

According to Valley Water Board's Ends Policy E-4.5.1, it is a Water Resources Stewardship objective to "provide appropriate and equal public access to Valley Water's streamside and watershed lands." As a result, any selected alternative will need to consider its ability to provide for public access (see *Figure 4.2*).



*Figure 4.1. Invasive vegetation observed at Berryessa Road bridge*





Figure 4.2. Selected alternative is to preserve and enhance public access. William Street Park, looking east

### E. Technical feasibility

Technical feasibility refers to the constructability, operation and maintenance of the selected alternative. This includes the availability of construction materials and equipment, the viability and existence of construction techniques and technology, adequate staging space and access for construction work, the ability to construct the Project as designed, as well as feasibility of the long term maintenance of the Project which includes establishing realistic operation and maintenance levels of service. Some general questions that can be asked when testing a project for technical feasibility are listed in Figure 4.3. Alternatives considered will be tested for technical feasibility.

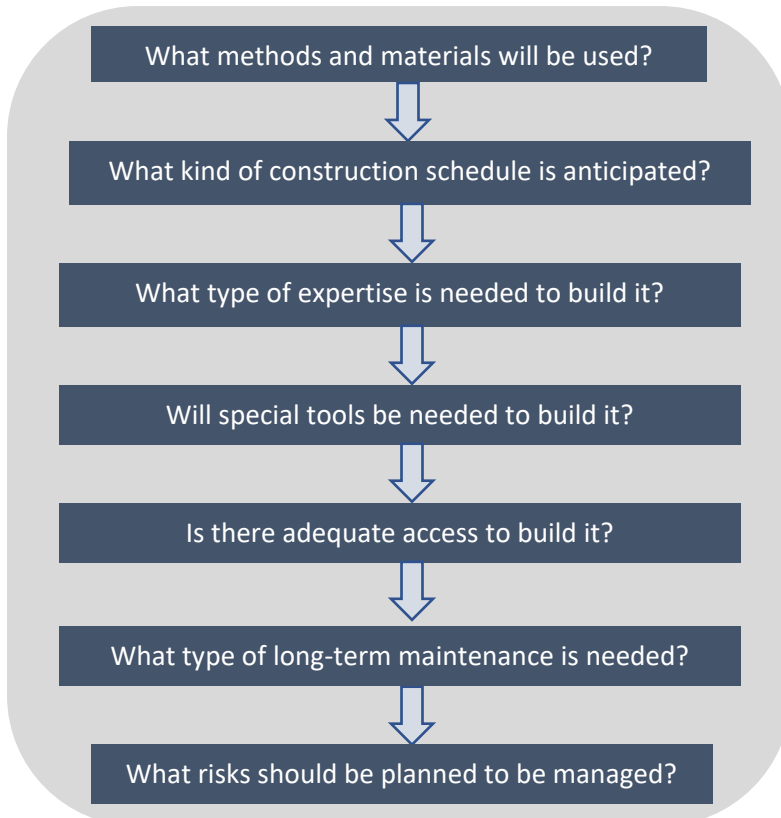


Figure 4.3. Sample of Must-Ask-Questions to test a project for Technical Feasibility



### *F. Logistical feasibility*

Logistical feasibility refers to the careful consideration, coordination and organization of key components of a project so that it progresses in a successful manner. Logistically feasible components considered for this Project include:

- Reasonable length of time to acquire environmental and construction related permits (1-2 years)
- No unreasonable constraints relative to acquiring property
- No insurmountable legal issues
- Project consistent with local land use policy
- No unacceptable community impacts
- Supported by external agencies and stakeholders
- Project consistent with Valley Water Board's Governance Policies

### *G. Financial feasibility*

For planning purposes, the total estimated cost for the CCFMMP and CCFPP combined cannot be more than 1.5 times the approved Project Plan Cost. As of May 24, 2020, the Project Plan Cost was \$59,746,000. Financial feasibility for both projects combined means that the total estimated cost cannot be more than \$90,000,000.

### *H. Has community support*

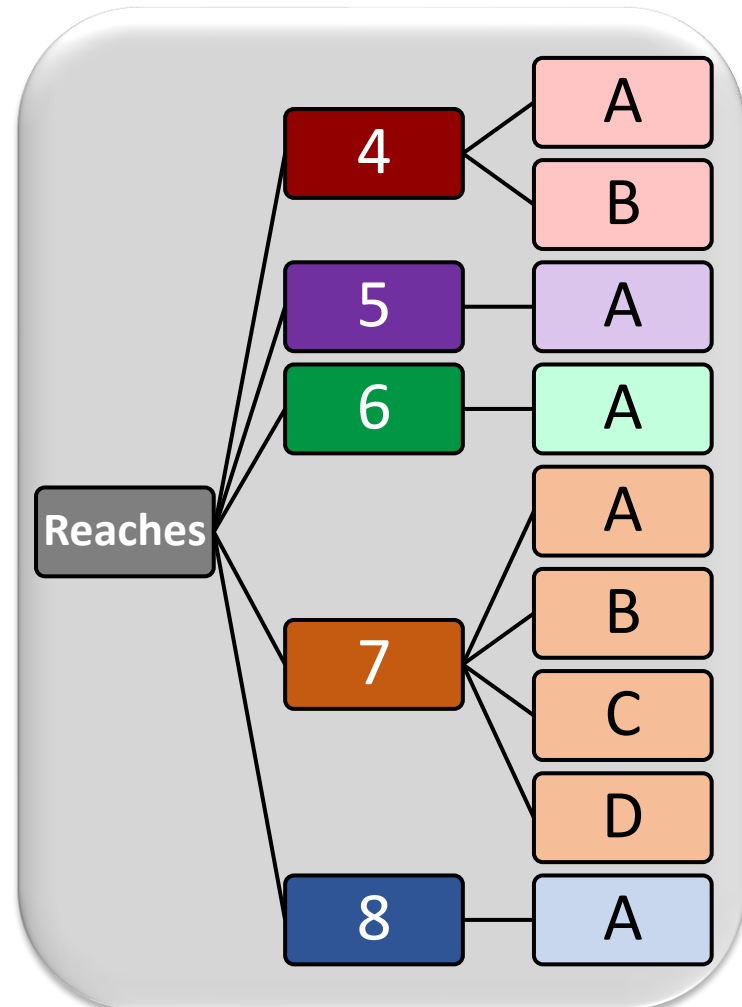
Public meetings to obtain input on conceptual alternatives were held in Spring 2019. Public input was gathered during these set of meetings and incorporated into the feasible alternatives. *Appendix B* shows a compiled list of public input given during the Spring 2019 public meetings



### 4.3 Feasible Alternatives

The feasible alternatives assessment criteria just described in the previous section as well as the incorporation of public input received during the Spring 2019 public meetings resulted in the identification of eight feasible alternatives, in addition to the *No Project* alternative, which were chosen to move forward after the conceptual screening process. These nine feasible alternatives are summarized in *Table 4.2*.

The various conceptual alternatives and resulting feasible alternatives are formed by combining various flood risk reduction options studied for each of the five reaches, as illustrated in *Figure 4.4*. During the feasible alternative analysis, there were two flood risk reduction options selected for Reach 4, one option each for Reaches 5, 6 and 8, and four options for Reach 7, which when combined together formed the eight selected feasible alternatives, E1, E2, E3, E5, F1, F2, F3, F5, in addition to the *No Project* alternative, H1, as illustrated in *Table 4.2*. The naming convention for the feasible alternatives is a carryover from the conceptual alternatives naming convention (see *Appendix A* for a complete list of conceptual alternatives). The identified nine feasible alternatives are described reach-by-reach in this section and illustrated in *Figures 4.5* through 4.32.



*Figure 4.4. Schematic illustrating the various flood risk reduction options selected for each reach*



Table 4.2. Feasible Alternatives Matrix

Reach		Feasible Alternatives								
		E1	E2	E3	E5	F1	F2	F3	F5	H1
4. Montague Expressway to Old Oakland Road		A. Build headwalls at upstream and downstream faces of Charcot Avenue bridge, build floodwalls upstream and downstream of bridge	Same as E1	Same as E1	Same as E1	B. Install 4-ft tall passive barriers at Charcot Avenue bridge, build floodwalls upstream and downstream of bridge	Same as F1	Same as F1	Same as F1	No Project
5. Old Oakland Road to Mabury Road		A. Replace and increase height of embankment from Old Oakland Road to Union Pacific Railroad (UPRR), build floodwalls from UPRR to Mabury Road	Same as E1	Same as E1	Same as E1	Same as E1	Same as E1	Same as E1	Same as E1	
6. Mabury Road to East Santa Clara Street		A. Build floodwalls from Highway 101 to Mabury Road, build floodwalls, passive barriers and berm within Watson Park, build floodwalls on east bank between Highway 101 and Julian Street	Same as E1	Same as E1	Same as E1	Same as E1	Same as E1	Same as E1	Same as E1	
7. East Santa Clara Street to Highway 280		A. Elevate 12 residential properties, build floodwalls, build vegetated berm at edge of William Street Park and install passive barrier at Selma Olinder Park	B. Acquire, demolish and restore riparian corridor for 12 residential properties, build floodwalls, build vegetated berm at edge of William Street Park and install passive barrier at Selma Olinder Park	C. Elevate 12 residential properties, build floodwalls, install passive barrier at edge of William Street Park and Selma Olinder Park	D. Elevate or acquire and demolish selected residential properties, build floodwalls, build vegetated berm at edge of William Street Park and install passive barrier at Selma Olinder Park	Same as E1	Same as E2	Same as E3	Same as E5	
8. Highway 280 to Tully Road		A. Build floodwalls east of South 12 <sup>th</sup> Street, east of Needles Drive and north of Tully Road, rebuild berm located at Rock Springs neighborhood and extend to Bevin Brook Drive neighborhood	Same as E1	Same as E1	Same as E1	Same as E1	Same as E1	Same as E1	Same as E1	
Assessment Criteria	A. Reduce risk of flooding from a 20-year flood event	Meets	Meets	Meets	Meets	Meets	Meets	Meets	Meets	Does Not Meet
	B. Avoid or reduce detrimental impacts to environment	Meets	Meets	Meets	Meets	Meets	Meets	Meets	Meets	Meets
	C. Enhance riparian corridor	Meets	Meets	Meets	Meets	Meets	Meets	Meets	Meets	Does Not Meet
	D. Provide appropriate and equal public access	Meets	Meets	Meets	Meets	Meets	Meets	Meets	Meets	Does Not Meet
	E. Technically feasible	Meets	Meets	Meets	Meets	Meets	Meets	Meets	Meets	Does Not Meet
	F. Logistically feasible	Meets	Meets	Meets	Meets	Meets	Meets	Meets	Meets	Does Not Meet
	G. Financially feasible	Meets Conceptual Cost: \$ 72 M O&M Annual Cost: \$1.2 M	Meets Conceptual Cost: \$80 M O&M Annual Cost: \$1.3 M	Meets Conceptual Cost: \$83 M O&M Annual Cost: \$1.2 M	Meets Conceptual Cost: \$79 M O&M Annual Cost: \$1.3 M	Meets Conceptual Cost: \$74 M O&M Annual Cost: \$1.2 M	Meets Conceptual Cost: \$82 M O&M Annual Cost: \$1.3 M	Meets Conceptual Cost: \$85 M O&M Annual Cost: \$1.2 M	Meets Conceptual Cost: \$80 M O&M Annual Cost: \$1.3 M	Meets Conceptual Cost: \$0 O&M Annual Cost: \$700 K
	H. Has community support	Meets	Meets	Meets	Meets	Meets	Meets	Meets	Meets	Does Not Meet
Meets all criteria		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No



The nine feasible alternatives shown in *Table 4.2* were presented to the public and additional stakeholders on November 6<sup>th</sup>, November 7<sup>th</sup> and November 19<sup>th</sup> of 2019. The intent of these meetings was to obtain input from the public on the various elements of the feasible alternatives. Received input and comments from these meetings are listed in *Appendix B*.

Following is a detailed description of the feasible alternatives reach by reach:

### REACH 4: Montague Expressway to Old Oakland Road

After a comprehensive conceptual alternative analysis process, there were two flood risk reduction options selected for Reach 4 to move forward into the feasible alternatives phase: option A and B. Option A consists of replacing the upstream and downstream existing bridge railings with approximately 4-ft tall headwalls as well as to build approximately 4-ft tall floodwalls upstream and downstream of the bridge for a combined length of approximately 2,100-ft, as illustrated in *Figures 4.5, 4.7 and 4.8*. The main purpose of option A is for floodwaters to go under pressurized flow underneath the bridge when encountering the headwalls and lateral floodwalls, preventing creek waters from overflowing the bridge as well as areas east and west on Charcot Avenue.

Option B consists on the installation of an approximately 4-ft tall, 50-ft long passive flood barriers at both east and west ends of Charcot Avenue bridge along the street width and continue with approximately 2,450-ft of 4-ft tall floodwalls upstream and downstream of the bridge with a short 25-ft long, 4-ft tall passive barrier at a current easement access point, as illustrated in *Figures 4.6, 4.9 and 4.10*. A passive flood barrier is a structural panel which does not require human intervention and remains embedded on the ground when dry while functioning as a flood barrier when buoyant forces are present, such as during a flood event.

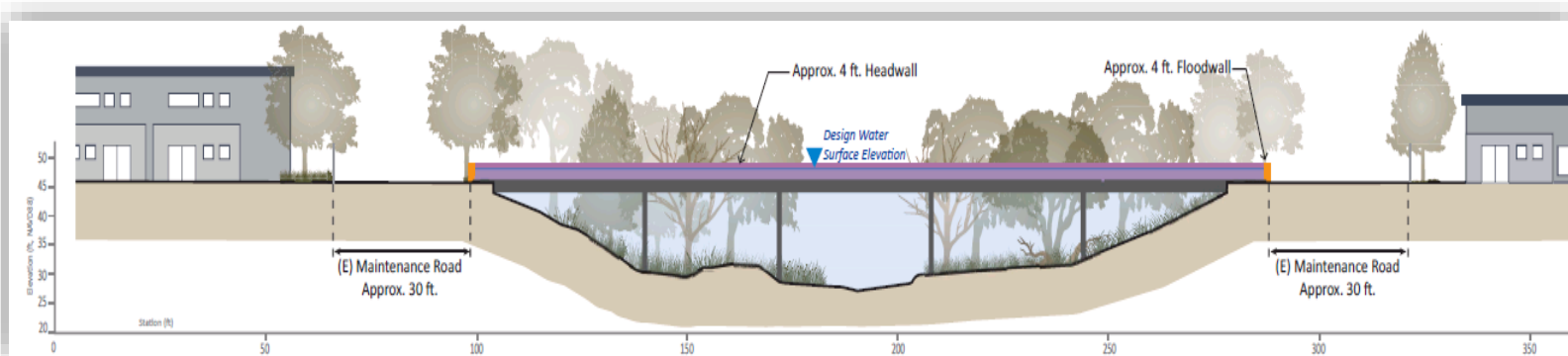


Figure 4.5. Reach 4 – Option A Cross-section: Headwall at Charcot Avenue bridge and floodwalls

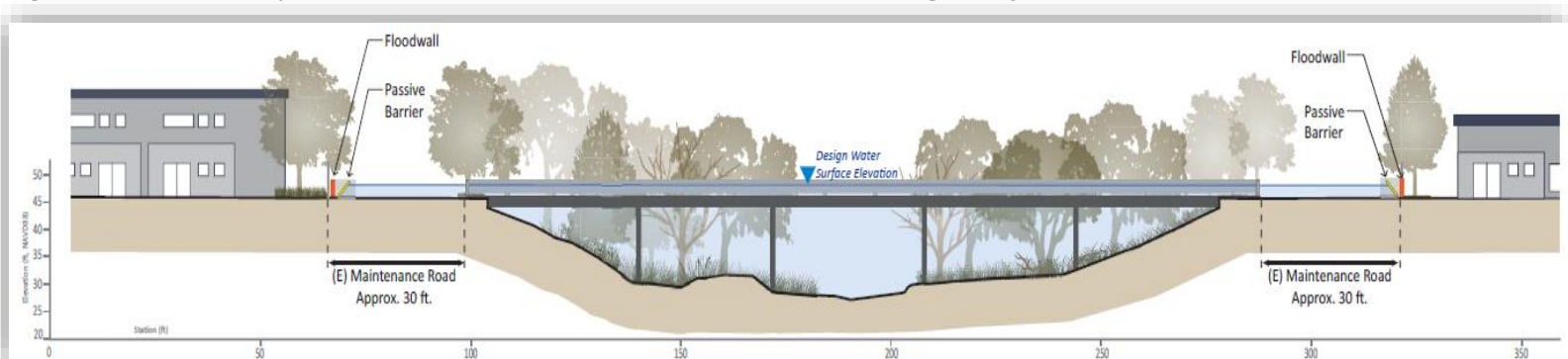


Figure 4.6. Reach 4 – Option B Cross-section: Passive barriers at Charcot Avenue bridge and floodwalls





Figure 4.7. Plan View of Charcot Avenue Bridge – Option for Feasible Alternative E1, E2, E3 & E5

## FEASIBLE ALTERNATIVE - E1, E2, E3, E5

### Reach 4 - A

#### Montague Expressway to Old Oakland Road

Build headwalls at upstream and downstream faces of Charcot Avenue bridge, build floodwalls upstream and downstream of bridge

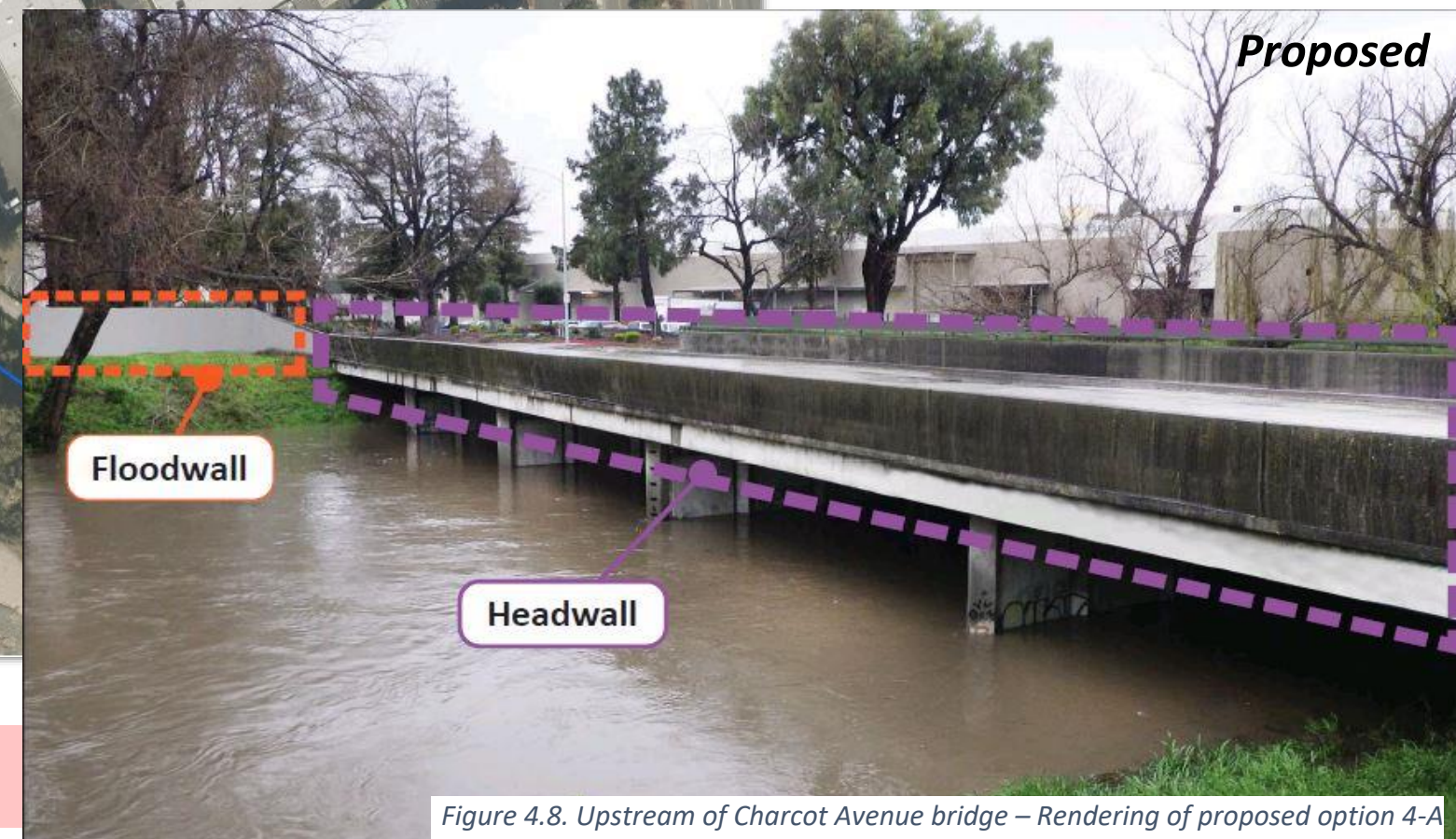


Figure 4.8. Upstream of Charcot Avenue bridge – Rendering of proposed option 4-A





Figure 4.9. Plan View of Charcot Avenue Bridge – Option for Feasible Alternative F1, F2, F3 & F5

**Reach 4 – B**

**Montague Expressway to Old Oakland Road**

Install 4-ft tall passive barriers at Charcot Avenue, build floodwalls upstream and downstream of bridge



Figure 4.10. At Charcot Avenue bridge – Rendering of proposed option 4-B

**FEASIBLE ALTERNATIVE - F1, F2, F3, F5**



### REACH 5: Old Oakland Road to Mabury Road

One flood risk reduction option for Reach 5 was selected during the feasible alternative process. This option consists of the construction of a new levee beginning at the south end of the South Bay Mobile Home Park, on the west bank, which extends upstream for a total length of approximately 350-ft and a height of approximately 4-ft from existing grade, as illustrated in *Figure 4.12*. Between the upstream end of the proposed new levee and Berryessa Road on the west bank, an approximately 2,000-ft long, 9-ft tall floodwall is proposed, as measured from existing grade. From Berryessa Road to Mabury Road, also on the west bank, an additional floodwall is proposed. The length of this floodwall is approximately 2,500-ft with a height of approximately 9-ft, also measured from existing grade, as shown in *Figures 4.11, 4.12 and 4.13*.

Along the east bank within Reach 5, another floodwall is proposed. This wall would be approximately 2-ft high from existing grade and would run approximately 350-ft in length. This flood risk mitigation feature would reduce the risk of flooding for the residential homes along Notting Hill Drive, as illustrated in *Figure 4.12*.

The purpose of all of the flood risk mitigation elements within Reach 5 is to reduce the risk of flooding to the South Bay, River Bend and Golden Wheel Mobile Home Parks as well as to all of the residential, industrial and commercial properties immediately adjacent to the creek in this area which remain subject to flooding.

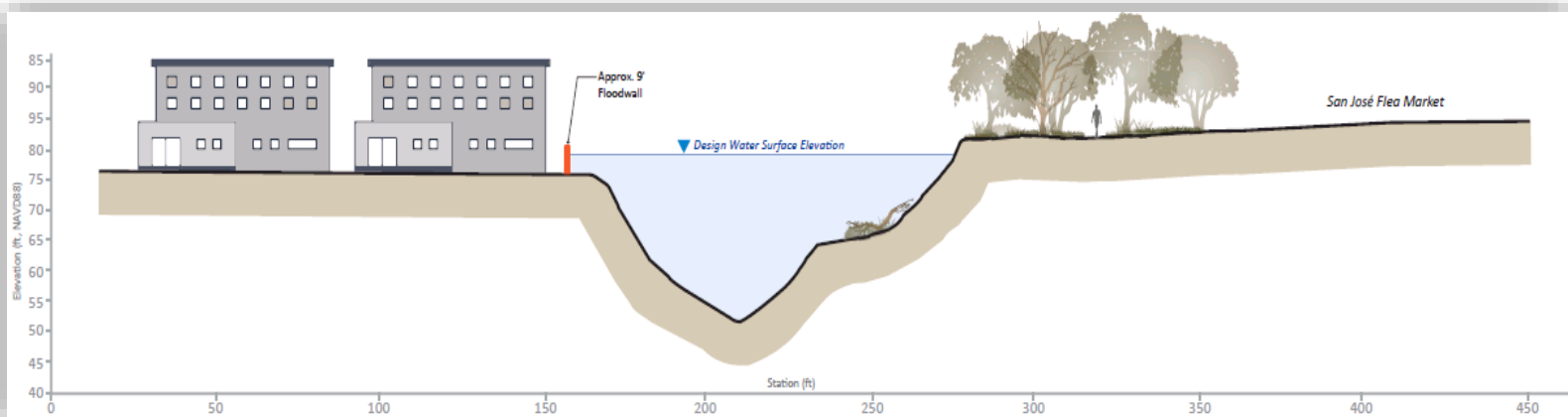


Figure 4.11. Reach 5 – Floodwalls proposed along east and west bank of creek within this reach



## Reach 5

### Old Oakland Road to Mabury Road

Replace and increase the height of embankment from Old Oakland Road to Union Pacific Railroad (UPRR), build floodwalls from UPRR to Mabury Road

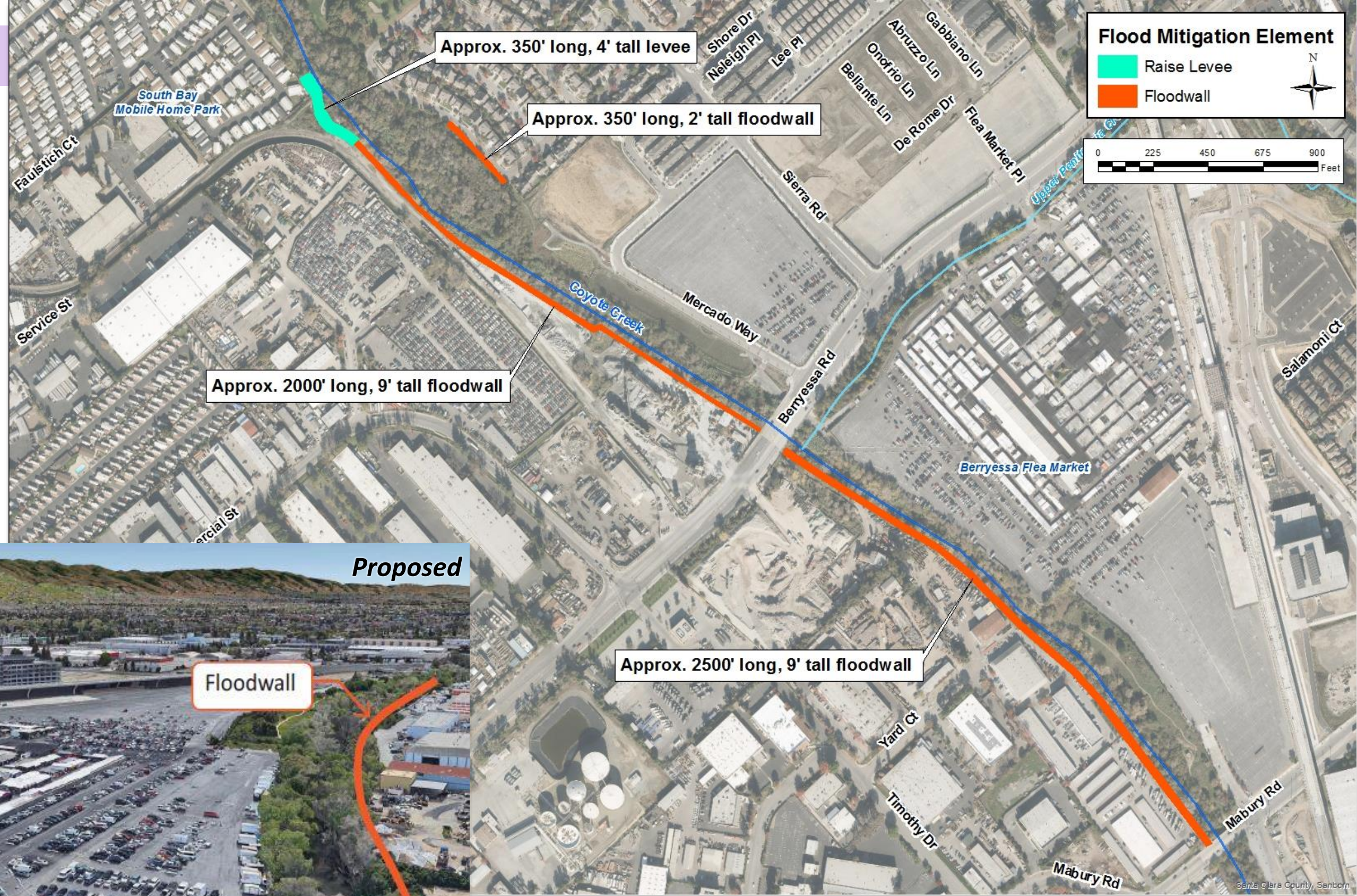


Figure 4.12. Plan View of Reach 5 – Old Oakland Road to Mabury Road – For Feasible Alternative E1, E2, E3, E5, F1, F2, F3 & F5

**FEASIBLE ALTERNATIVE - E1, E2, E3, E5, F1, F2, F3, F5**

Figure 4.13. Upstream of Berryessa Road looking towards San José Flea Market – Approximate location of proposed floodwall



## REACH 6: Mabury Road to Santa Clara Street

Similar to Reach 5, one flood risk reduction option for Reach 6 was selected during the feasible alternative process. The elements considered for this reach include floodwalls along both west and east banks of Coyote Creek from Mabury Road to the Highway 101 crossing. The west bank includes a 6-ft tall floodwall as measured from existing grade with an approximate length of 1,200-ft. Along the east bank, the proposed flood risk reduction mitigation element includes a 3-ft tall floodwall measured from existing grade with an approximate length of 1,100-ft. On the upstream face of the Highway 101 crossing, a 4-ft floodwall as measured from existing grade and oriented parallel to Highway 101 is proposed. This wall will run an approximate length of 350-ft.

Additional floodwalls are also proposed for various portions of Watson Park, which as described in *Section 2.9.2 Trails and Parks*, is owned by the City of San José. Along the western perimeter of Watson Park, and continuing along Jackson Street, a 6-ft tall floodwall as measured from existing grade, and approximately 1,200-ft long is being proposed to protect homes neighboring this area of the park. This floodwall is proposed to replace the existing brick wall along the residential property line. Additionally, a 75-ft long passive flood barrier is proposed to be installed at the entrance of Watson Park on Jackson Street. The passive flood barrier would be embedded into the ground and would automatically deploy under buoyant forces provided by water. The barrier would be approximately 5-ft tall, as measured from existing grade, and will tie into the adjacent floodwall located on the north face of Jackson Street and a short 5-ft berm, also measured from existing grade, and approximately 75-ft in length, located on Watson Park on the south side of Jackson Street.

Along the southern perimeter of Watson Park, a 5.5-ft floodwall above existing ground height is being proposed. This wall would mitigate flood risk for the Empire Gardens Elementary School. The wall would be approximately 250-ft in length.

Two additional floodwalls are being proposed south of Watson Park and east of Coyote Creek. The first one consists of a 2-ft tall floodwall, as measured from existing grade, with an approximate length of 850-ft. This wall would run adjacent to the western perimeter of the Kellogg Factory, which is situated just north of Lower Silver Creek. The second proposed floodwall in this area consists of a 5.5-ft tall floodwall also measured from existing grade, located south of the confluence of Lower Silver Creek and Coyote Creek. This floodwall will run an approximate length of 750-ft and will reduce the risk of flooding to the Parkside Terrace Apartments. All of these elements are illustrated in *Figures 4.14 through 4.17*.



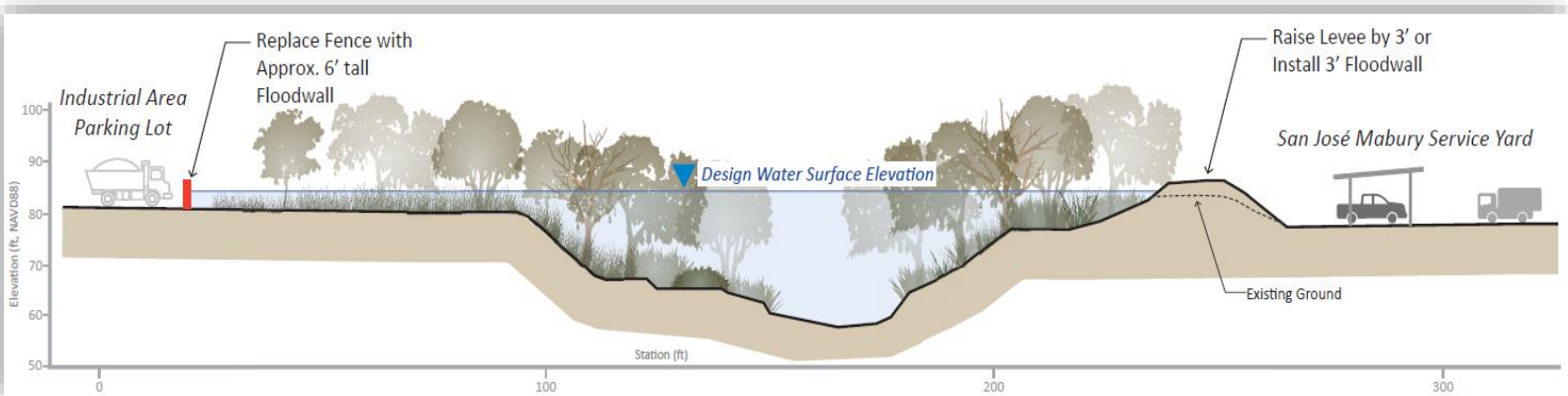


Figure 4.14. Reach 6 – Floodwalls/berm proposed along west and east Coyote Creek top of banks, between Mabury Road and Highway 101

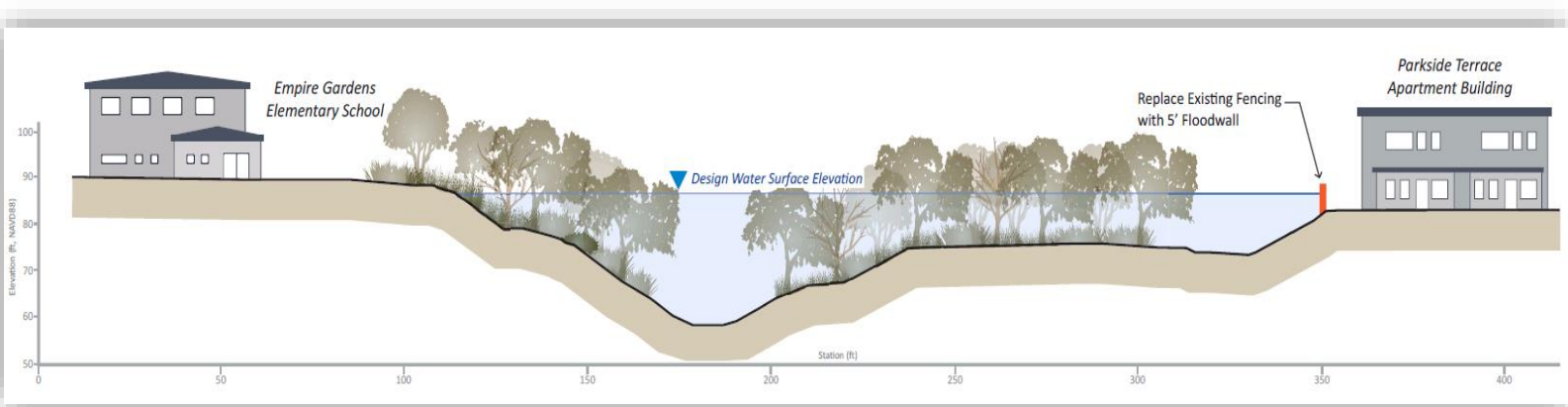


Figure 4.15. Reach 6 – Floodwalls proposed along east Coyote Creek top of banks to reduce the risk of flooding to the Parkside Terrace Apartment buildings





## Reach 6

### Mabury Road to Santa Clara Street

Build floodwalls from Mabury Road to Highway 101, build floodwalls, passive barrier and berm within Watson Park, build floodwalls on east bank between Highway 101 and Julian Street



Figure 4.16. Plan View of Reach 6 – Mabury Road to Santa Clara Street – For Feasible Alternative E1, E2, E3, E5, F1, F2, F3 & F5

**FEASIBLE ALTERNATIVE - E1, E2, E3, E5, F1, F2, F3, F5**

Figure 4.17. Proposed flood risk reduction improvements at Watson Park and immediately upstream of Highway 101



**REACH 7: East Santa Clara Street to Highway 280**

After a comprehensive conceptual alternative analysis process, there were four flood risk reduction options selected for Reach 7 to move forward to the feasible alternatives phase: options A, B, C and D. This reach has the greatest number of elements as compared to the other four reaches. The various elements for each option are listed below and illustrated in *Figures 4.19* through *4.29*. Some sample cross-sections for the various options are shown in *Figures 4.19* through *4.21*. A picture of the existing boundary between the backyard of a residential property located along Arroyo Way and the actual riparian vegetation, bank and creek is shown in *Figure 4.18* to illustrate the proximity of many residential homes located within Reach 7 to the stream corridor.

Option A consists of the following elements:

- Elevation of the following 12 residential structures above the design water surface elevation:
  1. 48-50 South 17<sup>th</sup> Street
  2. 60 South 17<sup>th</sup> Street
  3. 70 South 17<sup>th</sup> Street
  4. 120 Arroyo Way
  5. 150 Arroyo Way
  6. 166 Arroyo Way
  7. 180 Arroyo Way
  8. 398 South 17<sup>th</sup> Street
  9. 797 East William Street
  10. 311 Brookwood Avenue
  11. 315 Brookwood Avenue
  12. 321 Brookwood Avenue
- Installation of a floodwall approximately 550-ft long, 5.5-ft tall behind residential properties with addresses 82 South 17<sup>th</sup> Street and 96 South 17<sup>th</sup> Street
- Installation of a floodwall approximately 100-ft long, 3-ft tall behind residential property with address 329 Brookwood Avenue
- Installation of a floodwall approximately 700-ft long, 9-ft tall along the western boundary of the Coyote Outdoor classroom
- Installation of an approximately 150-ft long, 3-ft tall passive barrier at the entrance of the Coyote Outdoor classroom
- Construction of approximately 1,200-ft long of a 2-ft to 4-ft vegetated berm at the western edge of William Street Park
- Installation of an approximately 400-ft long, 4-ft tall floodwall behind residential properties with addresses 650 and 654 South 16<sup>th</sup> Street
- Installation of an approximately 950-ft long, 5-ft tall floodwall at the west boundary of Olinder Elementary School
- Installation of an approximately 1,750-ft long, 5-ft tall passive barrier at the east edge of Selma Olinder Park



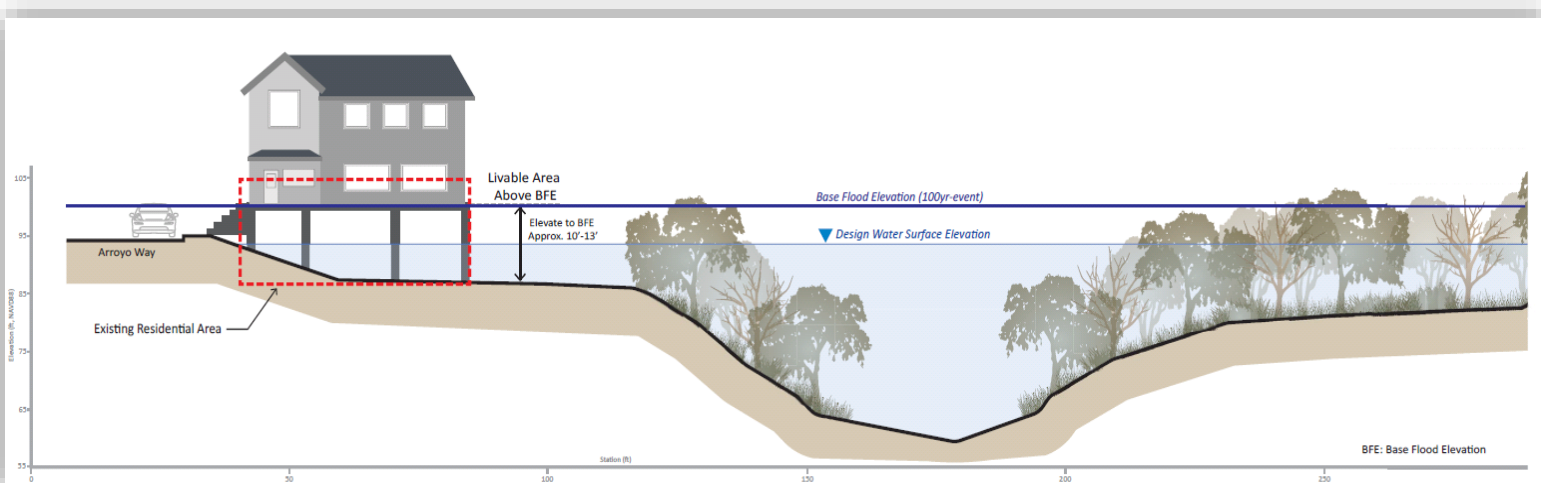
Option B consists of many of the same elements of Option A, except that instead of elevating 12 residential properties above the design flood elevation, the proposed flood risk mitigation element is to acquire the same 12 properties, demolish them and restore the land to a riparian corridor.

Option C consists of many of the same elements of Option A, except that instead of the construction of a vegetated berm along the western edge of William Street Park, this option proposes the installation of approximately 1,200-ft of a 4-ft tall passive barrier. The rest of the elements would remain the same as in Option A.

Option D consists of many of the same elements of Option A, except that the property elevation portion suggests a hybrid approach where some of the 12 properties would be elevated while the rest would be acquired, demolished and restored to a riparian corridor.



*Figure 4.18. Boundary between backyard of residential property located along Arroyo Way and Coyote Creek riparian vegetation, bank and channel*



*Figure 4.19. Reach 7 – Cross-section of residential structure elevation on Arroyo Way as proposed for Options A, C and D*



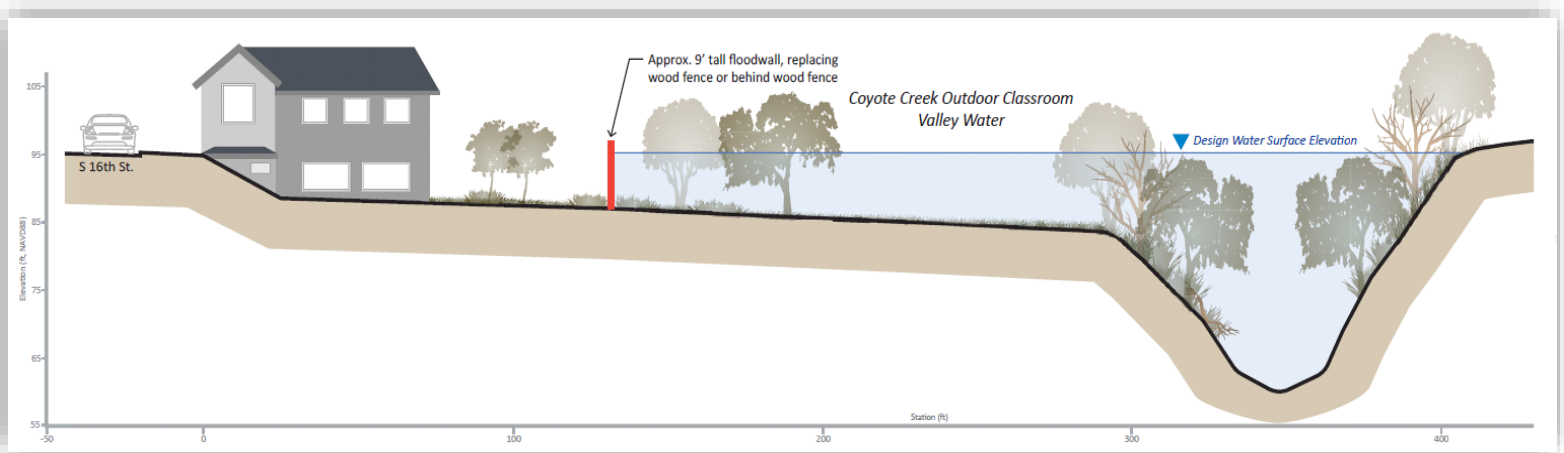


Figure 4.20. Reach 7 – Cross-section of proposed floodwall on the western edge of the Coyote Outdoor classroom per options A, B, C and D

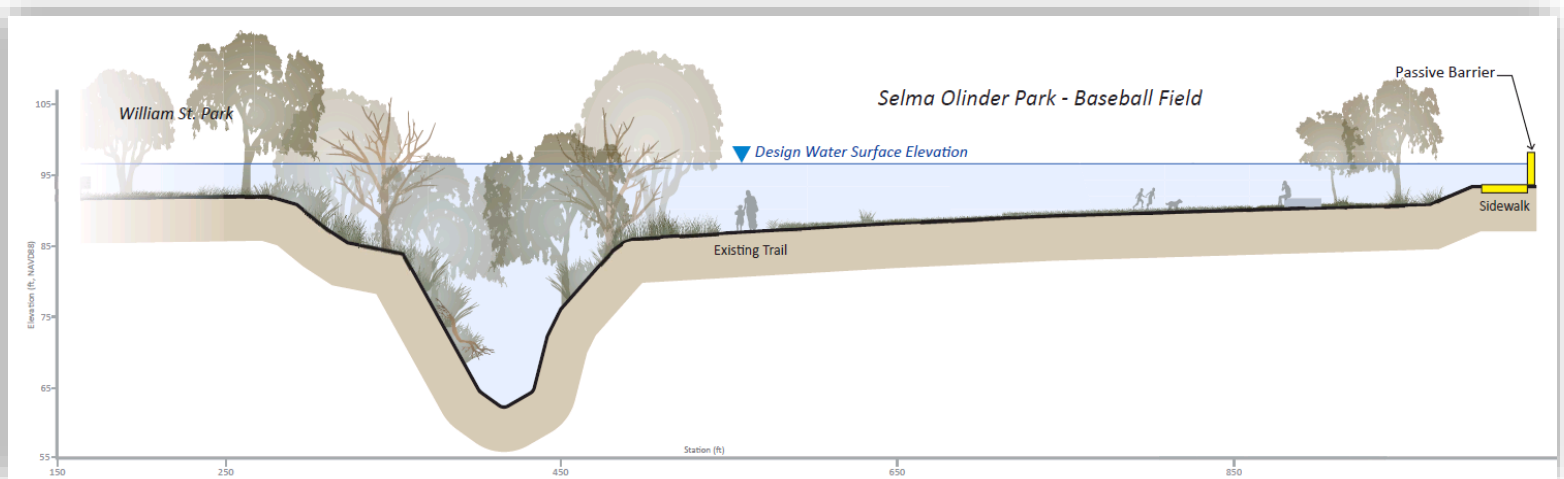


Figure 4.21. Reach 7 – Cross-section of proposed passive barrier on the eastern edge of Selma Olinder Park per Options A, B, C and D





Figure 4.22. Plan View of Reach 7 – East Santa Clara Street to Highway 280 – For Feasible Alternative E1 & F1

## FEASIBLE ALTERNATIVE - E1, F1

### Reach 7 - A

#### Santa Clara Street to Highway 280

Elevate 12 residential properties, build floodwalls, build vegetated berm at edge of William Street Park and install passive barrier at Selma Olinder Park

#### Proposed

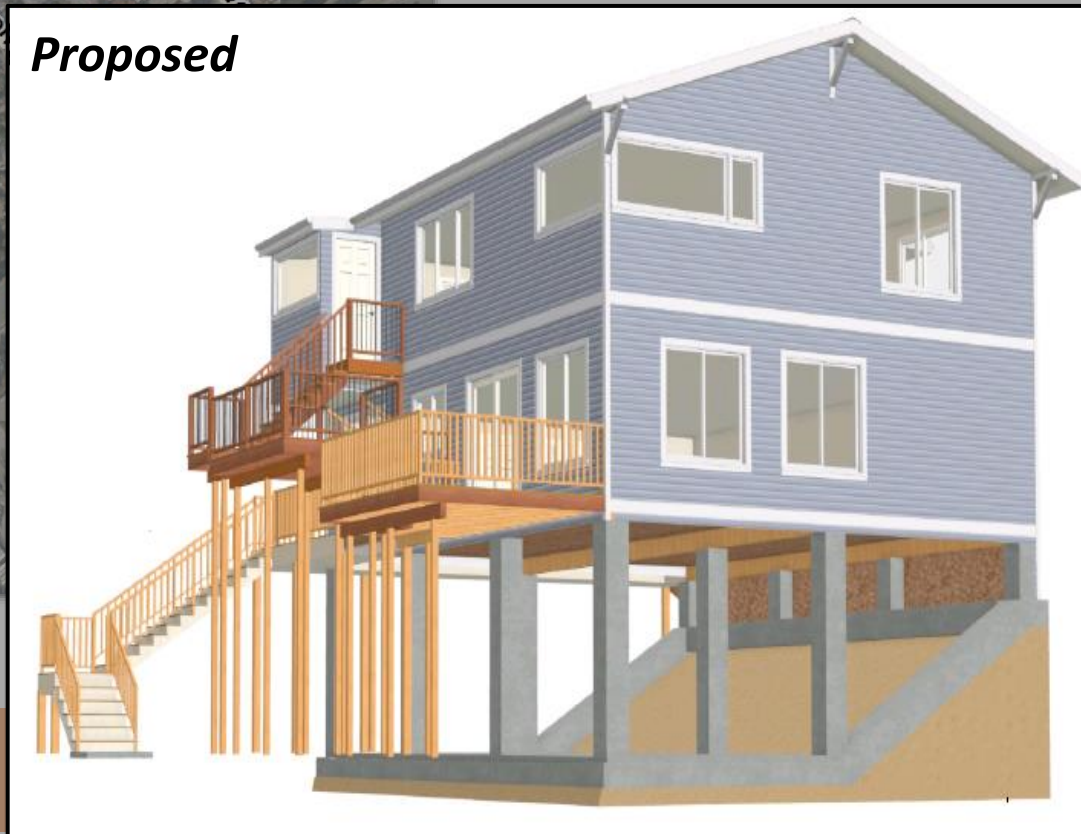


Figure 4.23. Rendering of home elevation – 48-50 South 17<sup>th</sup> Street, San Jose





## Reach 7 - B

### Santa Clara Street to Highway 280

Acquire, demolish and restore riparian corridor for 12 residential properties, build floodwalls, build vegetated berm at edge of William Street Park and install passive barrier at Selma Olinder Park



Figure 4.25. Various renderings of vegetated berms

## FEASIBLE ALTERNATIVE – E2, F2





## Reach 7 - C

***Santa Clara Street to Highway 280***

Elevate 12 residential properties, build floodwalls, install passive barrier at edge of William Street Park and Selma Olinder Park

Figure 4.26. Plan View of Reach 7 – East Santa Clara Street to Highway 280 – For Feasible Alternative E3 & F3

# FEASIBLE ALTERNATIVE – E3, F3



Figure 4.27. Passive barrier sample. Floodproofing element proposed for feasible alternatives E3 & F3





Figure 4.28. Plan View of Reach 7 – East Santa Clara Street to Highway 280 – For Feasible Alternative E5 & F5

## FEASIBLE ALTERNATIVE – E5, F5

### Reach 7 - D

#### Santa Clara Street to Highway 280

Elevate or acquire and demolish selected residential properties, build floodwalls, build vegetated berm at edge of William Street Park and install passive barrier at Selma Olinder Park



Figure 4.29. Various renderings of floodwalls

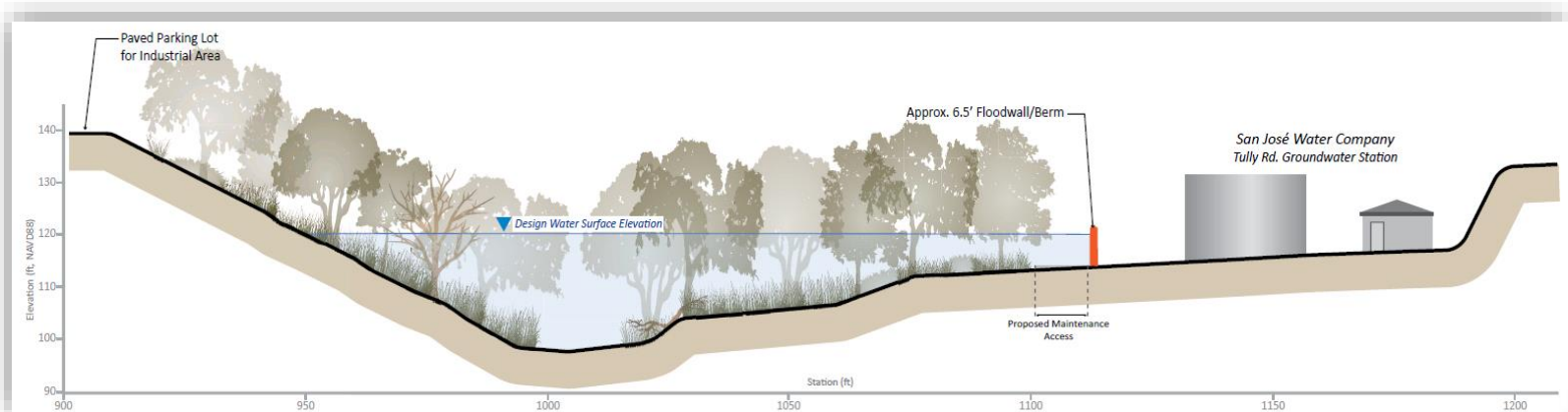


### REACH 8: Highway 280 to Tully Road

Similar to Reaches 5 and 6, one flood risk reduction option for Reach 8 was selected during the feasible alternative process. This option consists of the construction of an approximately 6-ft tall, 350-ft long floodwall along the western bank of the creek, located approximately at the corner of South 12<sup>th</sup> Street and Keyes Street, as indicated in *Figure 4.31*. This floodwall would reduce the flood risk for the Creekside Garden Apartment complex that was constructed within the creek's floodplain. Another floodwall that would need to be constructed consists of the replacement of the temporary floodwall built just east of Rocksprings Park after the February 2017 flood event. The new floodwall would be approximately 4.5-ft tall as measured from existing grade with an extent of approximately 500-ft. The proposed floodwall would connect to a berm with a total length of approximately 1,500-ft and a proposed height of approximately 4.5-ft, as illustrated in *Figure 4.31*. A temporary berm, constructed after the February 2017 flood event, currently exists in the area (see *Figure 4.32*). However, the existing berm would need to be raised and extended.

A third floodwall segment proposed for this reach consists of an approximately 600-ft long, 6.5-ft tall floodwall located along the eastern bank of Coyote Creek, just downstream of Tully Road. This floodwall would reduce flood risk for the neighboring San José Water Company groundwater station which is a critical potable water facility.

A sample cross-section for a floodwall proposed within Reach 8 is illustrated in *Figure 4.30*. All of the previously described elements within Reach 8 are illustrated in *Figures 4.38* and *4.39*.



*Figure 4.30. Reach 8 – Cross-section of proposed floodwall along the western boundary of San José Water Company's Tully Road Groundwater Station*



## Reach 8

### Highway 280 to Tully Road

Build floodwalls east of South 12<sup>th</sup> Street, east of Needles Drive and north of Tully Road, rebuild berm located at Rock Springs neighborhood and extend to Bevin Brook Drive neighborhood



Figure 4.32. Existing berm and floodwall at Rock Springs neighborhood. Location of proposed berm and floodwall in the area is similar to existing. Proposed floodwall and berm would be about 1.5-ft taller than existing.

Figure 4.31. Plan View of Reach 8 – Highway 280 to Tully Road – For Feasible Alternatives E1, E2, E3, E5, F1, F2, F3, F5

**FEASIBLE ALTERNATIVE - E1, E2, E3, E5, F1, F2, F3, F5**



#### 4.4 Alternative Ranking Methodology

The Valley Water Board has adopted Board's End Policy E-3 which main purpose is to achieve a balance between natural resource protection, property protection, community benefits, and cost. The Board's Ends Policy E-3, and more specifically E-3.1.1 provides guidance to planning teams by helping them identify, via a standard evaluation framework, the recommended project alternative. Board's End Policy 3.1.1 specifically describes natural flood protection as "protect[ing] parcels from flooding by applying an integrated watershed approach that balances environmental quality and protection from flooding."

The CEO has also interpreted the Board End's Policy E-3. The CEO's policy interpretation together with the Board's End Policy E-3 goals resulted in ten specific objectives which are the basis for the Natural Flood Protection (NFP) standard evaluation framework. The NFP framework looks to balance environmental quality, community benefit and protection from creek flooding in a cost-effective manner through integrated planning and management that considers the physical, hydrologic and ecologic functions and processes of streams within the community setting. Each NFP Objective is measured through evaluation of one or more criteria. The ten NFP Objectives as well as the associated criteria are listed in *Table 4.3*.

A detailed description of the NFP evaluation framework can be found in the internal Valley Water QEMS work instruction WW75125 – Guidance on Alternative Evaluation and Selection for Natural Flood Protection Projects (See *Appendix D* for complete copy of QEMS - work instruction WW75125).

Similar to the feasible alternatives formulation described in *Section 4.2 Feasible Alternatives Assessment Criteria*, a single alternative ranking process was performed for both CCFMMP and CCFPP combined since this analysis was completed prior to splitting up the original CCFPP. As a result, the selected recommended alternative will include elements for both projects which will be described in detail in *Chapter 5 Recommended Project*.

##### 4.4.1 Applying the NFP Evaluation Framework

To move forward with the selection of the recommended alternative, each of the nine feasible alternatives identified and described in *Table 4.2*, *Section 4.3 Feasible Alternatives*, was rated using the NFP framework. Following this framework ensures that the selected project alternative best meets the Project objectives, desires of the community, and minimizes the net impacts to the environment while being consistent with pertinent regulatory requirements.

Per NFP framework guidance, there are three relative scores that need to be applied to each of the feasible alternatives. The first one is the **Relative Objective Weight** which is a specific weight for each of the NFP Objectives listed in *Table 4.3*. These weights are determined first by the planning team and then fine-tuned through interactions with the community as well as with stakeholders and through consultation with the Deputy Operating Officer as well as the Board. The **Relative Objective Weights** determined for this Project are listed in *Table 4.3*. *Table 4.3* also includes the justifications for the selection of the specific **Relative Objective Weights**.

In addition, each of the criteria associated with the NFP Objectives carry a **Default Weight** (shown in *Table 4.3*). This **Criteria Default Weight** should not be modified since it was predetermined by a group of both internal and external technical advisors when the NFP framework was first developed.



The third score that needs to be applied to each of the feasible alternatives is the **Criteria Rating**. Per the NFP framework, this criteria rating is a customized qualitative or quantitative rating determined by the multi-disciplinary project team. The **Criteria Rating** selected for this Project is listed in *Table 4.4*. As observed in *Table 4.4*, the **Criteria Rating** selected was qualitative (see *Appendix E* for quantitative values). While qualitative values were initially calculated, these mainly assisted the team with the rating of the 36 distinct criteria for the feasible alternatives. However, the qualitative values helped to demonstrate how similar or dissimilar were the final ratings and, as a result, be able to remove some of the feasible alternatives from further consideration.

A completed NFP evaluation rating analysis for these projects is included in *Appendix E*. The NFP rating analysis was discussed, modified and finalized with the assistance of a multidisciplinary project team in April of 2020. The multidisciplinary team included the following staff:

- ❖ **Afshin Rouhani**, Water Policy and Planning Manager
- ❖ **Zooey Diggory**, Senior Biologist
- ❖ **Jennifer Michelsen**, Associate Environmental Planner
- ❖ **José Villarreal**, Public Information Representative, Office of Communications
- ❖ **Michael Potter**, Program Administrator, Office of Communications
- ❖ **Dámaris Villalobos-Galindo**, Associate Engineer

#### *4.4.2 NFP Evaluation Framework Results*

Following the NFP evaluation rating, there were two alternatives that ranked the highest. These include feasible alternatives F2 and F5. *Table 4.5* lists the elements included in each of the two recommended alternatives, including potential real estate implications, and *Table 4.6* shows the summary results for all of the feasible alternatives (see *Appendix E* for complete NFP analysis). As shown in *Table 4.5*, the main difference between alternatives F2 and F5 is in the flood risk reduction elements proposed for Reach 7, specifically the structure elevation versus acquisition, demolition and restoration element.



Table 4.3. Natural Flood Protection Evaluation Framework: Objectives, Criteria and Scoring

NFP Objective	Relative Objective Weight	Justification for Relative Objective Weight Selection	NFP Criteria	Default Criteria Weight
1. Homes, schools, businesses and transportation networks are protected from flooding and erosion	30	During public meetings held in Spring and Fall 2019, attendees expressed that flood protection should be the priority goal for the project. The Valley Water Board members also agree that reducing the risk of flooding to the creek adjacent community should be the main priority.	1.1 Safety	0.30
			1.2 Economic Protection	0.30
			1.3 Durability	0.10
			1.4 Resiliency	0.10
			1.5 Local Drainage	0.10
			1.6 Time to Implementation	0.10
2. Integrate within the context of the watershed	10	While physical, ecological and social Coyote Creek watershed processes were considered during initial development of alternatives, the project aims to contain flood waters by proposing structural solutions mainly away from the channel so as not to disturb the current floodplain. As a result, proposed flood mitigation alternatives do not seek to degrade nor benefit the watershed as a whole.	2.1 Meets local watershed goals	1
3. Support ecologic functions and processes	20	To the extent possible this project will look for opportunities to support locally and regionally appropriate habitat, as well as look for ways to interconnect local habitat with nearby habitat areas to have a resilient ecosystem into the future.	3.1 Meets Local habitat Goals	0.25
			3.2 Quality of Habitat	0.25
			3.3 Sustainability of Habitat	0.25
			3.4 Connectivity of Habitat	0.25
4. Integrate physical geomorphic stream functions and processes	10	Since most alternatives include structural solutions located away from the active channel and active-channel floodplain without necessarily making any profound changes to the flood conveyance corridor, proposed mitigation alternatives do not look into assessing whether the channel has been properly designed to integrate geomorphic processes, and whether energy is appropriately dissipated.	4.1 Floodplain	0.35
			4.2 Active Channel	0.30
			4.3 Stable Side Slopes	0.20
			4.4 Upstream/Downstream Transitions	0.15
5. Minimize maintenance requirements	30	As indicated by the Valley Water Board as well as the public, it is extremely important to propose an achievable long-term operations and maintenance obligation level. This will be done by reducing maintenance requirements by design and by working collaboratively with field-experienced maintenance personnel.	5.1 Structural Features	0.25
			5.2 Natural Processes	0.25
			5.3 Urban Flows	0.25
			5.4 Access	0.25
6. Protect the quality and availability of water	20	To the extent possible this project will look for opportunities to ensure clean, safe water in the creek which is a core Valley Water mission.	6.1 Water Availability	0.30
			6.2 Groundwater Quality	0.25
			6.3 Instream Water Quality	0.30
			6.4 Stormwater Management	0.10
			6.5 Flow Regime	0.05
7. Cooperate with other agencies to achieve mutually beneficial goals	30	Experience in past flood protection projects has indicated that a flood risk reduction project can only be completed in a timely manner if there is early cooperation and collaboration with local jurisdictions to identify common goals and visions. This will ensure not only a more effective completion of the planning, design and construction phases but also ensure the public that the government is working together for them.	7.1 Mutual Local Goals	0.50
			7.2 Supports General Plan	0.50
8. Maximize community benefits beyond flood protection	20	To the extent possible this project will look for opportunities to integrate community benefits beyond flood protection as communicated to the Project Team by the public during public meetings held in the Spring and Fall of 2019.	8.1 Community Safety	0.20
			8.2 Recreation	0.20
			8.3 Aesthetics	0.20
			8.4 Open Space	0.20
			8.5 Community Support	0.20
9. Minimize Life-Cycle costs	30	The costs for the various alternatives will be assessed, compared, and examined as long-term investments rather than one-time capital costs.	9.1 Capital Cost	
			9.2 Maintenance Cost	
			9.3 Grant or Cost-sharing opportunities	
10. Impacts are avoided, minimized or mitigated	30	The expedited projects schedules assume that the flood risk reduction alternative selected does not result in significant detrimental impacts to the environment.	10.1 Compliance with San Francisco Bay or Central Coast Basin Plan	0.50
			10.2 Identify the Least Environmentally Damaging Practicable Alternative (LEDPA)	0.50



Table 4.4. Natural Flood Protection Framework: Quantitative and Qualitative Criteria and Total NFP Rating



























































































NFP Criteria Rating			Total NFP Rating		
Rating Guidance	Quantitative Value	Qualitative Value	Rating Guidance	Quantitative Value	Qualitative Value
Outstanding	5	●	Outstanding	800-1000	●
Very Good	4	◐	Very Good	600-799	◐
Adequate	3	◑	Adequate	400-599	◑
Fair	2	◒	Fair	200-399	◒
Poor	1	○	Poor	100-199	○
Unacceptable	0	⊗	Unacceptable	<100	⊗

Table 4.5. Alternatives selected after applying the Natural Flood Protection Framework

Reach	Recommended Project	
	F2	F5
4. Montague Expressway to Old Oakland Road	B. Install 4' tall passive barriers at Charcot Avenue bridge, build floodwalls upstream and downstream of bridge	Same as F2
5. Old Oakland Road to Mabury Road	A. Replace and increase height of embankment from Old Oakland Road to Union Pacific Railroad (UPRR), build floodwalls from UPRR to Mabury Road	Same as F2
6. Mabury Road to East Santa Clara Street	A. Build floodwalls from Highway 101 to Mabury Road, build floodwalls, passive barriers and berm within Watson Park, build floodwalls on east bank between Highway 101 and Julian Street	Same as F2
7. East Santa Clara Street to Highway 280	B. Acquire, demolish and restore riparian corridor for 12 residential properties, build floodwalls, build vegetated berm at edge of William Street Park and install passive barrier at Selma Olinder Park	D. Elevate or acquire and demolish selected residential properties, build floodwalls, build vegetated berm at edge of William Street Park, and install passive barrier at Selma Olinder Park
8. Highway 280 to Tully Road	A. Build floodwalls east of South 12 <sup>th</sup> Street, east of Needles Drive and north of Tully Road, rebuild berm located at Rock Springs neighborhood and extend to Bevin Brook Drive neighborhood	Same as F2
Approx. Conceptual Capital Cost	\$ 82 M	\$ 80 M
Approx. Yearly Maintenance Cost	\$ 1.3 M	\$1.3 M
Real Estate Implications	Acquisition of 12 residential parcels and obtain permanent easements for approx. 84 public, commercial/industrial, residential properties	Acquisition of 6 residential parcels and obtain permanent easements for approx. 90 public, commercial/industrial, residential properties



Table 4.6. Natural Flood Protection Framework Rating Summary Results for all nine feasible alternatives

NFP Objective	Relative Objective Weight	Summary of Qualitative and Quantitative Criteria Rating								
		Feasible Alternatives								
		E1	E2	E3	E5	F1	F2	F3	F5	H1
1. Homes, schools, businesses and transportation networks are protected from flooding and erosion	30									
2. Integrate within the context of the watershed	10									
3. Support ecologic functions and processes	20									
4. Integrate physical geomorphic stream functions and processes	10									
5. Minimize maintenance requirements	30									
6. Protect the quality and availability of water	20									
7. Cooperate with other agencies to achieve mutually beneficial goals	30									
8. Maximize community benefits beyond flood protection	20									
9. Minimize Life-Cycle costs (Net Present Value)	30	Capital: \$72 M O&M: \$1.2 M	Capital: \$80 M O&M: \$1.3 M	Capital: \$83 M O&M: \$1.2 M	Capital: \$79 M O&M: \$1.3 M	Capital: \$74 M O&M: \$1.2 M	Capital: \$82 M O&M: \$1.3 M	Capital: \$85 M O&M: \$1.2 M	Capital: \$80 M O&M: \$1.3 M	Capital: \$0 M O&M: \$700 K
10. Impacts are avoided, minimized or mitigated	30									
Total NFP Rating										



# ***CHAPTER 5***

## ***RECOMMENDED PROJECT***





## 5. Recommended Project

The design criteria, recommended Project elements and right of way requirements are described in this chapter. The recommended alternative includes elements for both, the CCFMMP and the CCFPP, which were split as part of the ADTP implementation, as described in detail in [Section 3.1 Flooding](#).

### 5.1 Design Criteria

The overall design criteria for the Project is as follows:

- Project baseline conditions consist of meeting the water surface elevation obtained at various locations within the scope of the Project using the design flow event, approximately the 20-year storm recurrence interval (as listed in [Table 5.1](#)), under existing creek and floodplain land use and management conditions. [Table 5.1](#) includes the resultant heights, all above existing ground, (with freeboard) and locations for the proposed flood mitigation elements for both CCFMMP and CCFPP.
- The project elements (e.g., floodwalls, passive barriers) were designed to be 1 ft higher than the estimated water surface elevation.
- Identified flood mitigation elements for the Project will reduce the risk of flooding for the design water surface elevations, which are based on 2017 channel conditions and the design flows in [Table 5.1](#). This means, all property owners must continue to maintain and manage their creek lands appropriately into the future, otherwise the design water surface elevation will not carry the design flow.
- The Project shall meet all regulatory requirements, included but not limited to, review, approval and permitting from the California Department of Fish and Wildlife (CDFW), the San Francisco Bay Regional Water Quality Control Board (SFBRWQCB), the U.S. Army Corps of Engineers (USACE), and possible concurrence from U.S. Fish and Wildlife Service (USFWS), National Marine Fisheries Service (NMFS), or U.S. Environmental Protection Agency (USEPA).

### 5.2 Recommended Project

Even though the Project's objectives, in terms of elements and design flows, are similar for both CCFMMP and CCFPP, each project will be designed and constructed on a different schedule, albeit with overlapping timeframes. As a result, this section illustrates the recommended alternative for each of the two projects separately. The preferred alternative for each of the combined Project was presented virtually to the public and stakeholders on June 10, 11 and 17 of 2020 to obtain input and comments. Received input, as well as letters received as a result of this recent set of meetings are included in [Appendix B](#).

#### 5.2.1 Coyote Creek Flood Management Measures Project (CCFMMP)

The recommended project alternative for the CCFMMP includes elements identified within the entirety of Reach 5 and portions of Reaches 6 and 7 of the Project's extent (see [Figure 1.5](#) for extent of projects). In an updated cost estimate completed in November of 2020, the CCFMMP was approximated to be about 36% of the total estimated cost for the combined Project or about \$33 M (see [Chapter 8 Capital and Maintenance Cost, Funding and Schedule](#) for detailed project costs). [Table 5.1](#) lists the elements included as part of the CCFMMP and [Figures 5.1](#) to [5.3](#) illustrate its various elements.



### *5.2.2 Coyote Creek Flood Protection Project (CCFPP)*

The recommended project alternative for the CCFPP includes elements identified within the entirety of Reaches 4 and 8 and portions of Reaches 6 and 7 of the Project's extent (see *Figure 1.5* for extent of projects). In an updated cost estimate completed in November of 2020, the CCFPP was approximated to be about 64% of the total estimated cost for the combined Project or about \$57 M (see *Chapter 8 Capital and Maintenance Cost, Funding and Schedule* for detailed project costs). *Table 5.1* lists the elements included as part of the CCFPP and *Figures 5.4* to *5.7* illustrate its various elements.



Table 5.1. Staff Recommended Alternative for Coyote Creek Flood Management Measures Project and Coyote Creek Flood Protection Project

Reach	Facility/Area subject to Flooding	Approx. Existing Creek Capacity (cfs)	Design Flow (cfs)	Flood Mitigation Element Type, Height and Length	Project
4	Charcot Ave. Bridge	7,200	9,500	<ul style="list-style-type: none"><li>• 2,450-ft long, 4-ft tall floodwalls on both banks, U/S &amp; D/S of Charcot Ave. bridge</li><li>• Install two 4-ft, 50-ft long passive barriers on roadway at ends of bridge</li><li>• Install one 4-ft, 25-ft long passive barriers on Hartog Drive entrance to Valley Water easement (maintain VW access to its Brokaw Yard)</li></ul>	CCFPP
5	Mobile Home Parks and UPRR Tracks	2,000	9,500	<ul style="list-style-type: none"><li>• 350-ft long, 4-ft tall new levee on west bank south of South Bay Mobile Home Park</li></ul>	CCFMMP
	Notting Hill Dr. and Industrial Area D/S of Berryessa Rd.	1,300	9,500	<ul style="list-style-type: none"><li>• 350-ft long, 2ft tall floodwall on east bank by Notting Hill Dr.</li><li>• 2,000-ft long, 9-ft tall floodwall on west bank, D/S of Berryessa Rd.</li></ul>	
	Industrial Area U/S Berryessa Rd.	4,100	9,100	<ul style="list-style-type: none"><li>• 2,500-ft long, 9-ft tall floodwall on west bank, U/S of Berryessa Rd.</li></ul>	
6	CSJ Mabury Service Yard	7,200	9,100	<ul style="list-style-type: none"><li>• 1,100-ft long, 3-ft tall floodwall on east bank</li></ul>	CCFPP
	RV Storage Lot	4,500	9,100	<ul style="list-style-type: none"><li>• 1,200-ft long, 6-ft tall floodwall on west bank</li></ul>	CCFMMP
	Highway 101	-----	9,100	<ul style="list-style-type: none"><li>• 350-ft long, 4-ft tall floodwall</li></ul>	CCFPP
	Jackson St.	6,500	9,100	<ul style="list-style-type: none"><li>• 75-ft long, 5-ft tall passive barrier across Jackson St.</li></ul>	CCFPP
	Watson Park	2,000	9,100	<ul style="list-style-type: none"><li>• 1,200-ft long, 6-ft tall floodwall at western edge of Watson Park</li><li>• 75-ft long, 5-ft tall berm at Watson Park</li><li>• 250-ft long, 5.5-ft tall floodwall at northern side of Empire Gardens Elementary School</li></ul>	CCFPP
	Kellogg Company	-----	9,100	<ul style="list-style-type: none"><li>• 850-ft long, 2-ft tall wall at western edge of Kellogg Co.</li></ul>	CCFPP
	Parkside Terrace Apartments	-----	8,400	<ul style="list-style-type: none"><li>• 750-ft long, 5.5-ft tall floodwall on east bank</li></ul>	CCFPP
7	South 17 <sup>th</sup> St., north of San Antonio St.	1,600	8,400	<ul style="list-style-type: none"><li>• Acquire, demo and return to natural conditions or elevate properties located at 50 S. 17<sup>th</sup> St., 60 S. 17<sup>th</sup> St. and 70 S. 17<sup>th</sup> St.</li><li>• 550-ft long, 5.5-ft tall floodwall on the backyards of 82 S. 17<sup>th</sup> St. and 96 S. 17<sup>th</sup> St.</li></ul>	CCFMMP
	Arroyo Way	3,200	8,400	<ul style="list-style-type: none"><li>• Acquire, demo and return to natural conditions or elevate properties located at 120 Arroyo Way, 150 Arroyo Way, 166 Arroyo Way, 180 Arroyo Way</li></ul>	CCFMMP
	Brookwood Ave.	4,300	8,400	<ul style="list-style-type: none"><li>• 100-ft long, 3-ft tall floodwall on the backyard of 329 Brookwood Ave.</li><li>• Acquire, demo and return to natural conditions or elevate properties located at 311 Brookwood Ave., 315 Brookwood Ave., and 321 Brookwood Ave.</li></ul>	CCFPP
	South 17 <sup>th</sup> St. south of San Antonio St.	2,600	8,400	<ul style="list-style-type: none"><li>• Acquire, demo and return to natural conditions or elevate the property located at 398 S. 17<sup>th</sup> St.</li></ul>	CCFMMP
	South 16 <sup>th</sup> St. and William Street.	4,000	8,400	<ul style="list-style-type: none"><li>• 700-ft long, 9-ft tall floodwall along the western edge of Coyote Outdoor Classroom</li><li>• Acquire, demo and return to natural conditions or elevate property located at 797 East William Street.</li><li>• 400-ft long, 4-ft tall floodwall along the backyard perimeter of properties 650 S. 16<sup>th</sup> Street and 654 S. 16<sup>th</sup> Street.</li></ul>	CCFMMP
	William St. Park and William St.	2,500	8,400	<ul style="list-style-type: none"><li>• 1,200-ft long, 4-ft tall vegetated berm on western edge of William St. Park</li><li>• 150-ft long, 3-ft tall passive barrier at entrance of Coyote Outdoor Classroom ramp</li></ul>	CCFPP
	Selma Olinder Park and Olinder Elementary School	3,000	8,400	<ul style="list-style-type: none"><li>• 950-ft long, 5-ft tall floodwall located west of Olinder Elementary School</li><li>• 1,750-ft long, 5-ft tall passive barrier at eastern edge of Selma Olinder Park</li></ul>	CCFPP
8	Creekside Garden Apartments	-----	8,300	<ul style="list-style-type: none"><li>• 350-ft long, 6-ft tall floodwall on west bank, north of Keyes St.</li></ul>	CCFPP
	Rocksprings and Bevin Brook Dr. homes	7,400	8,300	<ul style="list-style-type: none"><li>• 500-ft long, 4.5-ft tall floodwall at edge of Rock Springs Park</li><li>• 1,500-ft long, 4.5-ft tall berm east of SJWC station and Bevin Brook Dr.</li></ul>	
	Tully Rd. San José Water Company Groundwater Station	-----	8,300	<ul style="list-style-type: none"><li>• 600-ft long, 6.5-ft tall floodwall on east bank, D/S of Tully Rd.</li></ul>	



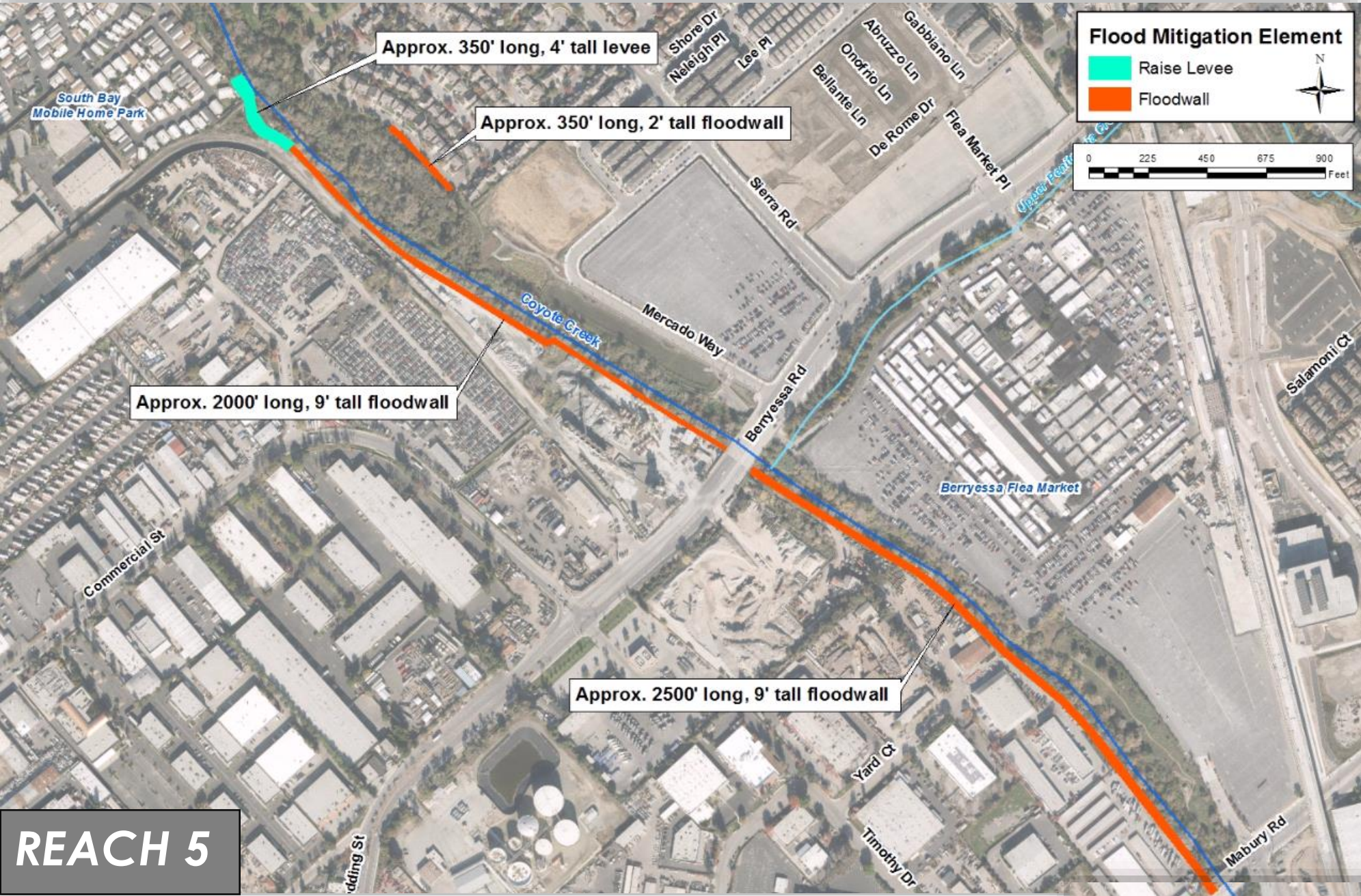


Figure 5.1. Reach 5, preferred CCFMMP Alternative

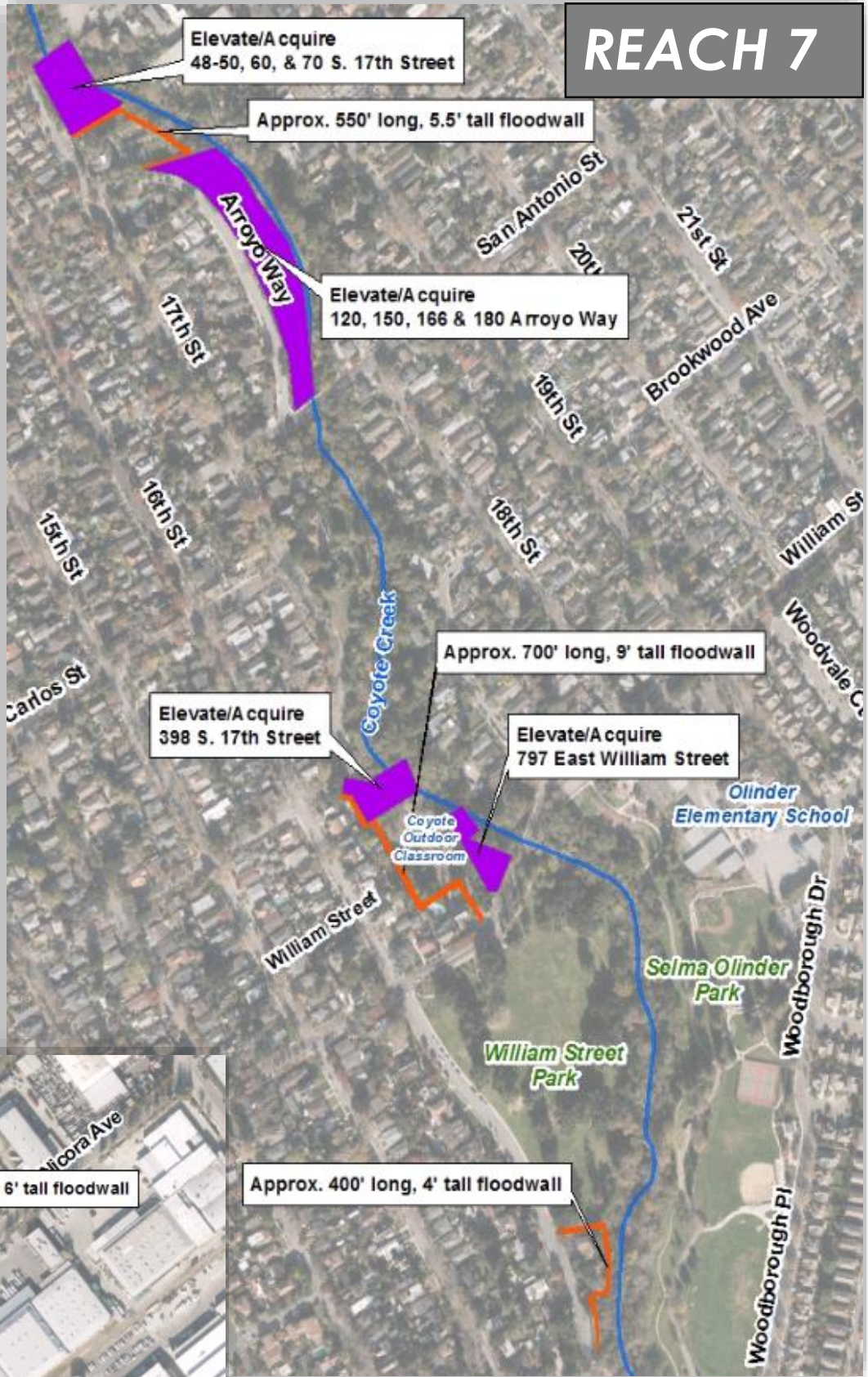


Figure 5.3. Reach 7, preferred CCFMMP Alternative



Figure 5.2. Reach 6, preferred CCFMMP Alternative

**Coyote Creek Flood Management Measures (CCFMMP)**

*Recommended project*



Coyote Creek Flood Protection (CCFPP)  
Recommended project



Figure 5.4. Reach 4, preferred CCFPP Alternative



Figure 5.5. Reach 6, preferred CCFPP Alternative

Figure 5.6. Reach 7, preferred CCFPP Alternative





Coyote Creek Flood Protection  
(CCFPP)  
Recommended project



Figure 5.7. Reach 8, preferred CCFPP Alternative



### 5.3 Right of Way Requirements

The desired Right of Way for the preferred Project elements is described reach by reach below. In addition to the desired Right of Way areas described in the following subsections, Temporary Construction Easement (TCE) areas will likely be needed during Project construction in areas overlapping those described below. However, since the anticipated TCE areas will likely become permanent easements for the long-term inspection and maintenance of flood mitigation elements, the subsections below describe desired permanent easement areas.

#### 5.3.1 *Reach 4: Montague Expressway to Old Oakland Road (CCFPP)*

Right of Way needed for Reach 4 includes a 12-ft wide strip on each side of the proposed floodwalls and passive barriers in addition to the width of the flood risk reduction element which will be further refined during Project design; it was assumed to be 1-ft during the planning stage of the Project (see *Figure 5.8*).

As described in *Section 3.3 Maintenance Concerns and Limited Right of Way* and illustrated in *Figure 5.8*, Valley Water currently owns in fee or has easements in most areas adjacent to the proposed Reach 4 Project elements. However, additional easements would be needed in those Project-adjacent areas where Valley Water does not have Right of Way in order to construct, access and maintain the flood risk reduction elements proposed within Reach 4.

#### 5.3.2 *Reach 5: Old Oakland Road to Mabury Road (CCFMMP)*

Right of Way needed for Reach 5 includes a 12-ft wide strip on each side of the proposed floodwall locations as well as a minimum 20-ft wide strip on each side of the approximately 12-ft top of levee. This is in addition to the width of the flood mitigation element which will be refined during Project design, but it was assumed to be 1-ft for all floodwalls and at least 12-ft wide for the top of levee during the planning stage of the Project (see *Figure 5.9* for Project elements). Some additional access Right of Way needed within Reach 5 was also identified for the Project off Berryessa Road as well as east of Yard Court which is shown in *Figure 5.9*. It is also recommended to pursue permanent easement access from Corie Court south to the new proposed levee east of the South Bay Mobile Home Park, as Valley Water has no formal access to this area.

After the completion of a pedestrian biological assessment within Reach 5 in winter 2020, the Mixed Riparian Forest and Woodland (MRFW) land cover was mapped within this reach. The MRFW land cover mapped area was overlaid on the map of Reach 5, as illustrated in *Figure 5.9*, and the proposed flood mitigation measures within the reach were placed whenever possible at the edge of this land cover type to reduce as much as possible negative environmental impacts within the reach. However, the Right of Way needed for this area might be located within the MRFW land cover type due to the proximity of industrial/commercial buildings to the top of the creek bank, as illustrated in *Figure 5.9*.

As described in *Section 3.3 Maintenance Concerns and Limited Right of Way* and illustrated in *Figure 5.9*, Valley Water currently has limited Valley Water fee or easement areas adjacent to the proposed Reach 5 Project elements. As a result, additional easements would be needed in those areas where Valley Water does not have Right of Way in order to construct, access and maintain the flood risk reduction elements proposed within Reach 5.



### 5.3.3 *Reach 6: Mabury Road to East Santa Clara Street (CCFMMP & CCFPP)*

Right of Way needed for Reach 6 includes a 12-ft wide strip on each side of all proposed floodwall locations, passive barrier locations as well as proposed berm location. This is in addition to the width of the flood mitigation element which will be refined during Project design, but it was assumed to be 1-ft for all floodwalls and passive barrier and approximately 10-ft for the proposed berm during the planning stage of the Project.

Similar to Reach 5, a pedestrian biological assessment was done in winter of 2020 north of Highway 101 which resulted in the MRFW land cover being mapped in this area. The MRFW land cover mapped area was overlaid on the map of Reach 6, as illustrated in *Figure 5.10*, and the proposed flood risk reduction elements within the reach were placed whenever possible at the edge of this land cover type to reduce negative environmental impacts within the reach as much as possible. However, the Right of Way needed within this area might be located within the MRFW land cover area due to the proximity of industrial/commercial/public buildings to the top of the creek bank.

As described in *Section 3.3 Maintenance Concerns and Limited Right of Way* and illustrated in *Figure 5.10* below, Valley Water currently has limited Valley Water fee or easement areas adjacent to the proposed Reach 6 Project elements. As a result, additional easements would be needed in those areas where Valley Water does not have Right of Way in order to construct, access and maintain the flood risk reduction elements proposed within this reach.

### 5.3.4 *Reach 7: East Santa Clara Street to Interstate 280 (CCFMMP & CCFPP)*

Right of Way needed for Reach 7 includes a 12-ft wide strip on each side of the proposed floodwall, proposed passive barrier, as well as the proposed vegetated berm, as illustrated in *Figure 5.11*. This is in addition to the width of the flood risk reduction element which will be refined during Project design, but it was assumed to be 1-ft for all floodwalls and passive barrier and approximately 10 to 20-ft for the vegetated berm. It is assumed that the Right of Way needed for the elevation or acquisition elements within Reach 7 would be the entire parcel, as illustrated in *Figure 5.11*.

Similar to Reaches 5 and 6, a pedestrian biological assessment was done in winter of 2020 within the majority of Reach 7, except for the segment between San Antonio Street to 300-feet south of San Carlos Street, since no flood mitigation elements are proposed in that area. As a result of the biological pedestrian survey, the MRFW land cover was mapped in this area. The MRFW land cover mapped area was overlaid on the map of Reach 7, as illustrated in *Figure 5.11*, and the proposed flood risk reduction elements within this reach were placed whenever possible at the edge of this land cover type to reduce negative environmental impacts within the reach as much as possible. However, the Right of Way needed within this area might be found within the MRFW land cover area due to the close location of residential structures with respect to the creek.

As described in *Section 3.3 Maintenance Concerns and Limited Right of Way* and illustrated in *Figure 5.11*, Valley Water currently has limited Valley Water fee or easement areas adjacent to the proposed Reach 7 Project elements. As a result, additional easements would be needed in those areas where Valley Water does not have Right of Way in order to construct, access and maintain the flood risk reduction elements proposed within this reach.



#### 5.3.5 *Reach 8: Interstate 280 to Tully Road (CCFPP)*

Right of Way needed for Reach 8 includes a 12-ft wide strip on each side of the proposed floodwall and proposed berm, in addition to the width of the flood risk reduction element which will be further refined during Project design but it was assumed to be 1-ft for floodwalls and approximately 10-ft for the berm during the planning stage of the Project (see *Figure 5.12*).

As described in *Section 3.3 Maintenance Concerns and Limited Right of Way* and illustrated in *Figure 5.12*, Valley Water currently has very limited Valley Water fee or easement in those areas adjacent to the proposed Reach 8 Project elements. As a result, additional easements would be needed in those Project adjacent areas where Valley Water does not have Right of Way in order to construct, access and maintain the flood risk reduction elements proposed within Reach 8.





Figure 5.8 Right of Way areas for proposed flood mitigation elements within Reach 4



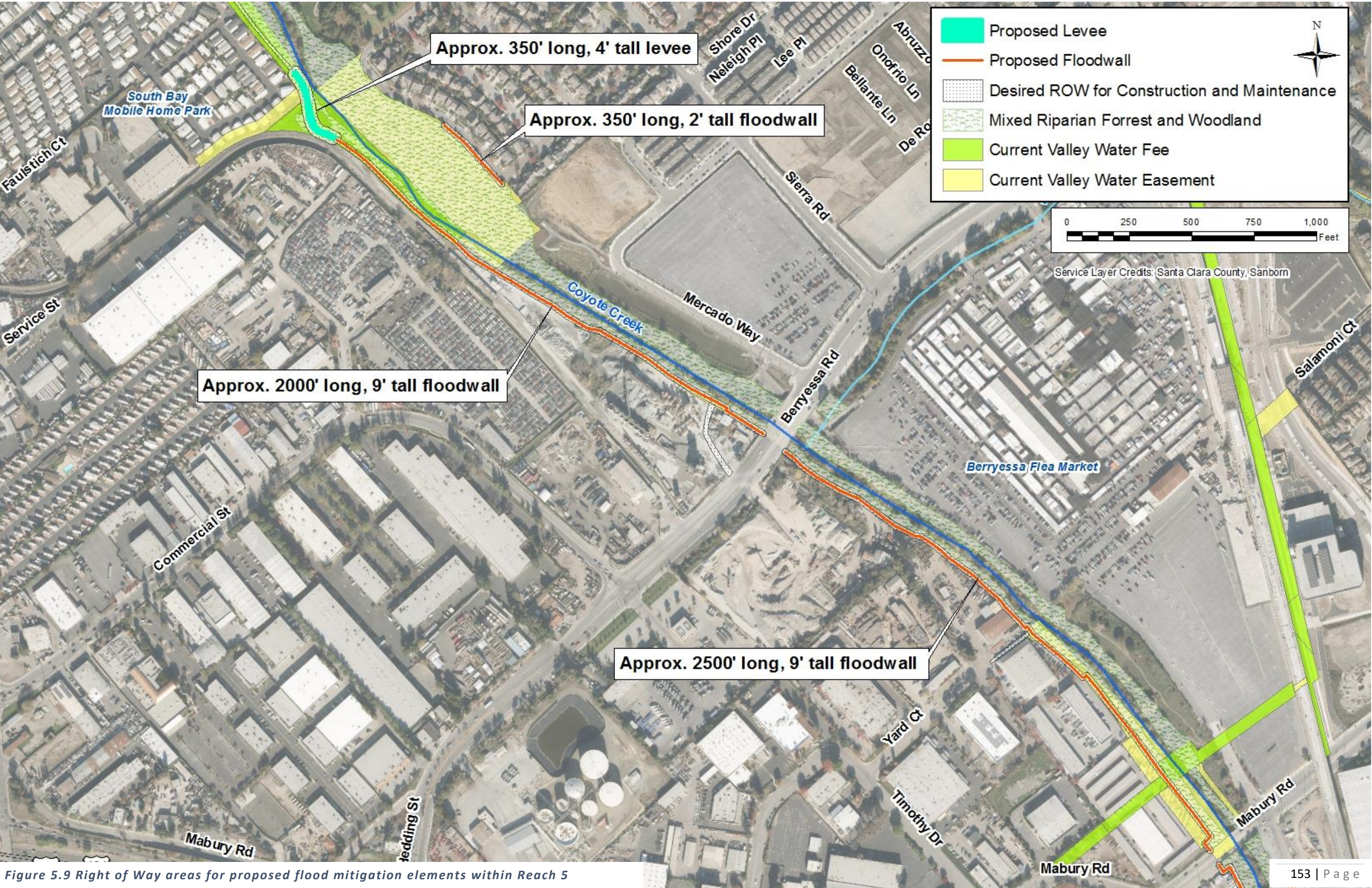


Figure 5.9 Right of Way areas for proposed flood mitigation elements within Reach 5





Figure 5.10 Right of Way areas for proposed flood mitigation elements within Reach 6



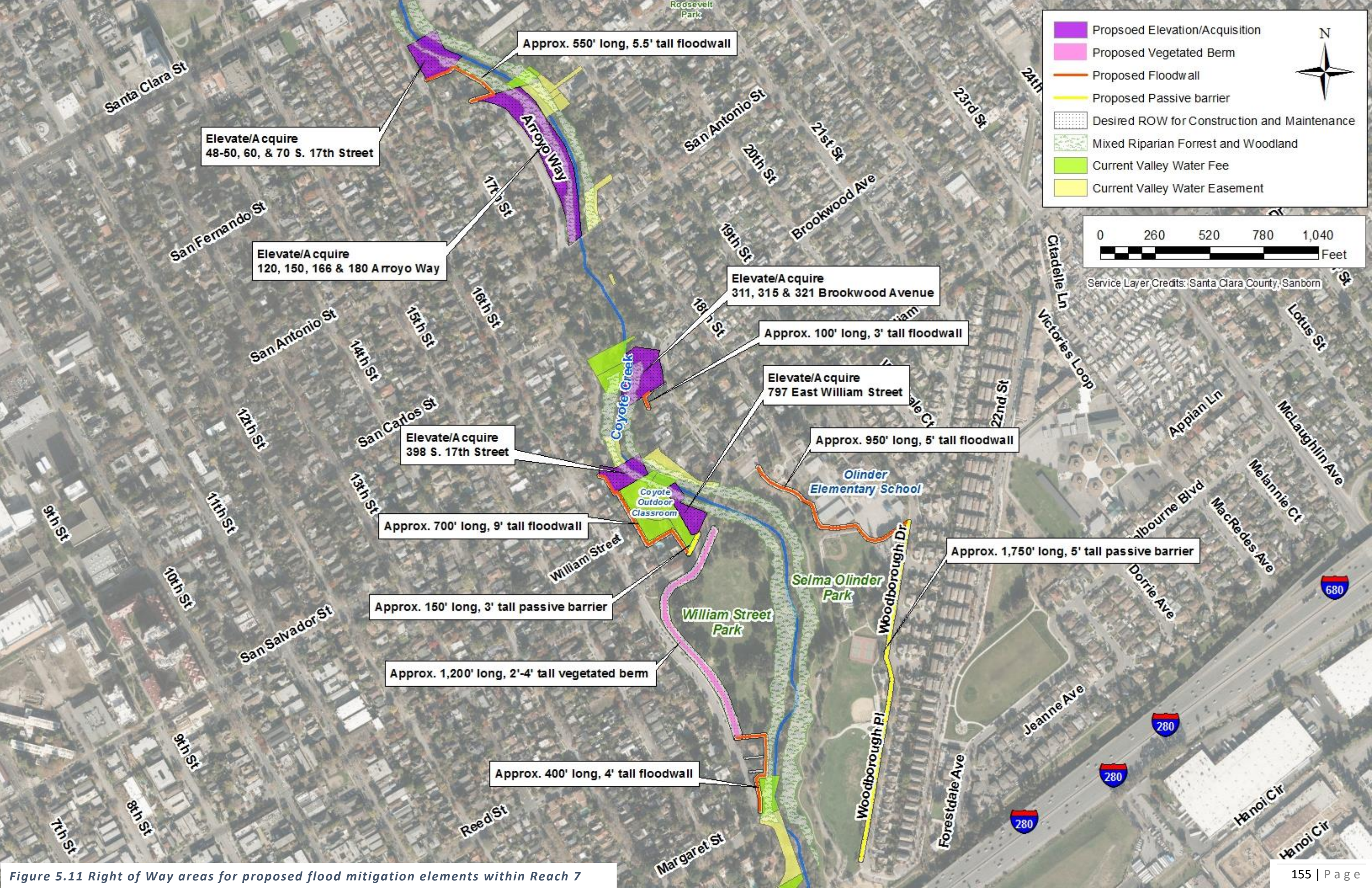


Figure 5.11 Right of Way areas for proposed flood mitigation elements within Reach 7



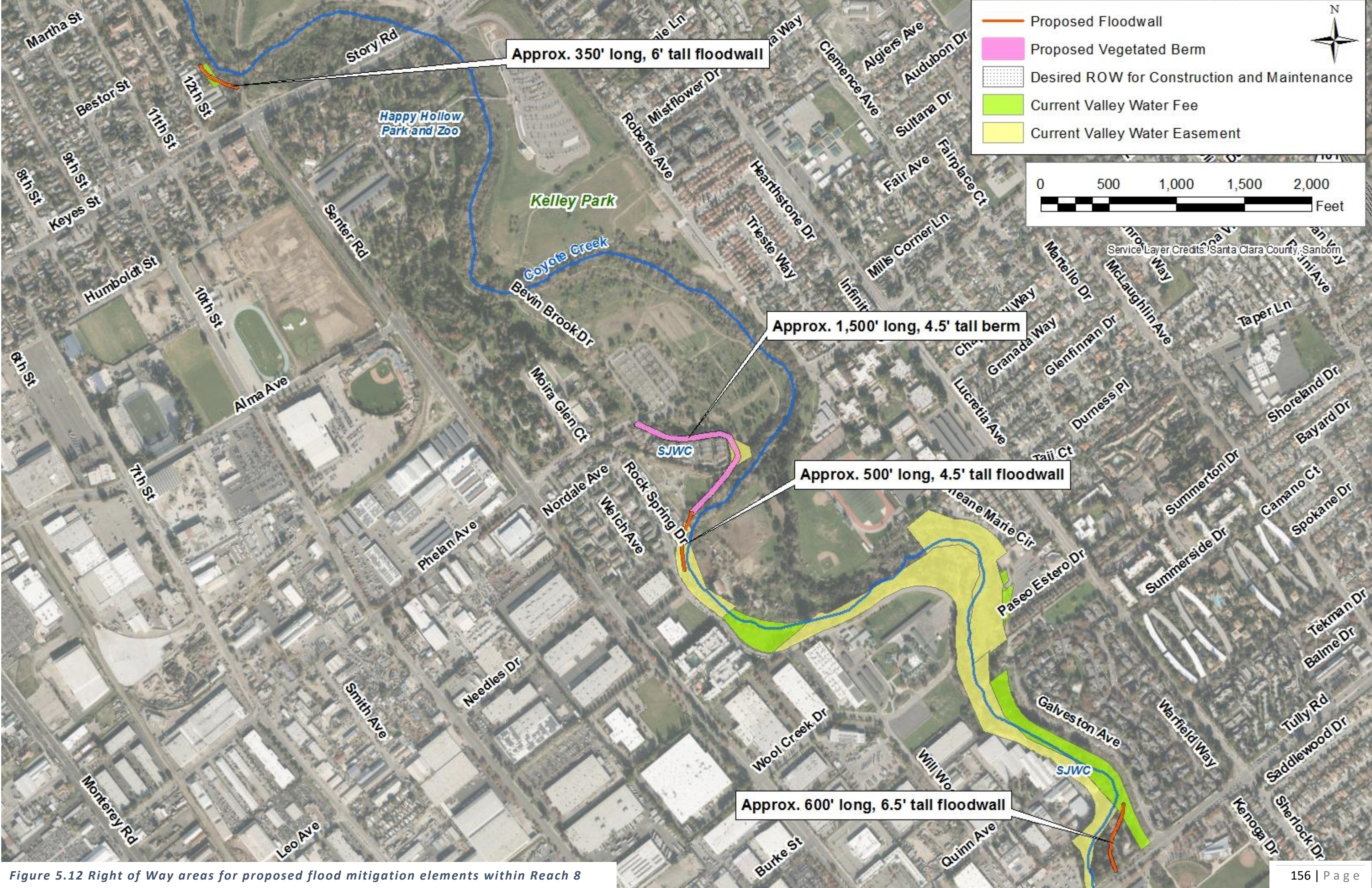
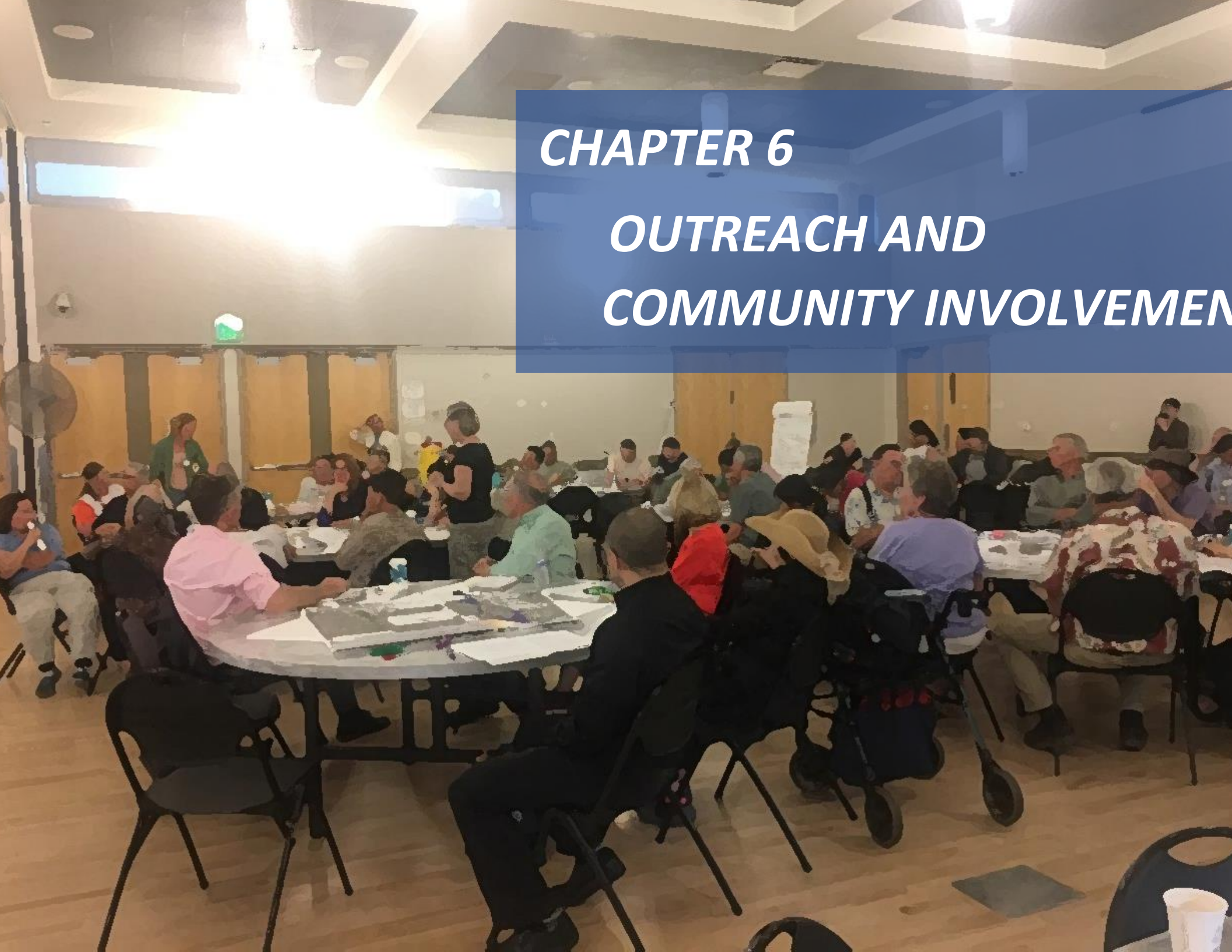


Figure 5.12 Right of Way areas for proposed flood mitigation elements within Reach 8



## *CHAPTER 6*

# *OUTREACH AND COMMUNITY INVOLVEMENT*





## 6. Outreach and Community Involvement

Throughout the planning phase of the Project, outreach and community engagement activities have been organized to gather input from the community, partner agencies, and stakeholders and to incorporate their input and comments into the development of the Project. This chapter details the various types of outreach activities that were completed up until the end of the planning phase (June 30<sup>th</sup>, 2020) to inform the Project. A summary table with information on each of the major outreach meetings organized during the planning phase can be found in *Table 6.1*. A compilation of all public input and comments received can be found in *Appendix B*.

### 6.1 Coyote Creek Flood Risk Reduction Ad Hoc Committee

Following the February 2017 flood event, the Coyote Creek Flood Risk Reduction Ad Hoc Committee was established to develop short-term/immediate solutions associated with the Coyote Creek flood event and Project. Various Ad Hoc Committee meetings were held prior to and during the planning phase of the Project with the latest being held on April 29<sup>th</sup>, 2019. During this planning phase Ad Hoc Committee meeting, the three Committee Valley Water Board representatives attended, including Committee Chair Tony Estremera, Vice Chair Barbara Keegan as well as Director Richard Santos. In addition, approximately 40 residents from the community as well as Valley Water staff were present. Main Project-related points and concerns raised by residents during this meeting included:

- Valley Water to improve and continue coordination and collaboration with City of San José staff regarding trail work, garbage, encampments and water quality issues at the creek
- Need for better vegetation management, development guidelines and best management practices for vegetation management within private property, where feasible

A complete list of input and comments received during the Ad Hoc Committee meeting held in Spring of 2019 can be found in *Appendix B* and logistical details of the meeting can be found in *Table 6.1*. The Ad Hoc Committee was disbanded on February 11<sup>th</sup>, 2020 since the projects have moved to the design phase and are now overseen by the Capital Improvement Project (CIP) Committee at Valley Water.

### 6.2 Public Meetings

Ten public meetings were organized during the planning phase of the Project beginning in Spring of 2019. These public meetings were held at critical milestones during the planning phase. *Table 6.1* includes logistical details on each of the public meetings and a summary of meeting objectives.

The goal of the three meetings organized in Spring of 2019 (one meeting per Valley Water District) was to provide an overview of the flooding issues observed and to present the early conceptual alternatives to the community as well as to solicit input (see *Figure 6.1*). Three meetings were also held in Fall of 2019, at various locations within each of the three affected Valley Water Districts, with the goal of presenting the feasible alternatives to the public and obtain input (see *Figure 6.2*). The last set of three public meetings were held virtually, due to COVID-19, in the summer of 2020 with the goal of presenting the preferred Project alternative to the public and receive input and comments.



An additional meeting with South 16<sup>th</sup> Street and William Street neighbors was organized on January 11<sup>th</sup>, 2020 to inform residents about the proposed plan to reduce the risk of flooding to their community and obtain input of various Project alternatives (see *Table 6.1* for meeting logistics and objectives).

Door-to-door (when possible and safe), email, as well as Nextdoor notifications were provided to residents affected by the proposed Project by the Valley Water Office of Communications prior to all the public meetings. The notifications and flyers distributed were also translated from English to Spanish and Vietnamese in order to be able to reach the diverse community that resides within the projects' extent, as shown in *Figures 6.3* and *6.4*. Individual public comments were compiled in comment matrices for each of the nine public meetings and they can all be found in *Appendix B*.

### 6.3 Inter-Agency Meetings

As previously described, the Project is located in its entirety within the City of San José. As a result, monthly inter-agency meetings were held with staff from the city to coordinate various aspects of the planning phase such as impacts to trails and parks as well as public works, bridge impacts and drainage issues. *Table 6.1* summarizes the inter-agency meeting logistics and details.

### 6.4 Intra-Agency Meetings

Intra-agency meetings and charrettes were also organized throughout the planning phase of the Project. During these meetings and charrettes, a multidisciplinary team including Valley Water environmental planners, operations and maintenance staff, vegetation field operations staff, biologists, hydraulics and hydrology staff, design engineers and communications staff were invited to participate during brainstorming sessions in order to develop the various Project alternatives. *Table 6.1* summarizes the main charrettes organized during the planning



*Figure 6.1. May 21<sup>st</sup>, 2019 – Table set up and public participation*



*Figure 6.2. November 7th, 2019 – Dir. Keegan and project team engaging with public*



phase of the Project. More regular intra-agency planning phase Project team meetings were held bi-weekly throughout the planning phase of the Project.

### 6.5 Additional Stakeholders

On September 26<sup>th</sup>, 2019 a meeting was held with the Valley Habitat Agency (VHA) to explain the projects and brainstorm possible joint work to meet the goals of both agencies. After various attempts were done to continue Valley Water outreach with the VHA and follow up on initial discussions, the planning Project team was unsuccessful in gathering enough interest from the VHA in working together on this Project, and, as a result, the Project team stopped reaching out to VHA.

On January 23<sup>rd</sup>, 2020 a meeting with the San José Parks Advocates organization was held to give an update of the various feasible alternatives and obtain comments, questions and input from the group. Meeting logistics are included in *Table 6.1* and received input and comments from this meeting are listed in *Appendix B*.

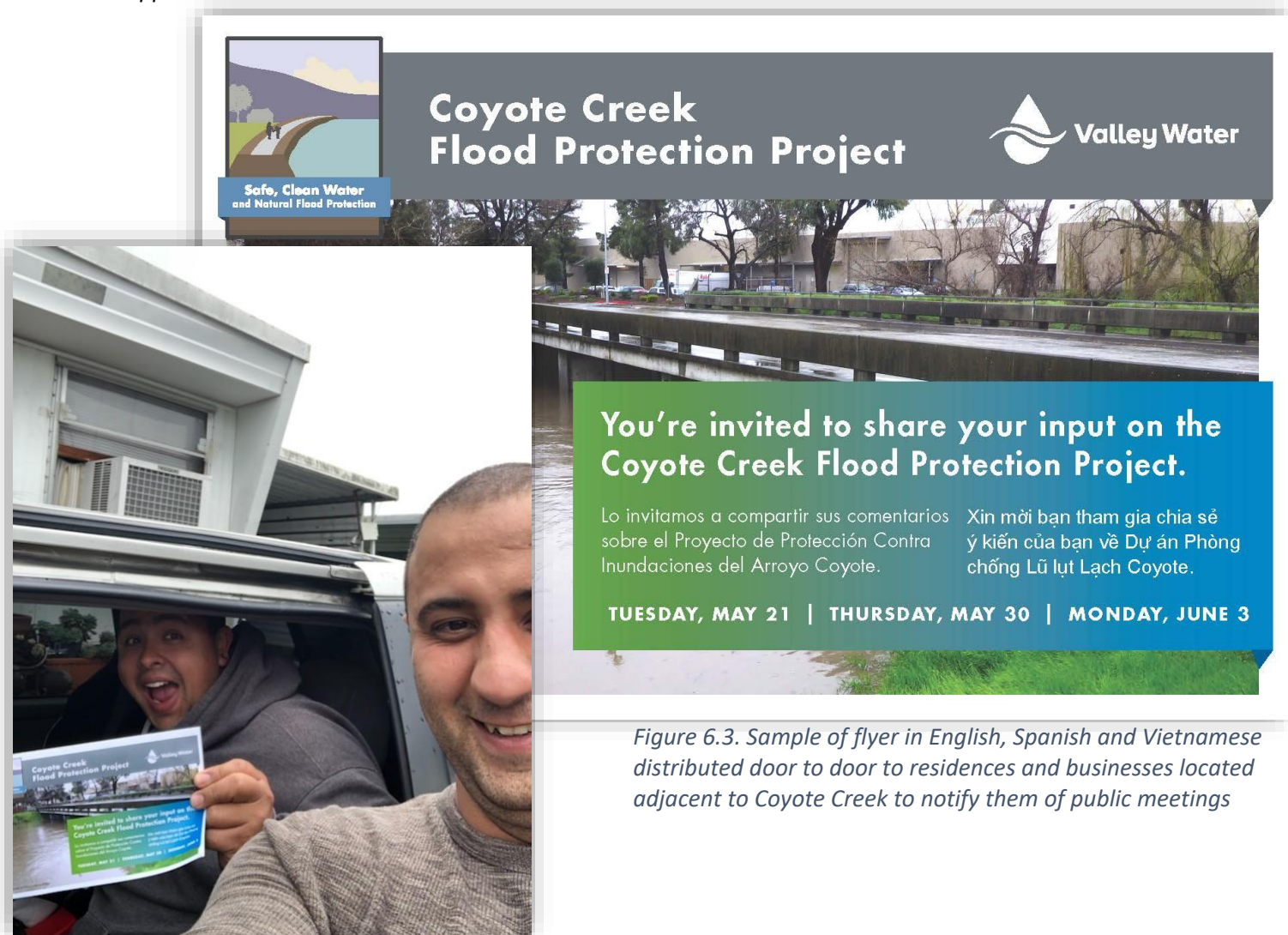


Figure 6.3. Sample of flyer in English, Spanish and Vietnamese distributed door to door to residences and businesses located adjacent to Coyote Creek to notify them of public meetings

Figure 6.4. Delivering public meeting flyers to Golden Wheel Mobile Home Park residents



Table 6.1. Logistical details and information of outreach and community involvement meetings organized during the planning phase of the Project

Meeting Date & Time	Location	Type	Meeting Objective
April 9, 2019, 1:00 pm	Valley Water Administration Building, 5750 Almaden Expressway, San José	Intra-agency Meeting: Conceptual Alternatives Charrette	Provide early conceptual alternatives to various groups within Valley Water and obtain input and recommendations
April 29, 2019, 5:30 pm	Roosevelt Community Center, 901 East Santa Clara Street, San José, CA	Coyote Creek Flood Risk Reduction Ad Hoc Committee	Provide Project updates to Valley Water Board of Directors
May 14, 2019, 4:00 pm	Valley Water Headquarters Building, 5700 Almaden Expressway, San José	Inter-Agency Meeting: City of San José, Parks, Recreation and Neighborhood Services and Public Works	Project coordination meeting with City of San Jose staff
May 21, 2019, 6:30 pm	San José Conservation Corps, 1560 Berger Drive, San José, CA	Public Meeting	Present problem definition and early conceptual alternatives and obtain public input (Target area: Montague Expressway to Mabury Road)
May 30, 2019, 6:00 pm	Franklin-McKinley School District, 645 Wool Creek Drive, San José, CA	Public Meeting	Present problem definition and early conceptual alternatives and obtain public input (Target area: I-280 to Tully Road)
June 3, 2019, 6:00 pm	Roosevelt Community Center, 901 East Santa Clara Street, San José, CA	Public Meeting	Present problem definition and early conceptual alternatives and obtain public input (Target area: Mabury Road to I-280)
June 10, 2019, 1:00 pm	San Jose City Hall, 200 East Santa Clara Street, San José, CA	Inter-Agency Meeting: City of San José, Parks, Recreation and Neighborhood Services	Project coordination meeting with City of San José
July 8, 2019, 1:00 pm	Valley Water Headquarters Building, 5700 Almaden Expressway, San José	Inter-Agency Meeting: City of San José, Parks, Recreation and Neighborhood Services and Public Works	To inform City of San José on project development and obtain input and coordinate on conceptual alternatives for Reaches 4 and 5
August 12, 2019, 1:00 pm	San Jose City Hall, 200 East Santa Clara Street, San José, CA	Inter-Agency Meeting: City of San José, Parks, Recreation and Neighborhood Services and Public Works	To inform City of San José on project development and obtain input and coordinate on conceptual alternatives for Reach 7
September 17, 2019, 3:30 pm	Valley Water Headquarters Building, 5700 Almaden Expressway, San José	Inter-Agency Meeting: City of San José, Parks, Recreation and Neighborhood Services and Public Works	To inform City of San José on project development and obtain input and coordinate on conceptual alternatives for Reach 8
September 26, 2019, 2:00 pm	Valley Water Headquarters Building, 5700 Almaden Expressway, San José	Stakeholders Meeting: Valley Habitat Agency	To present the project elements to the Valley Habitat Agency and brainstorm ways in which they can work in partnership with us on this project
October 3, 2019, 2:00 pm	Valley Water Headquarters Building, 5700 Almaden Expressway, San José, CA	Intra-agency Meeting: Operations and Maintenance Charrette	Discuss vegetation and creek maintenance needs and to establish realistic maintenance goals and schedules
October 23, 2019, 2:30 pm	San Jose City Hall, 200 East Santa Clara Street, San José, CA	Inter-Agency Meeting: City of San José, Parks, Recreation and Neighborhood Services	Project coordination meeting with City of San Jose staff
November 4, 2019, 2:00 pm	San Jose City Hall, 200 East Santa Clara Street, San José, CA	Inter-Agency Meeting: City of San José, Parks, Recreation and Neighborhood Services	Project coordination meeting with City of San Jose staff, Conceptual Visioning Workshop
November 6, 2019, 6:30 pm	Golden Wheel Mobile Home Park (Club House), 900 Golden Wheel Park Drive, San José, CA	Public Meeting	Present feasible alternatives and obtain public input (Target area: Montague Expressway to Mabury Road)
November 7, 2019, 6:30 pm	Franklin-McKinley School District, 645 Wool Creek Drive, San José, CA	Public Meeting	Present feasible alternatives and obtain public input (Target area: I-280 to Tully Road)
November 13, 2019, 6:30 pm	Roosevelt Community Center, 901 East Santa Clara Street, San José, CA	Public Meeting	Present feasible alternatives and obtain public input (Target area: Mabury Road to I-280)
November 21, 2019, 9:30 am	Valley Water Administration Building, 5750 Almaden Expressway, San José	Inter-Agency Meeting: City of San José, Parks, Recreation and Neighborhood Services	Follow up, progress, alignment meeting for City of San José and Valley Water on Mabury Road to Empire Street Trail Project
December 5, 2019, 2:00 pm	Valley Water Administration Building, 5750 Almaden Expressway, San José	Inter-Agency Meeting: City of San José, Parks, Recreation and Neighborhood Services	Follow up, progress, alignment meeting for City of San José and Valley Water on Mabury Road to Empire Street Trail Project
December 9, 2019, 9:30 am	Valley Water Administration Building, 5750 Almaden Expressway, San José	Inter-Agency Meeting: City of San José, Parks, Recreation and Neighborhood Services	Follow up, progress, alignment meeting for City of San José and Valley Water on Mabury Road to Empire Street Trail Project
January 11, 2020, 3:00 pm	Private residence, 450 South 16 <sup>th</sup> Street, San José, California	Neighborhood/Public Meeting	Inform residents about the proposed feasible alternatives in their neighborhood and obtain input (Target area: South 16 <sup>th</sup> Street and William Street)
January 21, 2020, 3:00 pm	San Jose City Hall, 200 East Santa Clara Street, San José, CA	Inter-Agency Meeting: City of San José, Public Works and Department of Transportation	Project coordination between City of San José and Valley Water on proposed flood risk reduction alternatives at Charcot Avenue
January 23, 2020, 7:00 pm	East San José Carnegie Library, 1102 East Santa Clara Street, San José, CA	Stakeholders Meeting: San José Parks Advocates Group	Inform San José Parks Advocates Group about the feasible alternatives to reduce risk of flooding within all parks located throughout the extent of the projects and obtain input from stakeholders
April 3, 2020, 2:00 pm	Virtual Meeting	Inter-Agency Meeting: City of San José, Parks, Recreation and Neighborhood Services	Follow up, progress, alignment meeting for City of San José and Valley Water on Mabury Road to Empire Street Trail Project



Continuation of Table 6.1. Logistical details and information of outreach and community involvement meetings organized during the planning phase of the Project

Meeting Date & Time	Location	Type	Meeting Objective
May 12, 2020, 9:00 am	Virtual Meeting	Inter-Agency Meeting: City of San José, Parks, Recreation and Neighborhood Services	Follow up, progress, alignment meeting for City of San José and Valley Water on Mabury Road to Empire Street Trail Project
June 2, 2020, 4:00 pm	Virtual Meeting	Intra-agency Meeting: Project coordination with Operations and Maintenance	Inform operations and maintenance staff about the preferred alternative selected and get input on approach to creek maintenance
June 10, 2020, 6:00 pm	Virtual Meeting	Public Meeting	Inform residents of preferred project alternative and process to select the preferred project alternative as well as to obtain input and comments (Target area: Montague Expressway to Mabury Road)
June 11, 2020, 6:00 pm	Virtual Meeting	Public Meeting	Inform residents of preferred project alternative and process to select the preferred project alternative as well as to obtain input and comments (Target area: I-280 to Tully Road)
June 15, 2020, 3:00 pm	Virtual Meeting	Inter-Agency Meeting: City of San José, Parks, Recreation and Neighborhood Services	Follow up, progress, alignment meeting for City of San José and Valley Water on Mabury Road to Empire Street Trail Project
June 17, 2020, 6:00 pm	Virtual Meeting	Public Meeting	Inform residents of preferred project alternative and process to select the preferred project alternative as well as to obtain input and comments (Target area: Mabury Road to I-280)
June 23, 2020, 6:00 pm	Virtual Meeting	Board Meeting	Public Hearing on the Engineer’s Report and the CEQA Emergency Exemption Determination for the Anderson Dam Federal Energy Regulatory Commission Order Compliance Project (FOCP); Resolution Approving the Engineer’s Report; and Project Approval for the Anderson Dam FOCP, Project No. 91864005



# **CHAPTER 7**

## **OPERATIONS AND MAINTENANCE PROGRAM**





## 7. Operations and Maintenance Program

As described in *Section 1.3 Project Objectives*, one of the goals of the Project is to minimize the need for future operations and maintenance activities. Coyote Creek, within the nine mile stretch of the Project, is a relatively undisturbed channel surrounded by an active urbanized area. Therefore, preservation and enhancement of intact riparian areas, management of invasive species that might present an obstruction to flow or compromise the proper functioning and condition of the proposed Project elements should be the main priorities of this program. Consequently, operations and maintenance activities identified for this Project are limited to maintaining the proposed flood risk reduction elements and those Right of Way areas needed to maintain those elements, as identified in *Section 5.3 Right of Way Requirements*.

This chapter begins by summarizing the design criteria that will establish a baseline for the operations and maintenance program and those elements and areas that would need to be maintained, then it moves on to identify the triggers that would prompt maintenance activities, and finally it identifies the operations and maintenance activities and inspection frequencies. Due to the expedited nature of this Project, this chapter is meant to be a summary of a more detailed operations and maintenance plan which will be completed during the design phase of this project. Estimated operations and Maintenance Costs can be found in *Chapter 8 Capital and Maintenance Cost, Funding and Schedule* of this report.

### 7.1 Operations and Maintenance Plan Baseline and Target Areas

A 20-year storm recurrence interval under current channel conditions was used to identify the flood risk reduction elements for the Project. Using the 20-year recurrence interval, a minimum water surface elevation at various locations within the scope of the Project was identified based on 2017 conditions. A freeboard of one foot was added to this water surface elevation, which constitutes the Project's design flood mitigation element height. The flood mitigation element height, which is identified in *Table 7.1*, establishes the baseline for the operations and maintenance program for the Project, under normal channel and floodplain land use conditions. *Table 7.1* also identifies the proposed elements for the Project and their locations within Coyote Creek.

### 7.2 Operations and Maintenance Triggers

Operations and maintenance activities would ensure the serviceability of the Project elements in order to reduce the risk of flooding to Coyote Creek adjacent communities (see *Section 3.1 Flooding* which describes flooding issues). These activities would be planned and performed upon identification of clear deficiency triggers. Deficiency triggers are listed in *Table 7.2* for each type of floodproofing element proposed for the Project. *Table 7.2* also includes the section in the Draft Operations and Maintenance Manual which addresses the specific deficiency.

### 7.3 Operations and Maintenance Activities

A list of identified operations and maintenance activities for each type of floodproofing element is summarized in *Table 7.3*.



Table 7.1. Design criteria for both Coyote Creek Flood Management Measures Project and Coyote Creek Flood Protection Project

Reach	Nearby Facility/Area	Design Flow <sup>a</sup> (cfs)	Flood Mitigation Element	Height <sup>b</sup> (ft)	Approx. Length (ft)	Downstream Limit (Station)/Address	Upstream Limit (Station)/Address	Bank Location	Project
4	Charcot Ave. Bridge	9,500	Floodwall	4	575	4104	4639	West	CCFPP
			Passive barrier	4	50	4639	4694	West	
			Floodwall	4	460	4694	135-ft D/S of 4972	West	
			Passive barrier	4	25	135-ft D/S of 4972	110-ft D/S of 4972	West	
			Floodwall	4	465	110-ft D/S of 4972	5164	West	
			Floodwall	4	550	4104	4639	East	
			Passive barrier	4	50	4639	4694	East	
			Floodwall	4	400	4694	5164	East	
5	Mobile Home Parks and UPRR Tracks	9,500	Levee	4	350	13350	13672	West	CCFMMP
	Notting Hill Dr. and Industrial Area D/S of Berryessa Rd.	9,500	Floodwall	9	2000	13672	15766	West	
			Floodwall	9	2500	15888	18268	West	
	Industrial Area U/S Berryessa Rd.	9,100	Floodwall	2	350	13965	14368	East	
6	CSJ Mabury Service Yard	9,100	Floodwall	3	1,100	18567	150-ft U/S of 19459	East	CCFPP
	RV Storage Lot	9,100	Floodwall	6	1,200	18336	19604	West	CCFMMP
	Highway 101	9,100	Floodwall	4	350	19780	20089	East	CCFPP
	Jackson St.	9,100	Passive barrier	5	75	85-ft U/S of 20625	70-ft D/S 20825	West	
	Watson Park	9,100	Floodwall	6	1,200	85-ft D/S 19919	85-ft U/S 20625	West	
			Berm	5	75	137-ft U/S 20625	20825		
			Floodwall	5.5	250	80-ft U/S 21200	100-ft D/S 21400		
	Kellogg Company	9,100	Floodwall	2	850	100-ft D/S 20825	21400	East	
Parkside Terrace Apartments	8,400	Floodwall	5.5	750	40-ft D/S 21585	50-ft D/S 22142	East		
7	South 17 <sup>th</sup> St., north of San Antonio St.	8,400	Acquire/Elevate	12	N/A	70 South 17 <sup>th</sup> Street		West	CCFMMP
			Acquire/Elevate	13	N/A	60 South 17 <sup>th</sup> Street			
			Acquire/Elevate	12	N/A	48-50 South 17 <sup>th</sup> Street			
			Floodwall	5.5	550	40-ft D/S of 26130	80-ft D/S of 26533		
	Arroyo Way	8,400	Acquire/Elevate	7	N/A	120 Arroyo Way		West	
			Acquire/Elevate	8	N/A	150 Arroyo Way			
			Acquire/Elevate	8	N/A	166 Arroyo Way			
			Acquire/Elevate	9	N/A	180 Arroyo Way			
	Brookwood Ave.	8,400	Acquire/Elevate	8	N/A	311 Brookwood Avenue		East	CCFPP
			Acquire/Elevate	8	N/A	315 Brookwood Avenue			
			Acquire/Elevate	7	N/A	321 Brookwood Avenue			
			Floodwall	3	100	100-ft U/S of 28013	75-ft D/S of 28259		
	South 17 <sup>th</sup> St. south of San Antonio St.	8,400	Acquire/Elevate	12	N/A	398 South 17 <sup>th</sup> Street		West	CCFMMP
	South 16 <sup>th</sup> St. and William Street.	8,400	Floodwall	9	700	28441	28920		
			Acquire/Elevate	8	N/A	797 East William Street			
			Floodwall	4	400	150-ft D/S of 30403	25-ft U/S of 30599		
	William St. Park and William St.	8,400	Vegetated berm	4	1,200	28965	150-ft U/S of 30173	West	
			Passive barrier	3	150	28920	28920		
	Selma Olinder Park and Olinder Elementary School	8,400	Floodwall	5	950	29016	100-ft D/S of 29540	East	CCFPP
			Passive barrier	5	1,750	100-ft D/S 29540	85-ft D/S 31032		
8	Creekside Garden Apartments	8,300	Floodwall	6	350	35-ft U/S of 33167	30-ft D/S of 33457	West	CCFPP
	Rocksprings and Bevin Brook Dr. homes	8,300	Floodwall	4.5	500	130-ft U/S of 40967	90-ft D/S of 41567		
			Berm	4.5	1500	40067	150-ft U/S of 40967		
	Tully Rd. San José Water Company Groundwater Station	8,300	Floodwall	6.5	600	145-ft D/S of 46667	47188	East	

Notes: a. 20-year storm recurrence interval. b. Flood risk reduction element design height based on existing grade elevation.



Table 7.2. Operations and Maintenance Triggers identified for all flood mitigation elements proposed for the Project

Flood Mitigation Element	Component	Operations and Maintenance Trigger	O&M Manual Section
Floodwall	Coating	For sheetpile floodwalls, observed damage to coating such as penetration, chipping, or corrosion	TBD
	Structure	Observed damage to structure, alignment or foundation, concrete deterioration, exposure of steel and wear, significant floodwall deflections from established survey control points	TBD
	Vegetation	Vegetation growth that obstructs outboard and inboard inspection of floodwall, observed overhanging growth	TBD
	Vandalism	Observed graffiti markings on floodwall or removal of signage or vandalism	TBD
Passive Barrier	Gate Panel	Debris/litter accumulation in panel, visible damage to panel, pan or sidewalls, gasket wearing or lack of lubrication and damage to hinges	TBD
	Vegetation	Vegetation growth on gate panel or any component	TBD
	Vandalism	Observed graffiti on panel, removal of parts or visible damage	TBD
Levee	Structure	Observed levee deflections and settlement of more than one foot	TBD
	Crown	Erosion of levee crown, observed animal burrows, damage to crown integrity, slumps and cracks	TBD
	Slopes/banks	Erosion of slopes, scouring that undercuts banks, animal burrows, seepage, slumps and cracks	TBD
	Vegetation	Vegetation growth that obstructs inspection of levee or compromising its integrity, observed woody vegetation establishment	TBD
Berm	Slopes	Erosion of slopes, structural integrity, lack of compaction, seepage, slumps, cracks	TBD
	Access Roads	Surface damage to access roads and ramps	
Acquisition	Vegetation	Maintain riparian vegetation and removal of invasive vegetation growth	TBD
	Vandalism	Fencing and sign damage, unauthorized access, littering	TBD
	Encampments	Observed encampments anywhere within the acquired parcel, littering, removal/burning of riparian vegetation	TBD
Structure Elevation	Access	Blocked access to inspections	TBD
	Structure	Damage to columns/piles, unauthorized structural attachments	TBD
	Enclosures	Observed addition of enclosure walls within perimeter of structure elevation	TBD
Maintenance Roads/Trails and Access Ramps	Roads	Surface damage to access roads/blockage	TBD
	Ramps	Surface damage to ramps/blockage	TBD
	Vegetation	Observed vegetation growth hindering access to roads or ramps, hazardous tree conditions, channel blockages	TBD
	Encampments	Observed encampments blocking access to roads or ramps	TBD
Miscellaneous	Line of sight	Observed blockage to line of sign during inspection of project elements such as from access roads and bridges, hazardous tree conditions, channel blockages	TBD
	Fencing, signs, graffiti	Observed graffiti, fence and sign damage within areas containing project elements	TBD
	Theft/Vandalism	Removal of any project components or parts of them, destruction or damage to project elements, littering	TBD
	Unauthorized encroachments	Unauthorized obstructions and/or additions to areas of project elements or Valley Water Right of Way	TBD
	Encampments	Observed encampments obstructing inspection passage, repair activities or visual inspections of project elements or Valley Water Right of Way	TBD



Table 7.3. Operations and Maintenance Activities identified for all flood risk reduction elements proposed for the Project

Flood Mitigation Element	Component	Operations and Maintenance Activities
Floodwall	Coating	For sheetpile floodwalls, recoat floodwall or repair coating
	Structure	Repair structural deterioration, consult structural engineer to analyze significant floodwall deflections and repair as needed in order to maintain floodwall to design specifications
	Vegetation	To allow inspection of the outboard and inboard side of floodwalls, remove vegetation via hand removal, mechanical removal or chemical treatment
	Vandalism	Paint and repair any defaced surfaces, repair or replace items that have been stolen or vandalized
Passive Barrier	Gate Panel	Power wash any accumulated debris in gate panel and repair or replace any damaged components, lubricate or replace gaskets as needed. Test passive barrier by allowing it to raise
	Vegetation	To allow inspection of passive barrier and components, remove vegetation growth via hand or mechanical removal
	Vandalism	Pain defaced surfaces, repair or replace stolen or damaged components
Levee	Structure	Excavate, repair or reconstruct levee embankments due to deflection, seepage, slumps, cracks, rodent burrows, scour and/or erosion in order to maintain full levee section to design specifications
	Crown	Reconstruct or repair levee crown due to sags, depression or groundwater subsidence to design specifications
	Slopes/banks	Excavate, repair or reconstruct levee slopes due seepage, slumps, cracks, rodent burrows, scour and/or erosion in order to maintain full levee section to design specifications. Use rodent abatement program to control burrowing animal damage
	Vegetation	To allow inspection of the outboard and inboard side of levees, remove vegetation via hand removal, mechanical removal or chemical treatment. Cut and remove woody growth compromising the integrity of the levee via hand or mechanical removal methods, excavate roots and follow up with herbicide to prevent regrowth.
Berm	Slopes	Excavate, repair or reconstruct berm slopes due to seepage, slumps, cracks, rodent burrows, scour and/or erosion in order to maintain full berm section to design specifications. Use a rodent abatement program to control burrowing animal damage.
	Access Roads	Repair access roads and pathways to design specifications, remove woody vegetation and overhanging growth which impairs or obstructs maintenance access.
Acquisition	Vegetation	Replant or reseed riparian vegetation, irrigate if necessary, and remove invasive vegetation
	Vandalism	Repair or replace any fencing and sign damage and remove littering
	Encampments	Monitor, evaluate and repair impacts from encampments, abate encampments with the assistance from local authorities
Structure Elevation	Access	Remove access obstructions, coordinate with property owner to remove any obstructions in order to inspect project elements
	Structure	Structural deterioration should be the responsibility of the property owner.
	Enclosures	Notify property owners of deed restrictions regarding construction of enclosed elements within flood risk mitigation area, instruct removal of enclosures which is to be done by property owner
Maintenance Roads/Trails and Access Ramps	Roads	Repair access roads and pathways to design specifications
	Ramps	Repair ramps to design specifications
	Vegetation	Removal or pruning of vegetation encroaching access roads and ramps using hand removal, mechanical removal or chemical removal. Cut, prune, or remove landscape ground covers, brush and ornamentals which encroach onto access roads and ramps.
	Encampments	Monitor, evaluate and repair impacts from encampments, abate encampments with the assistance from local authorities
Miscellaneous	Line of sight	Remove vegetation that impedes any line of sign to project elements including from observation points at bridges, access roads and pathways. Remove any observed hazardous tree conditions or channel blockages observable from areas adjacent to project elements.
	Fencing, signs, graffiti	Paint and repair any defaced surfaces, repair or replace items that have been stolen or vandalized including fencing and sign damage within areas containing project elements or adjacent to project elements
	Theft/Vandalism	Repair or replace any components which are damaged or stolen, remove littering within project components location or Right of Way
	Unauthorized encroachments	Remove unauthorized encroachments within Right of Way, notify adjacent property owners to remove unauthorized encroachments if they are the responsible party, provide neighborhood notice if work is necessary to remove encroachments
	Encampments	Monitor, evaluate and repair impacts from encampments, abate encampments with the assistance from local authorities



### 7.4 Inspection Frequency

Flood risk mitigation elements should be fully inspected on an annual basis. In addition, event-driven inspections should take place during or immediately after a natural hazard such as a large storm event, a flood, an earthquake or any other event having the potential to damage the flood mitigation elements or create hazards for public safety.



## ***CHAPTER 8***

# ***CAPITAL AND MAINTENANCE COST, FUNDING AND SCHEDULE***





### 8. Capital and Maintenance Cost, Funding and Schedule

This chapter describes in detail the estimated planning level capital cost, operations and maintenance cost, and life cycle cost for both, the CCFMMP and the CCFPP. It also presents the Project's funding sources and the tentative schedules.

#### 8.1 Estimated Capital Cost

Planning level capital cost estimates for the various feasible Project alternatives were prepared. Once the Natural Flood Protection (NFP) evaluation framework was completed (see [Section 4.4 Alternative Raking Methodology](#) for details on NFP process), the estimated capital cost for the preferred Project alternative was revised and resulted in an estimated total of \$90 M (combination of CCFMMP and CCFPP). However, since each project is funded separately and on a different schedule, the estimated total capital cost was determined for each project and a summary cost can be found in *Table 8.1* for the CCFMMP and in *Table 8.2* for CCFPP. Detailed reach by reach estimated planning level capital costs for each of the two projects can be found in *Appendix F*. As observed in *Tables 8.1* and *8.2*, based on capital cost, the CCFMMP represents about 36% of the combined cost for the Project and, hence, 36% of the original Board directed Coyote Creek Flood Protection Project, as described in [Section 1.1 Project Origin](#), and the CCFPP represents 64% of the total capital cost of the Project or 64% of the original project.

*Table 8.1. Estimated planning level capital cost for the Coyote Creek Flood Management Measures Project*

Phase	Estimated Amount <sup>a</sup>
Planning	\$0 <sup>b</sup>
Environmental	\$200,000
Design	\$2,400,000
Right of Way	\$16,240,000
Construction	\$13,720,000
Close Out	\$100,000
<b>Total</b>	<b>\$32,700,000</b>

**Notes:** a. Estimated amount is in 2020 dollars. b. Planning work was assigned to CCFPP.

*Table 8.2. Estimated planning level capital cost for the Coyote Creek Flood Protection Project*

Phase	Estimated Amount <sup>a</sup>
Planning	\$9,724,000
Environmental	\$1,514,000
Design	\$5,300,000
Right of Way	\$10,400,000
Construction	\$30,300,000
Close Out	\$110,000
<b>Total</b>	<b>\$57,400,000</b>

**Notes:** a. Estimated amount is in 2020 dollars.



### 8.2 Estimated Operations and Maintenance Cost

Once a flood protection project is constructed, it is expected for the improvements to have a life of a minimum of 50 years if properly maintained. As a result, the total 50-year life cycle cost of a project includes not only the initial capital expense but, most importantly, the cost of operating and maintaining the constructed elements over their expected life.

Because operations and maintenance costs need to be forecasted, captured and planned over the long term (50 years), in August 2018, Watershed Operations and Maintenance Division staff organized a multi-disciplinary team meeting to work on the long-term forecasting of operations and maintenance cost impacts for capital improvement projects currently in planning or design in order to better determine future resource needs and communicate any resource gaps to the Valley Water Board. One of the main action items that came out of the August 2018 multidisciplinary meeting was that in order for the Watersheds Operations and Maintenance Division to better plan for needed resources in the long term, each year in July, project managers would provide to operations and maintenance (O&M) staff the estimated long-term impacts of capital projects once constructed and delivered to O&M. Since 2018, the operations and maintenance cost estimation has been done yearly via a spreadsheet template prepared and partially prepopulated by the O&M team and completed by each project manager.

Using as basis the maintenance work described in [Chapter 7 Operations and Maintenance Program](#) for this report, the O&M spreadsheet template was completed for each of the two projects, CCFMMP and CCFPP, and are presented in [Appendix F](#). A summary of the estimated operations and maintenance cost for each project is presented in [Table 8.3](#).

*Table 8.3. Estimated operations and maintenance costs for the CCFMMP and the CCFPP*

Type	CCFMMP	CCFPP
Estimated Annual O&M Cost	\$252, 000	\$469,000
Useful Life (years)	50	50
O&M over useful life (2020 dollars)	\$12,600,000	\$23,500,000

### 8.3 Project Life Cycle Cost

To better grasp the impacts of a capital project from inception to the end of its useful, a Life Cycle Cost calculation is made. For the CCFMMP and the CCFPP in particular, a present value Life Cycle Cost calculation over an expected life of 50-years was made by combining the initial capital cost, as summarized in [Tables 8.1](#) and [8.2](#), with the operations and maintenance cost calculations, as summarized in [Table 8.3](#). The Life Cycle Costs for each project is shown in [Table 8.4](#).



Table 8.4. Estimated Life-Cycle Costs for the CCFMMP and the CCFPP

Life Cycle Cost Calculation		
Type	CCFMMP	CCFPP
Capital Cost (2020 dollars)	\$32,700,000	\$57,400,000
Useful Life (years)	50	50
O&M over useful life	\$12,600,000	\$23,500,000
<b>Total 50-year Life Cycle Cost (2020 dollars)</b>	<b>\$45,300,000</b>	<b>\$80,900,000</b>

### 8.4 Funding Source

As described in *Section 1.1 Project Origin* and *Section 3.1 Flooding*, the CCFMMP is part of the Anderson Dam FERC Order Compliance Project (FOCP) and, as a result, is 100% funded by the Water Utility Enterprise Fund (Fund 61). The Coyote Creek Flood Protection Project is funded by the November 2020 voter approved Measure S, a renewal of the 2012 Safe, Clean Water and Natural Flood Protection Program (SCW). Funds for the CCFPP were originally carried into the 2012 SCW from the Clean, Safe Creeks and Natural Flood Protection Plan approved by voters in November 2000.

### 8.5 Schedule

The CCFMMP is anticipated to be completed at the end of 2023 to coincide with operations of the Anderson Dam Tunnel Project. The CCFPP is scheduled to be completed at the end of 2025, just ahead of the operation of the Anderson Dam Seismic Retrofit Project's higher volume diversion system. A high-level Project schedule is shown in the timeline illustrated in *Figure 8.1*.

Phases	Project	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
Planning	Both projects										
Design and Permitting	CCFMMP										
	CCFPP										
Construction	CCFMMP										
	CCFPP										

Figure 8.1. High-level schedules for Coyote Creek Flood Management Measure Project and Coyote Creek Flood Protection Project



A photograph of a dirt path leading through a wooded area. On the left side of the path, there is a large, tall pile of brown mulch or dried leaves. The path itself is made of light-colored soil and leads towards the background where more trees are visible. The scene is lit by natural daylight.

## ***CHAPTER 9***

# ***CONCLUSIONS AND RECOMMENDATIONS***



## 9. Conclusions and Recommendations

Both the Coyote Creek Flood Management Measures Project and Coyote Creek Flood Protection Project look to reduce the risk of flooding to the Coyote Creek adjacent community. However, while these projects are intended to accomplish mainly that objective, they should not be viewed as an end-all solution for the various flooding, operations and maintenance concerns, erosion problems, water quality issues and possible hazardous materials concerns observed throughout the whole length of Coyote Creek. If anything, these projects should be viewed as parts of a holistic approach to managing Coyote Creek, keeping in mind that it is one of the few still unmodified natural creek settings in a heavily urbanized environment. As a result, the preservation, conservation, and enhancement of the creek's habitat should be main priorities while attempting to solve the various human-induced challenges to the creek.

With the goal of a continual improvement of Coyote Creek habitat conditions, **partnering and coordinating with local jurisdictions** will be essential. Valley Water's One Water Plan<sup>80</sup> for the Coyote Creek Watershed and Coyote Creek Native Ecosystem Enhancement Tool<sup>81</sup> indicate that many miles and hundreds of acres of habitat enhancement work can be done in and around Coyote Creek, but this cannot be accomplished solely by Valley Water. The willingness and participation of a variety of landowners, agencies, and organizations, and the coordination of those efforts, will be necessary for individual enhancement efforts to culminate in meaningful ecological improvement in the health of Coyote Creek.

Enhancing Coyote Creek for the benefit of the community, as well as ecology, should be a priority. Based on the input that has been obtained from the various public and stakeholder meetings held during the planning phase of these projects, the public is eager to participate in the improvement of the conditions at Coyote Creek. As a result, it would become very important to find ways to **engage the public and additional stakeholders** in future preservation and enhancement opportunities at Coyote Creek.

Finally, while the CCFMMP and CCFPP include a set of operations and maintenance guidelines that look to mainly preserve the life of new flood mitigation facilities, a more **comprehensive operations and maintenance plan with an educational component** that includes the participation of local jurisdictions, the community, and stakeholder groups would be necessary and its enforcement continuous in order to improve and preserve the Coyote Creek riparian corridor.

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<sup>80</sup> *One Water Plan*. Valley Water. <https://www.valleywater.org/your-water/one-water-plan>. Accessed 10 July 2021.

<sup>81</sup> *Coyote Creek Native Ecosystem Enhancement Tool (CCNEET)*. San Francisco Estuary Institute and The Aquatic Science Center. <https://www.sfei.org/projects/coyote-creek-native-ecosystem-enhancement-tool>. Accessed 10 July 2021.



# *CHAPTER 10*

## *REFERENCES*





## 10. References

California Division of Mines and Geology Staff (2001), Seismic Hazard Zone Report for the Milpitas 7.5-minute quadrangle, Santa Clara County, California: California Division of Mines and Geology, Seismic Hazard Zone Report 051, scale 1:24,000.

California Division of Mines and Geology Staff (2002), Seismic Hazard Zone Report for the Milpitas 7.5-minute quadrangle, Santa Clara County, California: California Division of Mines and Geology, Seismic Hazard Zone Report 058, scale 1:24,000.

California Regional Water Quality Control Board, San Francisco Bay Region (2007). Adoption of the Site Cleanup Requirements for City of San Jose, Acosta Properties, LLC., Danna Properties, Kelley Park Community Resource Center a Johnson and Marylou Russell for the Story Road Landfill, San Jose, Santa Clara County.  
[https://www.waterboards.ca.gov/rwqcb2/board\\_decisions/adopted\\_orders/2007/R2-2007-0049.pdf](https://www.waterboards.ca.gov/rwqcb2/board_decisions/adopted_orders/2007/R2-2007-0049.pdf)

*California Monthly Climate Summary, February 2017*. California Department of Water Resources, 2017.  
[https://water.ca.gov/LegacyFiles/floodmgmt/hafoo/csc/docs/California\\_Climate\\_Summary\\_022017.pdf](https://water.ca.gov/LegacyFiles/floodmgmt/hafoo/csc/docs/California_Climate_Summary_022017.pdf)

Coyote meadows Coalition (2018). *Coyote Meadows Redevelopment Concept Plan*. Retrieved from  
[http://coyotemeadowssj.org/wp-content/uploads/2018/07/WW\\_Coyote\\_Creek\\_report\\_single-page-4.26.2018.pdf](http://coyotemeadowssj.org/wp-content/uploads/2018/07/WW_Coyote_Creek_report_single-page-4.26.2018.pdf)

City of San José. *Parks and Trails, Kelley Park*. Retrieved from  
<https://www.sanjoseca.gov/Home/Components/FacilityDirectory/FacilityDirectory/2245/2028>

City of San José. *Parks and Trails, Roosevelt Park*. Retrieved from  
<https://www.sanjoseca.gov/Home/Components/FacilityDirectory/FacilityDirectory/2357/34?npage=18>

City of San José. *Parks and Trails, Watson Park*. Retrieved from  
<https://www.sanjoseca.gov/Home/Components/FacilityDirectory/FacilityDirectory/2697/2002?npage=10>

City of San José. *Parks and Trails, William Street Park*. Retrieved from  
<https://www.sanjoseca.gov/Home/Components/FacilityDirectory/FacilityDirectory/2705/>

*Coyote Creek Native Ecosystem Enhancement Tool (CCNEET)*. San Francisco Estuary Institute and The Aquatic Science Center. <https://www.sfei.org/projects/coyote-creek-native-ecosystem-enhancement-tool>. Accessed 10 July 2021.

Department of Toxic Substances Control (September 2008). *Draft Remedial Action Plan Proposed for the Watson Park Site*. Retrieved from [https://dtsc.ca.gov/wp-content/uploads/sites/31/2017/11/Watson\\_Park\\_FS\\_RAP\\_0908.pdf](https://dtsc.ca.gov/wp-content/uploads/sites/31/2017/11/Watson_Park_FS_RAP_0908.pdf)

Department of Toxic Substances Control (2020). *EnvironStor. Watson Park (70000112)*. Retrieved from  
[https://www.envirostor.dtsc.ca.gov/public/profile\\_report?global\\_id=70000112](https://www.envirostor.dtsc.ca.gov/public/profile_report?global_id=70000112)

Dibblee, T.W. and Minch, J.A. (2005) Geologic Map of the Milpitas quadrangle, Alameda & Santa Clara Counties, California: Dibblee Geological Foundation, Dibblee Foundation Map DF-153, SCALE 1:24,000

Dibblee, T.W. and Minch, J.A. (2007) Geologic Map of the Cupertino and San Jose West quadrangles, Santa Clara and Santa Cruz Counties, California: Dibblee Geological Foundation, Dibblee Foundation Map DF-351, SCALE 1:24,000

Dobkin, Marjorie; Hill, Ward (1994). *Kelley House in Kelley Park*. Jones & Stokes Associates. Retrieved 1 January 2021.



Dueñas, Norberto L. (March 2017) *Coyote Creek Flood Preliminary After Action Report*. City of San Jose, San Jose, CA. 8 March 2017, [http://sanjose.granicus.com/MetaViewer.php?view\\_id=&event\\_id=2760&meta\\_id=622008](http://sanjose.granicus.com/MetaViewer.php?view_id=&event_id=2760&meta_id=622008)

*Feature Detail Report for: Coyote Creek*. United States Geological Survey. 18 December 2018. [https://geonames.usgs.gov/apex/f?p=gnispq:3::NO::P3\\_FID:255083](https://geonames.usgs.gov/apex/f?p=gnispq:3::NO::P3_FID:255083)

Foote, H.S., ed (1888). *Pen Pictures from the "Garden of the World" or Santa Clara County, California Illustrated*. Chicago: The Lewis Publishing Company, pp. 90-91. Retrieved 1 January 2021.

GIS Open Data (2020). City of San José. Retrieved from <https://gisdata-csj.opendata.arcgis.com/datasets/trail>

Golf California.com (2021). San Jose Municipal Golf Course. Retrieved from <http://www.golfcalifornia.com/courses/san-jose/san-jose-municipal-gc/>

Grossinger, Robin, et al. (2006). *Coyote Creek Watershed Historical Ecology Study: Historical Condition, Landscape Change, and Restoration Potential in the Eastern Santa Clara Valley, California*. Prepared for the Santa Clara Valley Water District. A Report of SFEI's Historical Ecology, Watersheds, and Wetlands Science Programs, SFEI Publication 426, San Francisco Estuary Institute, Oakland, CA.

Hase, Grace. San Jose Oks Three New Fire Stations, Relocating Two Existing Stations. San Jose Spotlight, 18 June 2019. <https://sanjosespotlight.com/san-jose-oks-three-new-fire-stations-relocating-two-existing-stations/>. Accessed 15 January 2021.

Hedgecock, D. *Provenance Analysis of Chinook Salmon (Oncorhynchus tshawytscha) in the Santa Clara Valley Watershed*. Bodega Marine Laboratory, University of California, Davis, n.d. 25.

Horvart, TG., G.A. Lamberti, D.M. Lodge, and W.L. Perry. 1996. Zebra mussels in lake-stream systems: sources-sink dynamics. *Journal of the North American Benthological Society* 15:564-575

Kennedy/Jenks Consultants. *Phase I Hazardous Materials Investigation (East Julian Street to East Santa Clara Street) and Phase II Hazardous Materials Investigation (Montague Expressway to East Santa Clara Street)*. 1994. Prepared for Santa Clara Valley Water District, San Jose, CA.

Kleinfelder (2020), Preliminary Geotechnical Report, Coyote Creek Flood Protection Project, Reaches 4 & 5, STA 3+33 to STA 145+50.17. 27 February 2020. Prepared for Santa Clara Valley Water District, San Jose, California.

Leidy, R.A. *Distribution and Ecology of Stream Fisheries in the San Francisco Bay Drainage*. Hilgardia Volume 52. Number 8. Agriculture and Natural Resources Publication, University of California, Berkeley, CA. 1984

Mai, Michael. "Re: Storm drain – flap gate work." Message to Damaris Villalobos-Galindo. 4 December 2019. E-mail

Northgate Environmental Management, Inc. (May 2017) *Phase I Hazardous Substance Liability Assessment. Coyote Creek Parcels APN 237-05-057 and 237-05-058*. 2017. Prepared for Santa Clara Valley Water District.

Northgate Environmental Management, Inc. (18 November 2019). *Phase II Hazardous Substance Liability Assessment (HSLA), Coyote Creek Flood Protection Project in San Jose, California (Project No. 26174043)*. Prepared for Santa Clara Valley Water District.

*One Water Plan*. Valley Water. <https://www.valleywater.org/your-water/one-water-plan>. Retrieved 10 July 2021.



Pacific Legacy, Inc. Historic Preservation. *Santa Clara Valley Water District Cultural Resources On-Call, Coyote Creek Flood Protection Project, San Jose (PL-3039-01, Task 10)*. 14 April 2020. Cultural Resources Report.

Reardon, Melissa. (26 June 2020). *Technical Memorandum: Coyote Creek Steady State Model – Existing and Proposed Conditions (DRAFT)*. Hydrology, Hydraulics and Geomorphology Unit. Valley Water, San José, CA.

SCVURPPP. *Stormwater Environmental Indicators Demonstration project, Final Report. San Jose: Prepared for the Water Environment Research Foundation, Project 96-IRM-3, USEPA Cooperative Agreement #CX 823666-01-2, 2001.*

SCVURPPP (2012). Watershed Monitoring and Assessment Program. *Interim Monitoring Project Report, Stressor/Source Identification Project (Coyote Creek)*. Santa Clara Valley Urban Runoff Pollution Prevention Program, September 2012.

SCVWD (1968). Improvement of Coyote Creek from Trimble Road to Nimitz Freeway in Santa Clara County, Project Number 40021. Creegan and D'Angelo Consultant Engineers. Santa Clara Valley Water District, San Jose, CA.

SCVWD (1982). *Report on Flooding and Flood Related Damages, Santa Clara County, January 1 to April 30, 1982*. Santa Clara Valley Water District, San Jose, CA. Available at <https://www.valleywater.org/floodready/flood-reports>

SCVWD (1983). *Report on Flooding and Flood Related Damages, Santa Clara County, January 1 to April 30, 1983*. Santa Clara Valley Water District, San Jose, CA. Available at <https://www.valleywater.org/floodready/flood-reports>

SCVWD (1984). Coyote Creek Planning Study (San Francisco Bay to Montague Expressway). Santa Clara Valley Water District, San Jose, CA.

SCVWD (1998). *Report on Flooding and Flood Related Damages in Santa Clara County, December 31, 1996 to January 27, 1997*. Santa Clara Valley Water District, San Jose, CA. Available at <https://www.valleywater.org/floodready/flood-reports>

SCVWD (1999). *Report on Flooding and Flood Related Damages in Santa Clara County, February 2 to 9, 1998*. Santa Clara Valley Water District, San Jose, CA. Available at <https://www.valleywater.org/floodready/flood-reports>

SCVWD (2000). South Bay Mobile Home Park Flood Wall, November 2000. Santa Clara Valley Water District, San Jose, CA.

SCVWD (2001). Coyote Creek Outdoor Classroom, 791 William Street. Santa Clara Valley Water District, San Jose, CA. Available at <https://www.valleywater.org/coyote-creek-outdoor-classroom>

SCVWD (2001). *Santa Clara Valley Water District Stream Maintenance Program*. 2018, <https://www.valleywater.org/flooding-safety/stream-maintenance-program>

SCVWD (2004). *Mid-Coyote Creek Preliminary Hazardous Substance Liability Assessment*. Santa Clara Valley Water District, San Jose, CA.

SCVWD (2005). *Santa Clara Valley Water District Fisheries Surveys, 1995-2005*. Santa Clara Valley Water District, San Jose, CA.

SCVWD (2007). *HEC-6T Sediment Transport Study. Mid-Coyote Creek Project. Montague Expressway to Interstate 280*. Santa Clara Valley Water District, San Jose, CA.



SCVWD (2011). Mid-Coyote Creek Project Planning Study. Montague Expressway to Interstate 280. Planning Study Report.

SCVWD (2017). *Design Flood Flow Manual for All District Watersheds*. Prepared by Jack Xu, P.E. and Robert Chan, E.I.T. Hydraulics, Hydrology and Geomorphology Unit. December 2017. Santa Clara Valley Water District. San Jose, CA.

SCVWD (2017). *Hydraulics, Hydrology, and Geomorphology Unit. Flooding Report (Final), Coyote Creek, Uvas Creek, San Francisquito Creek, and West Llagas Creek, January and February of 2017*. Santa Clara Valley Water District, San Jose, CA. <https://www.valleywater.org/floodready/flood-reports>

SCVWD (2017). *Public Hearing on Proposed Modification to the Coyote Creek Flood Protection Project of the Safe, Clean Water and Natural Flood Protection Program*. Santa Clara Valley Water District, 13 June 2017, <https://scvwd.legistar.com/LegislationDetail.aspx?ID=3064265&GUID=D843FFA6-6EA4-4825-9A8F-76221C76BB82&Options=&Search=&FullText=1>

SCVWD (2017). *Water District Approves Expediting and Extending a Flood Protection Project for Coyote Creek*. 15 June 2017, <https://www.valleywater.org/news-events/news-releases/water-district-approves-expediting-and-extending-flood-protection-project>

SCVWD (2018). *Ogier Ponds Feasibility Study, Feasibility of Removing Surface Hydraulic Connection Between Coyote Creek and Ogier Ponds, Santa Clara County, California*. March 2018. Santa Clara Valley Water District, San Jose.

SCVWD (2018). *Safe, Clean Water and Natural Flood Protection Program*. Santa Clara Valley Water District, 2018. <https://www.valleywater.org/project-updates/safe-clean-water-and-natural-flood-protection-program>

SCVWD (2018). *Watersheds of Santa Clara Valley*. Santa Clara Valley Water District, 2018, <https://www.valleywater.org/learning-center/watersheds-of-santa-clara-valley>

SCVWD (2019). *2019 Annual Groundwater Report*. Santa Clara Valley Water District, San Jose, CA. Available at [https://www.valleywater.org/sites/default/files/2020-09/2019\\_Annual\\_Groundwater\\_Report\\_Web\\_Version.pdf](https://www.valleywater.org/sites/default/files/2020-09/2019_Annual_Groundwater_Report_Web_Version.pdf)

SCVWD (2020). *Approve the preliminary Project Description for the Anderson Dam Federal Energy Regulatory Commission Order Compliance Project and find that the requirements of the Federal Energy Regulatory Commission Order Compliance Project are consistent with Santa Clara Valley Water Resolution No. 605*. Santa Clara Valley Water District, 26 May 2020. <https://scvwd.legistar.com/LegislationDetail.aspx?ID=4544457&GUID=90C04448-3866-4CEF-93D1-7A7222AC65B7&Options=&Search=&FullText=1>

SCVWD (2020). *District Act*. Retrieved from <https://www.valleywater.org/how-we-operate/about-valley-water/district-act>

Soller, J. Stephenson, J. Olivieri, K. Downing, J. Olivieri, A.W. (2004) "Evaluation of First Flush Pollutant Loading and Implications for Water Resources and Urban Runoff Management." 2004.

State of California San Francisco Bay Regional Water Quality Control Board. California 303 (d) List of Water Quality Limited Segments. 25 October 2017. [https://www.waterboards.ca.gov/water\\_issues/programs/tmdl/2010state\\_ir\\_reports/category5\\_report.shtml](https://www.waterboards.ca.gov/water_issues/programs/tmdl/2010state_ir_reports/category5_report.shtml)

Tetra Tech (2001). *City of San Jose Environmental Enhancement Program Coyote Creek Streamflow Augmentation Pilot Project*. San Jose, 2001.



The Mercury News (February 2012). *San Jose: Two Alarm Fire Damages Historical Kelley House*. Retrieved on 1 January 2021 from <https://www.mercurynews.com/2012/02/16/san-jose-two-alarm-fire-damages-historic-kelley-house/>

ThruTheGreen. *Respected Golf Course Architect, Author and Educator Dies at 72*. Archive.lib.msu.edu. Retrieved 1 January 2021

U.S. Army Corps of Engineers (1977). *Hydrologic Engineering Office Report: Guadalupe River and Coyote Creek, Santa Clara County, California*. San Francisco District, San Francisco, CA.

Valley Water News (2017). *Water District Moves Forward with its Short-Term Project Elements in Rock Springs*. <https://valleywater.org/2017/08/28/water-district-moves-forward-with-short-term-project-elements-in-rock-springs/>.

Witter, R.C., Knudsen, K.L., Sowers, J.M., Wentworth, C.M., Koehler, R.D., Randolph, C.E., Brooks, S.K., and Gans, K.D. (2006), Maps of Quaternary Deposits and Liquefaction Susceptibility in the Central San Francisco Bay Region, California: U.S. Geological Survey, Open-File Report OF-2006, scale 1:200,000.

Xu, Jack. (October 2019). *Technical Memorandum: Design Flows for Mid-Coyote Project Team (Addendum 1)*. Hydrology, Hydraulics and Geomorphology Unit. Valley Water, San Jose, CA.





# *CHAPTER 11*

## *APPENDICES*



## 11. Appendices

This section serves to support the information contained in this report and it includes the following appendices:

- Appendix A. Conceptual Alternatives
- Appendix B. Public and Stakeholder Input and Comments
- Appendix C. Coyote Creek Steady State Model Technical Memorandum
- Appendix D. WW75125 - Guidance on Alternative Evaluation and Selection for Natural Flood Protection Projects
- Appendix E. NFP Framework Analysis
- Appendix F. Capital and Maintenance Costs



## APPENDIX A. CONCEPTUAL ALTERNATIVES



Reach		Conceptual Alternative						
		A1	A2	A3	A4	A5	A6	A7
4. Montague Expressway to Old Oakland Road		Replace Charcot Avenue Bridge, build floodwalls upstream and downstream of bridge	Same as A1	Same as A1	Same as A1	Same as A1	Same as A1	Same as A1
5. Old Oakland Road to Mabury Road		Replace and increase height of embankment from Old Oakland Road to Union Pacific Railroad (UPRR), build floodwalls from UPRR to Mabury Road	Same as A1	Same as A1	Same as A1	Same as A1	Same as A1	Same as A1
6. Mabury Road to East Santa Clara Street		Build floodwalls from Highway 101 to Mabury Road, build floodwalls, passive barriers and berm within Watson Park, build floodwalls on east bank between Highway 101 and Julian Street	Same as A1	Same as A1	Same as A1	Same as A1	Same as A1	Same as A1
7. East Santa Clara Street to Highway 280		Elevate 12 residential properties, build floodwalls, build vegetated berm at edge of William Street Park and install passive barrier at Selma Olinder Park	Acquire, demolish and restore riparian corridor for 12 residential properties, build floodwalls, build vegetated berm at edge of William Street Park and install passive barrier at Selma Olinder Park	Elevate 12 residential properties, build floodwalls, install passive barrier at edge of William Street Park and Selma Olinder Park	Acquire, demolish, and restore riparian corridor 12 residential properties, build floodwalls, install passive barrier at edge of William Street and Selma Olinder Parks	Elevate or acquire and demolish selected residential properties, build floodwalls, build vegetated berm at edge of William Street Park and install passive barrier at Selma Olinder Park	Install floodwalls in backyard of all frequently flooded properties, build vegetated berm at edge of William Street Park and install passive barrier at Selma Olinder Park	Install floodwalls in backyard of all frequently flooded properties, install passive barrier at edge of William Street Park and Selma Olinder Park
8. Highway 280 to Tully Road		Build floodwalls east of South 12 <sup>th</sup> Street, east of Needles Drive and north of Tully Road, rebuild berm located at Rock Springs neighborhood, excavate and restore to riparian conditions the Cooksy Family Stables area	Same as A1	Same as A1	Same as A1	Same as A1	Same as A1	Same as A1
Assessment Criteria	A. Reduce risk of flooding from a 20-year flood event	Meets	Meets	Meets	Meets	Meets	Meets	Meets
	B. Avoid or reduce detrimental impacts to environment	Does Not Meet: Reaches 4 and 8 project elements are disruptive and impactful to environment	Does Not Meet: Reaches 4 and 8 project elements are disruptive and impactful to environment	Does Not Meet: Reaches 4 and 8 project elements are disruptive and impactful to environment	Does Not Meet: Reaches 4 and 8 project elements are disruptive and impactful to environment	Does Not Meet: Reaches 4 and 8 project elements are disruptive and impactful to environment	Does Not Meet: Reaches 4 and 8 project elements are disruptive and impactful to environment	Does Not Meet: Reaches 4 and 8 project elements are disruptive and impactful to environment
	C. Enhance riparian corridor	Does Not Meet: Reaches 4 and 8 elements impact riparian corridor	Does Not Meet: Reaches 4 and 8 elements impact riparian corridor	Does Not Meet: Reaches 4 and 8 elements impact riparian corridor	Does Not Meet: Reaches 4 and 8 elements impact riparian corridor	Does Not Meet: Reaches 4 and 8 elements impact riparian corridor	Does Not Meet: Reaches 4 and 8 elements impact riparian corridor	Does Not Meet: Reaches 4 and 8 elements impact riparian corridor
	D. Provide for public recreation and access	Meets	Meets	Meets	Meets	Meets	Meets	Meets
	E. Technically feasible	Meets	Meets	Meets	Meets	Meets	Meets	Meets
	F. Logistically feasible	Does Not Meet: Reaches 4 and 8 project elements will take more than 1-2 years to permit	Does Not Meet: Reaches 4 and 8 project elements will take more than 1-2 years to permit	Does Not Meet: Reaches 4 and 8 project elements will take more than 1-2 years to permit	Does Not Meet: Reaches 4 and 8 project elements will take more than 1-2 years to permit	Does Not Meet: Reaches 4 and 8 project elements will take more than 1-2 years to permit	Does Not Meet: Reaches 4 and 8 project elements will take more than 1-2 years to permit	Does Not Meet: Reaches 4 and 8 project elements will take more than 1-2 years to permit
	G. Financially feasible	Meets Conceptual Cost: \$ 83 M	Does not Meet: Conceptual Cost: \$91 M	Does Not Meet Conceptual Cost: \$94 M	Does Not Meet Conceptual Cost: \$102 M	Meets Conceptual Cost: \$90 M	Meets Conceptual Cost: \$88 M	Does Not Meet: Conceptual Cost: \$91 M
	H. Has community support	Does Not meet: City of San Jose indicated they have other plans for Cooksy Family Stables area	Does Not meet: City of San Jose indicated they have other plans for Cooksy Family Stables area	Does Not meet: City of San Jose indicated they have other plans for Cooksy Family Stables area	Does Not meet: City of San Jose indicated they have other plans for Cooksy Family Stables area	Does Not meet: City of San Jose indicated they have other plans for Cooksy Family Stables area	Does Not meet: City of San Jose indicated they have other plans for Cooksy Family Stables area and public does not support floodwalls	Does Not meet: City of San Jose indicated they have other plans for Cooksy Family Stables area and public does not support floodwalls
Meets all criteria		No	No	No	No	No	No	No



Reach		Conceptual Alternative						
		B1	B2	B3	B4	B5	B6	B7
4. Montague Expressway to Old Oakland Road		Build headwalls at upstream and downstream faces of Charcot Avenue bridge, build floodwalls upstream and downstream of bridge	Same as B1	Same as B1	Same as B1	Same as B1	Same as B1	Same as B1
5. Old Oakland Road to Mabury Road		Same as A1	Same as A1	Same as A1	Same as A1	Same as A1	Same as A1	Same as A1
6. Mabury Road to East Santa Clara Street		Same as A1	Same as A1	Same as A1	Same as A1	Same as A1	Same as A1	Same as A1
7. East Santa Clara Street to Highway 280		Same as A1	Same as A2	Same as A3	Same as A4	Same as A5	Same as A6	Same as A7
8. Highway 280 to Tully Road		Same as A1	Same as A1	Same as A1	Same as A1	Same as A1	Same as A1	Same as A1
Assessment Criteria	A. Reduce risk of flooding from a 20-year flood event	Meets	Meets	Meets	Meets	Meets	Meets	Meets
	B. Avoid or reduce detrimental impacts to environment	Does Not Meet: Reaches 4 and 8 project elements are disruptive and impactful to environment	Does Not Meet: Reaches 4 and 8 project elements are disruptive and impactful to environment	Does Not Meet: Reaches 4 and 8 project elements are disruptive and impactful to environment	Does Not Meet: Reaches 4 and 8 project elements are disruptive and impactful to environment	Does Not Meet: Reaches 4 and 8 project elements are disruptive and impactful to environment	Does Not Meet: Reaches 4 and 8 project elements are disruptive and impactful to environment	Does Not Meet: Reaches 4 and 8 project elements are disruptive and impactful to environment
	C. Enhance riparian corridor	Does Not Meet: Reaches 4 and 8 elements impact riparian corridor	Does Not Meet: Reaches 4 and 8 elements impact riparian corridor	Does Not Meet: Reaches 4 and 8 elements impact riparian corridor	Does Not Meet: Reaches 4 and 8 elements impact riparian corridor	Does Not Meet: Reaches 4 and 8 elements impact riparian corridor	Does Not Meet: Reaches 4 and 8 elements impact riparian corridor	Does Not Meet: Reaches 4 and 8 elements impact riparian corridor
	D. Provide for public recreation and access	Meets	Meets	Meets	Meets	Meets	Meets	Meets
	E. Technically feasible	Meets	Meets	Meets	Meets	Meets	Meets	Meets
	F. Logistically feasible	Does Not Meet: Reaches 4 and 8 project elements will take more than 1-2 years to permit	Does Not Meet: Reaches 4 and 8 project elements will take more than 1-2 years to permit	Does Not Meet: Reaches 4 and 8 project elements will take more than 1-2 years to permit	Does Not Meet: Reaches 4 and 8 project elements will take more than 1-2 years to permit	Does Not Meet: Reaches 4 and 8 project elements will take more than 1-2 years to permit	Does Not Meet: Reaches 4 and 8 project elements will take more than 1-2 years to permit	Does Not Meet: Reaches 4 and 8 project elements will take more than 1-2 years to permit
	G. Financially feasible	Meets Conceptual Cost: \$ 83 M	Does not Meet: Conceptual Cost: \$91 M	Does Not Meet Conceptual Cost: \$94 M	Does Not Meet Conceptual Cost: \$102 M	Meets Conceptual Cost: \$90 M	Meets Conceptual Cost: \$88 M	Does Not Meet: Conceptual Cost: \$91 M
	H. Has community support	Does Not meet: City of San Jose indicated they have other plans for Cooksy Family Stables area	Does Not meet: City of San Jose indicated they have other plans for Cooksy Family Stables area	Does Not meet: City of San Jose indicated they have other plans for Cooksy Family Stables area	Does Not meet: City of San Jose indicated they have other plans for Cooksy Family Stables area	Does Not meet: City of San Jose indicated they have other plans for Cooksy Family Stables area	Does Not meet: City of San Jose indicated they have other plans for Cooksy Family Stables area and public does not support floodwalls	Does Not meet: City of San Jose indicated they have other plans for Cooksy Family Stables area and public does not support floodwalls
Meets all criteria		No	No	No	No	No	No	No



Reach		Conceptual Alternative						
		C1	C2	C3	C4	C5	C6	C7
4. Montague Expressway to Old Oakland Road		Install 4’ tall passive barriers at Charcot Avenue bridge, build floodwalls upstream and downstream of bridge	Same as C1	Same as C1	Same as C1	Same as C1	Same as C1	Same as C1
5. Old Oakland Road to Mabury Road		Same as A1	Same as A1	Same as A1	Same as A1	Same as A1	Same as A1	Same as A1
6. Mabury Road to East Santa Clara Street		Same as A1	Same as A1	Same as A1	Same as A1	Same as A1	Same as A1	Same as A1
7. East Santa Clara Street to Highway 280		Same as A1	Same as A2	Same as A3	Same as A4	Same as A5	Same as A6	Same as A7
8. Highway 280 to Tully Road		Same as A1	Same as A1	Same as A1	Same as A1	Same as A1	Same as A1	Same as A1
Assessment Criteria	A. Reduce risk of flooding from a 20-year flood event	Meets	Meets	Meets	Meets	Meets	Meets	Meets
	B. Avoid or reduce detrimental impacts to environment	Does Not Meet: Reach 8 project elements are disruptive and impactful to environment	Does Not Meet: Reaches 8 project elements are disruptive and impactful to environment	Does Not Meet: Reach 8 project elements are disruptive and impactful to environment	Does Not Meet: Reach 8 project elements are disruptive and impactful to environment	Does Not Meet: Reach 8 project elements are disruptive and impactful to environment	Does Not Meet: Reach 8 project elements are disruptive and impactful to environment	Does Not Meet: Reach 8 project elements are disruptive and impactful to environment
	C. Enhance riparian corridor	Does Not Meet: Reach 8 elements impact riparian corridor	Does Not Meet: Reach 8 elements impact riparian corridor	Does Not Meet: Reach 8 elements impact riparian corridor	Does Not Meet: Reach 8 elements impact riparian corridor	Does Not Meet: Reach 8 elements impact riparian corridor	Does Not Meet: Reach 8 elements impact riparian corridor	Does Not Meet: Reach 8 elements impact riparian corridor
	D. Provide for public recreation and access	Meets	Meets	Meets	Meets	Meets	Meets	Meets
	E. Technically feasible	Meets	Meets	Meets	Meets	Meets	Meets	Meets
	F. Logistically feasible	Does Not Meet: Reach 8 project elements will take more than 1-2 years to permit	Does Not Meet: Reach 8 project elements will take more than 1-2 years to permit	Does Not Meet: Reach 8 project elements will take more than 1-2 years to permit	Does Not Meet: Reach 8 project elements will take more than 1-2 years to permit	Does Not Meet: Reach 8 project elements will take more than 1-2 years to permit	Does Not Meet: Reach 8 project elements will take more than 1-2 years to permit	Does Not Meet: Reach 8 project elements will take more than 1-2 years to permit
	G. Financially feasible	Meets Conceptual Cost: \$ 76 M	Meets Conceptual Cost: \$84 M	Meets Conceptual Cost: \$87 M	Does Not Meet Conceptual Cost: \$95 M	Meets Conceptual Cost: \$83 M	Meets Conceptual Cost: \$81 M	Meets Conceptual Cost: \$84 M
	H. Has community support	Does Not meet: City of San Jose indicated they have other plans for Cooksy Family Stables area	Does Not meet: City of San Jose indicated they have other plans for Cooksy Family Stables area	Does Not meet: City of San Jose indicated they have other plans for Cooksy Family Stables area	Does Not meet: City of San Jose indicated they have other plans for Cooksy Family Stables area	Does Not meet: City of San Jose indicated they have other plans for Cooksy Family Stables area	Does Not meet: Public does not support floodwalls for low lying homes in Reach 7	Does Not meet: Public does not support floodwalls for low lying homes in Reach 7
Meets all criteria		No	No	No	No	No	No	No



Reach		Conceptual Alternative						
		D1	D2	D3	D4	D5	D6	D7
4. Montague Expressway to Old Oakland Road		Replace Charcot Avenue Bridge, build floodwalls upstream and downstream of bridge	Same as A1	Same as A1	Same as A1	Same as A1	Same as A1	Same as A1
5. Old Oakland Road to Mabury Road		Same as A1	Same as A1	Same as A1	Same as A1	Same as A1	Same as A1	Same as A1
6. Mabury Road to East Santa Clara Street		Same as A1	Same as A1	Same as A1	Same as A1	Same as A1	Same as A1	Same as A1
7. East Santa Clara Street to Highway 280		Same as A1	Same as A2	Same as A3	Same as A4	Same as A5	Same as A6	Same as A7
8. Highway 280 to Tully Road		Build floodwalls east of South 12 <sup>th</sup> Street, east of Needles Drive and north of Tully Road, rebuild berm located at Rock Springs neighborhood and extend to Bevin Brook Drive neighborhood	Same as D1	Same as D1	Same as D1	Same as D1	Same as D1	Same as D1
Assessment Criteria	A. Reduce risk of flooding from a 20-year flood event	Meets	Meets	Meets	Meets	Meets	Meets	Meets
	B. Avoid or reduce detrimental impacts to environment	Does not meet: Reach 4 project elements are disruptive and impactful to environment	Does Not Meet: Reach 4 project elements are disruptive and impactful to environment	Does Not Meet: Reach 4 project elements are disruptive and impactful to environment	Does Not Meet: Reach 4 project elements are disruptive and impactful to environment	Does Not Meet: Reach 4 and 8 project elements are disruptive and impactful to environment	Does Not Meet: Reach 4 project elements are disruptive and impactful to environment	Does Not Meet: Reach 4 project elements are disruptive and impactful to environment
	C. Enhance riparian corridor	Does Not Meet: Reach 4 project elements impact riparian corridor	Does Not Meet: Reach 4 project elements impact riparian corridor	Does Not Meet: Reach 4 project elements impact riparian corridor	Does Not Meet: Reach 4 project elements impact riparian corridor	Does Not Meet: Reach 4 project elements impact riparian corridor	Does Not Meet: Reach 4 project elements impact riparian corridor	Does Not Meet: Reach 4 project elements impact riparian corridor
	D. Provide for public recreation and access	Meets	Meets	Meets	Meets	Meets	Meets	Meets
	E. Technically feasible	Meets	Meets	Meets	Meets	Meets	Meets	Meets
	F. Logistically feasible	Does Not Meet: Reach 4 project elements will take more than 1-2 years to permit	Does Not Meet: Reach 4 project elements will take more than 1-2 years to permit	Does Not Meet: Reach 4 project elements will take more than 1-2 years to permit	Does Not Meet: Reach 4 project elements will take more than 1-2 years to permit	Does Not Meet: Reach 4 project elements will take more than 1-2 years to permit	Does Not Meet: Reach 4 project elements will take more than 1-2 years to permit	Does Not Meet: Reach 4 project elements will take more than 1-2 years to permit
	G. Financially feasible	Meets Conceptual Cost: \$ 80 M	Meets Conceptual Cost: \$88 M	Does Not Meet Conceptual Cost: \$91 M	Does Not Meet Conceptual Cost: \$99 M	Meets Conceptual Cost: \$87 M	Meets Conceptual Cost: \$85 M	Meets Conceptual Cost: \$88 M
	H. Has community support	Meets	Meets	Meets	Meets	Meets	Does Not meet: Public does not support floodwalls for low lying homes in Reach 7	Does Not meet: Public does not support floodwalls for low lying homes in Reach 7
Meets all criteria		No	No	No	No	No	No	No



Reach		Conceptual Alternative						
		E1	E2	E3	E4	E5	E6	E7
4. Montague Expressway to Old Oakland Road		Same as B1	Same as B1	Same as B1	Same as B1	Same as B1	Same as B1	Same as B1
5. Old Oakland Road to Mabury Road		Same as A1	Same as A1	Same as A1	Same as A1	Same as A1	Same as A1	Same as A1
6. Mabury Road to East Santa Clara Street		Same as A1	Same as A1	Same as A1	Same as A1	Same as A1	Same as A1	Same as A1
7. East Santa Clara Street to Highway 280		Same as A1	Same as A2	Same as A3	Same as A4	Same as A5	Same as A6	Same as A7
8. Highway 280 to Tully Road		Same as D1	Same as D1	Same as D1	Same as D1	Same as D1	Same as D1	Same as D1
Assessment Criteria	A. Reduce risk of flooding from a 20-year flood event	Meets	Meets	Meets	Meets	Meets	Meets	Meets
	B. Avoid or reduce detrimental impacts to environment	Meets	Meets	Meets	Meets	Meets	Meets	Meets
	C. Enhance riparian corridor	Meets	Meets	Meets	Meets	Meets	Meets	Meets
	D. Provide for public recreation and access	Meets	Meets	Meets	Meets	Meets	Meets	Meets
	E. Technically feasible	Meets	Meets	Meets	Meets	Meets	Meets	Meets
	F. Logistically feasible	Meets	Meets	Meets	Meets	Meets	Meets	Meets
	G. Financially feasible	Meets Conceptual Cost: \$ 72 M	Meets Conceptual Cost: \$80 M	Meets Conceptual Cost: \$83 M	Does Not Meet Conceptual Cost: \$91 M	Meets Conceptual Cost: \$79 M	Meets Conceptual Cost: \$77 M	Meets Conceptual Cost: \$80 M
	H. Has community support	Meets	Meets	Meets	Meets	Meets	Does Not meet: Public does not support floodwalls for low lying homes in Reach 7	Does Not meet: Public does not support floodwalls for low lying homes in Reach 7
Meets all criteria		Yes	Yes	Yes	No	Yes	No	No



Reach		Conceptual Alternative						
		F1	F2	F3	F4	F5	F6	F7
4. Montague Expressway to Old Oakland Road		Same as C1	Same as C1	Same as C1	Same as C1	Same as C1	Same as C1	Same as C1
5. Old Oakland Road to Mabury Road		Same as A1	Same as A1	Same as A1	Same as A1	Same as A1	Same as A1	Same as A1
6. Mabury Road to East Santa Clara Street		Same as A1	Same as A1	Same as A1	Same as A1	Same as A1	Same as A1	Same as A1
7. East Santa Clara Street to Highway 280		Same as A1	Same as A2	Same as A3	Same as A4	Same as A5	Same as A6	Same as A7
8. Highway 280 to Tully Road		Same as D1	Same as D1	Same as D1	Same as D1	Same as D1	Same as D1	Same as D1
Assessment Criteria	A. Reduce risk of flooding from a 20-year flood event	Meets	Meets	Meets	Meets	Meets	Meets	Meets
	B. Avoid or reduce detrimental impacts to environment	Meets	Meets	Meets	Meets	Meets	Meets	Meets
	C. Enhance riparian corridor	Meets	Meets	Meets	Meets	Meets	Meets	Meets
	D. Provide for public recreation and access	Meets	Meets	Meets	Meets	Meets	Meets	Meets
	E. Technically feasible	Meets	Meets	Meets	Meets	Meets	Meets	Meets
	F. Logistically feasible	Meets	Meets	Meets	Meets	Meets	Meets	Meets
	G. Financially feasible	Meets Conceptual Cost: \$ 74 M	Meets Conceptual Cost: \$82 M	Meets Conceptual Cost: \$85 M	Does Not Meet Conceptual Cost: \$93 M	Meets Conceptual Cost: \$80 M	Meets Conceptual Cost: \$79 M	Meets Conceptual Cost: \$82 M
	H. Has community support	Meets	Meets	Meets	Meets	Meets	Does Not meet: Public does not support floodwalls for low lying homes in Reach 7	Does Not meet: Public does not support floodwalls for low lying homes in Reach 7
Meets all criteria		Yes	Yes	Yes	No	Yes	No	No



Reach		Conceptual Alternative						
		G1	G2	G3	G4	G5	G6	G7
4. Montague Expressway to Old Oakland Road		Same as B1	Same as B1	Same as B1	Same as B1	Same as C1	Same as C1	Same as C1
5. Old Oakland Road to Mabury Road		Same as A1	Same as A1	Same as A1	Same as A1	Same as A1	Same as A1	Same as A1
6. Mabury Road to East Santa Clara Street		Same as A1	Same as A1	Same as A1	Same as A1	Same as A1	Same as A1	Same as A1
7. East Santa Clara Street to Highway 280		Same as A1	Same as A2	Same as A3	Same as A5	Same as A1	Same as A2	Same as A3
8. Highway 280 to Tully Road		Same as D1	Same as D1	Same as D1	Same as D1	Same as D1	Same as D1	Same as D1
Upstream of Coyote Creek		Create storage to reduce Anderson Dam peak by building berms around large parcels of land, utilizing approximately 96 acres of land adjacent to creek	Same as G1	Same as G1	Same as G1	Same as G1	Same as G1	Same as G1
Assessment Criteria	A. Reduce risk of flooding from a 20-year flood event	Meets	Meets	Meets	Meets	Meets	Meets	Meets
	B. Avoid or reduce detrimental impacts to environment	Meets	Meets	Meets	Meets	Meets	Meets	Meets
	C. Enhance riparian corridor	Meets	Meets	Meets	Meets	Meets	Meets	Meets
	D. Provide for public recreation and access	Meets	Meets	Meets	Meets	Meets	Meets	Meets
	E. Technically feasible	Does Not Meet: This area has a high groundwater table. As a result, excavating a detention basin is not feasible. In addition, basin might not be effective at high flow events.	Does Not Meet: This area has a high groundwater table. As a result, excavating a detention basin is not feasible. In addition, basin might not be effective at high flow events.	Does Not Meet: This area has a high groundwater table. As a result, excavating a detention basin is not feasible. In addition, basin might not be effective at high flow events.	Does Not Meet: This area has a high groundwater table. As a result, excavating a detention basin is not feasible. In addition, basin might not be effective at high flow events.	Does Not Meet: This area has a high groundwater table. As a result, excavating a detention basin is not feasible. In addition, basin might not be effective at high flow events.	Does Not Meet: This area has a high groundwater table. As a result, excavating a detention basin is not feasible. In addition, basin might not be effective at high flow events.	Does Not Meet: This area has a high groundwater table. As a result, excavating a detention basin is not feasible. In addition, basin might not be effective at high flow events.
	F. Logistically feasible	Does Not Meet: Areas needed for water detention typically flood days before the Anderson Dam peak comes through. The added flood protection for areas downstream is limited and unreliable at best.	Does Not Meet: Areas needed for water detention typically flood days before the Anderson Dam peak comes through. The added flood protection for areas downstream is limited and unreliable at best.	Does Not Meet: Areas needed for water detention typically flood days before the Anderson Dam peak comes through. The added flood protection for areas downstream is limited and unreliable at best.	Does Not Meet: Areas needed for water detention typically flood days before the Anderson Dam peak comes through. The added flood protection for areas downstream is limited and unreliable at best.	Does Not Meet: Areas needed for water detention typically flood days before the Anderson Dam peak comes through. The added flood protection for areas downstream is limited and unreliable at best.	Does Not Meet: Areas needed for water detention typically flood days before the Anderson Dam peak comes through. The added flood protection for areas downstream is limited and unreliable at best.	Does Not Meet: Areas needed for water detention typically flood days before the Anderson Dam peak comes through. The added flood protection for areas downstream is limited and unreliable at best.
	G. Financially feasible	Meets Conceptual Cost: \$ 77 M	Meets Conceptual Cost: \$88 M	Meets Conceptual Cost: \$84 M	Meets Conceptual Cost: \$ 79 M	Meets Conceptual Cost: \$79 M	Meets Conceptual Cost: \$87 M	Meets Conceptual Cost: \$90 M
	H. Has community support	Meets	Meets	Meets	Meets	Meets	Meets	Meets
Meets all criteria		No	No	No	No	No	No	No



Reach		Conceptual Alternative	
		G8	H1
4. Montague Expressway to Old Oakland Road		Same as C1	No Project
5. Old Oakland Road to Mabury Road		Same as A1	
6. Mabury Road to East Santa Clara Street		Same as A1	
7. East Santa Clara Street to Highway 280		Same as A5	
8. Highway 280 to Tully Road		Same as D1	
Upstream of Coyote Creek		Same as G1	
Assessment Criteria	A. Reduce risk of flooding from a 20-year flood event	Meets	Does Not Meet: No reduction in flood risk
	B. Avoid or reduce detrimental impacts to environment	Meets	Meets
	C. Enhance riparian corridor	Meets	Does Not Meet: No riparian corridor enhancements
	D. Provide for public recreation and access	Meets	Does Not Meet: No coordination with other agencies or improvements for public access and recreation
	E. Technically feasible	Does Not Meet: This area has a high groundwater table. As a result, excavating a detention basin is not feasible. In addition, basin might not be effective at high flow events.	Does Not Meet: This area has a high groundwater table. As a result, excavating a detention basin is not feasible. In addition, basin might not be effective at high flow events.
	F. Logistically feasible	Does Not Meet: Areas needed for water detention typically flood days before the Anderson Dam peak comes through. The added flood protection for areas downstream is limited and unreliable at best.	Does Not Meet: Areas needed for water detention typically flood days before the Anderson Dam peak comes through. The added flood protection for areas downstream is limited and unreliable at best.
	G. Financially feasible	Meets Conceptual Cost: \$ 85 M	Meets Conceptual Cost: \$0
	H. Has community support	Meets	Does Not Meet: Public has indicated their support for this project via the November 2012 approved Safe, Clean Water, Natural Flood Protection Program
Meets all criteria		No	No



## APPENDIX B. PUBLIC AND STAKEHOLDER INPUT AND COMMENTS



## Input and Comments Received from Public during April 29, 2019 Coyote Creek Flood Risk Reduction Ad Hoc Committee Meeting

Date Received	Reach	Comment/Input
4/29/2019	All	If you fix Anderson Dam, the other solutions are not necessary, but it seems money is spent in other projects. If the dam does not spill, it does not flood downstream. Use the money to accelerate fixing of the dam.
4/29/2019	7	Valley Water described simulations predicting that you would be able to control flooding during dam reconstruction during future rain scenarios. Were these simulations vetted by independent consultants so that we can be certain there were no erroneous assumptions that were used as the basis for the modeling? Can your simulation model's guarantee that all measures for flood mitigation taken upstream will not increase the probability for flooding in the Naglee Park neighborhood?
4/29/2019	All	Perhaps no fixes would need to be done downstream of the dam (at least for 25-year flood levels), if the Anderson Dam and spillway project was completed.
4/29/2019	7	Flooding close to I-280 was not caused by overtopping of banks but flooding waters crossed under the bridge and went in a straight line along the Five Wounds Trail and inundated the communities close to Selma Olinder Park and east of it.
4/29/2019	5	I live at the Golden Wheel Mobile Home Park and following the 1995 flood event, the City of San José built a pump station at the mobile home park. However, during the 2017 flood event, the pump station did not work. What are you doing to fix this problem and ensure that the pumps work during an emergency flood event?
4/29/2019	5	About 4-5 years ago, the City of San José mentioned a trail project along the edge of the mobile home park [levee]. Have not heard much about the project after that, is that project still happening?
4/29/2019	All	Would like to know what Valley Water is doing to connect with the City of San José to solve issues such as: garbage, homeless encampments, water quality issues, other. When I call the City to report issues along the creek, they tell me it is the District's responsibility and the District tells me it is the City's. Whose responsibility is it?
4/29/2019	All	Are you doing any vegetation management in the creek and how often do you do it? What is the schedule?
4/29/2019	All	We heard you cannot do vegetation management in private property without asking for permission. Nobody has asked for my permission to access my yard for maintenance. I personally give permission. Please, help me maintain my section of creek.
4/29/2019	All	Have contacted the Valley Water number several times to get assistance on doing vegetation maintenance in my yard but I have never seen Valley Water come and inspect my property. I have given them full access, but I have not even seen any effort to come and inspect.



Input and Comments Received from Public and Stakeholders on Conceptual Alternatives - Spring 2019 Public Meetings		
Date Received	Reach	Comment/Input
5/21/2019	4 & 5	Main project objective should be flood protection. Spend the funding on flood protection and use the rest on other improvements.
5/21/2019	4 & 5	Keep creek natural, do not endanger flora and fauna and protect native animals.
5/21/2019	4 & 5	Maintain stream and fish habitat
5/21/2019	4 & 5	Some of the budget should be spent on improving stream habitat. However, main part of the budget should be spent on flood protection.
5/21/2019	4 & 5	Would like multi-use recreational areas, like playing fields and mini-parks which would also work as flood protection areas
5/21/2019	4 & 5	Add visual elements and enjoyment to open space areas
5/21/2019	4 & 5	Safe trail access
5/21/2019	4 & 5	Pedestrian connections and bridges
5/21/2019	4 & 5	Implement double purpose areas that can be flooded and enjoyed when they are dry. Design accordingly to be able to use the space when is not flooding, and when the area floods it will not damage any structure or life
5/21/2019	4 & 5	Trail on one side of the creek while the other can get flooded
5/21/2019	4 & 5	Minimize visual impacts of conceptual alternatives. Do minor bank modifications
5/21/2019	4 & 5	If you add a levee, put a trail on top
5/21/2019	4 & 5	In industrial areas, floodwalls visual impacts are less on an issue
5/21/2019	4 & 5	Make Coyote Meadows lower as floodplain
5/21/2019	4 & 5	Upstream detention possibilities in Coyote Valley, reduce the time to look at this an do it quickly
5/30/2019	8	Flood risk reduction should be the number one goal. Aesthetics is important but less than safety. As renters we care about safety only, other benefits do not concern us much. Valley water could exercise eminent domain in floodplain.
5/30/2019	8	Keep creek natural and surrounded by open spaces with trail access
5/30/2019	8	Some of the residents living away from proposed floodwalls are not too concerned with aesthetics, they just want to be protected from flooding
5/30/2019	8	If we are given a choice between berms and floodwalls, prefer berms
5/30/2019	8	Who would maintain walls? Keep them clean from vandalism? Tall walls need to include aesthetic features.
5/30/2019	8	Natural approach/non-structural more favorable
5/30/2019	8	Work on permitting and timeline because it takes time.
6/3/2019	6 & 7	Flood risk reduction is important, but we do not want a big impact on our neighborhood with the proposed alternatives.
6/3/2019	6 & 7	Protect habitat would also like flood protection
6/3/2019	6 & 7	On 17th Street and San Antonio Street, absolutely no public access since we would like to deter the homeless from living there
6/3/2019	6 & 7	Include aesthetics in alternatives
6/3/2019	6 & 7	Floodwalls are hideous, Coyote Creek is beautiful. For 20-25 year protection, it isn't worth it.
6/3/2019	6 & 7	Floodwalls may redirect water and cause flooding in other areas
6/3/2019	6 & 7	Floodwalls block the view
6/3/2019	6 & 7	Instead of permanent floodwalls, what about temporary floodwalls?
6/3/2019	6 & 7	Need to understand how floodwalls work
6/3/2019	6 & 7	We do not like tall floodwalls
6/3/2019	6 & 7	Floodwall instead of fence might be okay if not too tall
6/3/2019	6 & 7	Opposed to walls, disrupt the neighborhood and are ugly
6/3/2019	6 & 7	Should a wall be breached in a flood event that exceeds its design capacity, the water will be trapped on the wrong side of the wall making it impossible to clean up the houses until the water is pumped out. This will lead to severe mold accumulation. During the 2017 event, we were able to begin clean up within 24 hours after the creek overflow since the water drained so rapidly
6/3/2019	6 & 7	Most of the people in the affected areas do not want berms, walls or floodproofing
6/3/2019	6 & 7	Would like vegetation along walls and berms
6/3/2019	6 & 7	For berms, walking or crossing over might be difficult
6/3/2019	6 & 7	Berms at William Street might redirect flooding
6/3/2019	6 & 7	Berms would take room at William Street Park and degrade neighborhood
6/3/2019	6 & 7	No berms at William Street Park
6/3/2019	6 & 7	Under I-280, why can't berm encompass green spaces? (border of reach 7 and 8)
6/3/2019	6 & 7	Most residents support berms since they are a better option than floodwalls, but one resident is concerned about losing park space
6/3/2019	6 & 7	William Street Park/16TH Street berm makes no sense since those homes did not flood
6/3/2019	6 & 7	Concerns about proposed William Street Park berms blocking the sight-view to the park, possibly hiding undesirable activity. Visually, a berm would ruin the character of the park, take up a lot of space, and possibly interfere with some of our old trees.
6/3/2019	6 & 7	Rather than raise houses, buy homes to recreate the floodplain north of Selma Olinder/William Street Park
6/3/2019	6 & 7	House raising is not okay
6/3/2019	6 & 7	Some homes in the Naglee Park neighborhood are listed on the National Register of Historic Places and are a San Jose landmark. Once designated as a landmark, it is our understanding that you cannot change the outside of the structure. We are not certain if the City of San José would allow this type of house to be raised with no further changes to the outside of the structure.
6/3/2019	6 & 7	After the February 2017 flood, my landmark house was torn down to the studs. You will need to tear it down to the studs again to raise it since it is bolted to the foundation. The house has extensive mahogany and cedar paneling, walnut molding, oak flooring and mahogany, walnut and oak cabinetry all meticulously replaced to maintain the historical integrity of the property. Much of this will be removed and destroyed while raising the house. It took approximately a year to reconstruct the house after it was torn down to the studs last time. The optimal time to raise the house was immediately after the flood. Should you choose to adopt this strategy, we would probably suggest that you purchase the house at market value and raise and rebuild without us living there since we would probably have to move out for a year anyway.
6/3/2019	6 & 7	Our estimated cost for raising and rebuilding the house is \$500 to \$600 thousand based on our previous experience after 2017.
6/3/2019	6 & 7	Increase the capacity of the creek then the water that would go into the drains can stay in the creek
6/3/2019	6 & 7	United States Army Corps of Engineers Cost/Benefit Analysis hurts communities by not accounting for low-income communities
6/3/2019	6 & 7	In future presentations, please articulate feasibility factors for suggested solutions as I am left wondering what those are.



Input and Comments Received from Public and Stakeholders on Feasible Alternatives - Fall 2019 Public Meetings		
Date Received	Reach	Comment/Input
11/6/2019	4	Charcot Avenue Bridge – No preference between two presented alternatives (passive flood barrier vs. headwall)
11/6/2019	5	Concerns with trash, debris, and fallen trees. Both may have contributed to the failure of pumps next to the mobile home park area.
11/6/2019	5	Raising levee by 3 ft might not be enough
11/6/2019	5	Keep residents of mobile home park informed with project updates and progress of the project
11/6/2019	5	Communicate warnings and imminent flood events to mobile home park residents in a timelier manner
11/6/2019	5	Be in communication with mobile home park manager and make sure they are notified of imminent flood events
11/6/2019	5	Is it possible to build floodwalls on top of existing levees?
11/7/2019	8	Clean up trash and debris in the creek
11/7/2019	8	Homeless encampments need to be addressed
11/7/2019	8	Floodwalls should be higher at Rock Springs neighborhood
11/7/2019	8	Concerns with maintenance of floodwall. How often should the floodwall be maintained and inspected?
11/7/2019	8	Why not provide a higher level of protection than 20 year? Was a cost/benefit analysis done for higher events?
11/13/2019	6 & 7	How much warning are we going to get during a flood event?
11/13/2019	6 & 7	Be clear on what areas are going to be protected
11/13/2019	6 & 7	Whatever works best for protecting the houses – Safety and protection of the residents should be first.
11/13/2019	6 & 7	Take care of the problem sooner rather than later
11/13/2019	6 & 7	For 16 <sup>th</sup> Street, an eight feet floodwall does not seem high enough. Could this be higher? We saw about six feet within Coyote Outdoor classroom.
11/13/2019	6 & 7	Do not be saying the dams are not for flood protection if you say you care about public safety.
11/13/2019	6 & 7	If you build a wall on one side of the creek, do you need to build one on the other side?
11/13/2019	6 & 7	Houses farther upstream of William Street Park flooded in 2017, what are you going to do about that?
11/13/2019	6 & 7	Would you need to acquire property to build floodwall? Does everybody need to agree?
11/13/2019	6 & 7	If you raise the houses, it would be very high! There are elderly people who would struggle with stairs. But, would rather have that than no project.
11/13/2019	6 & 7	Like the planted landscape berm. Looks better than it does now.
11/13/2019	6 & 7	Can you get parts of this built before others? We want this project as soon as possible.
11/13/2019	6 & 7	Do you have to build all parts everywhere for the project to work?
11/13/2019	6 & 7	Concern with water coming out of storm drains during 2017 flood (on S 19 <sup>th</sup> Street and S 20 <sup>th</sup> Street)
11/13/2019	6 & 7	How would you maintain passive barriers when the creeks aren’t maintained well?
11/13/2019	6 & 7	Clean out the creeks
11/13/2019	6 & 7	Passive barrier would need to be tested regularly to make sure it works as intended
11/13/2019	6 & 7	Reconsider raising all homes apart from the ones specified in the presentation
11/13/2019	6 & 7	If water had not been released from dam, reaches 6 and 7 would not have flooded?
11/13/2019	6 & 7	How would containing water in one area not cause flooding in other areas?
11/13/2019	6 & 7	Safety and aesthetics are concerns regarding floodwalls
11/13/2019	6 & 7	This project would become obsolete after dam construction
11/13/2019	6 & 7	Why after so many years of planning to upgrade the dam, are measures being taken now to protect Coyote Creek downstream reaches?
11/13/2019	6 & 7	After so many years of overlooking deficiencies with the dam, should we have any confidence in Valley Water’s planning process? How can we trust Valley Water to fix the flooding problems?
11/13/2019	6 & 7	Division of Safety of Dams (DSOD) has known since 1985, that Anderson’s spillway was inadequate, why is this being addressed until now?
11/13/2019	6 & 7	Do we think California Department of Fish and Wildlife and other regulatory agencies will approve this project?
11/13/2019	6 & 7	For the houses along Arroyo Way, floodwalls and berms would not be an appropriate solution.
11/13/2019	6 & 7	Concern about passive barriers, if one segment fails, then the whole system will fail.
11/13/2019	6 & 7	For the passive barriers potential vendor, can we trust the “100% track record”?
11/13/2019	6 & 7	For detaining flows at Coyote Valley, why can’t we use pumps or siphon to move water from Coyote Creek to Coyote Valley?
11/13/2019	6 & 7	How much of the brush/vegetation along Coyote Creek needs to come out?
11/13/2019	6 & 7	Wouldn’t it be cheaper to raise the homes on higher ground (or even acquire property) than to build the floodwalls?
11/13/2019	6 & 7	Some homes along Arroyo Way are designated by City of San Jose as historical landmarks. Modifying them in any way might be complicated.
11/13/2019	6 & 7	Is this project completely funded and how?
11/13/2019	6 & 7	Not enough attention paid to the comments from the first meetings
11/13/2019	6 & 7	William Street – concerns with access as well as preserving the many functions of the park. Please think about providing ramps or other accessibility features.
11/13/2019	6 & 7	Will City of San Jose drainage issues be addressed with this project? They have an inadequate and undersized drainage system.
11/13/2019	6 & 7	Trash in the creek. Prioritize cleaning areas where flooding has occurred.
11/13/2019	6 & 7	Still want more technical justification why berm is necessary.
11/13/2019	6 & 7	Preference for passive barrier along South 16 <sup>th</sup> Street
11/13/2019	6 & 7	Along Jackson Street, near Watson Park, there is a 6-ft privacy wall, project is proposing a 2-ft floodwall. You still need a 6-ft privacy wall.
11/13/2019	6 & 7	Passive barrier – Concerns about vandalism, will you check and inspect every 3 months or other specific intervals?
11/13/2019	6 & 7	Watson Park owners (City of San Jose) - want to add an entry way and a pathway – Will the berm interfere with those plans?
11/13/2019	6 & 7	Watson Park area - Need to protect the electrical system, lighting and irrigation
11/13/2019	6 & 7	Floodwall surrounding Parkside Terrace Apartments – Will it force water over into Terrace Drive and 22 <sup>nd</sup> Street across Coyote Creek on west bank?
Input and Comments Received from Public and Stakeholders on Feasible Alternatives – Fall 2019 Public Meetings, continuation....		



Date Received	Reach	Comment/Input
11/13/2019	6 & 7	Will the narrow channel flood areas downstream in the industrial areas? Will the BART tunnel flood?
11/13/2019	6 & 7	Will construction affect the new trail plans?
11/13/2019	6 & 7	Watson Park is a former landfill area, will that be a problem with flood waters? What about top-soil loss?

Input/Comments Received from Public and Stakeholders on Feasible Alternatives – January 23<sup>rd</sup>, 2020 Public Meeting, San José Parks Advocates

Date Received	Park that comment is addressing	Comment/Question/Input
1/23/2020	Watson Park	How tall would passive barrier be?
		Would passive barrier prevent access to park?
		How deep was the flooding at Watson Park?
		Who would oversee the maintenance of the passive barrier?
		Can the passive barrier be protected with steel so that it is not vandalized?
		How will the general public know that the passive barrier is given the proper maintenance?
		How long does it take to clean the passive barrier?
		Can the general public give input on wall design? For example, what type of material like stone, concrete, etcetera?
		Can we have an approximately 10’ wide road on top of the berm for access?
		What is the design flow for the project?
		What is the level of flood protection that the project will be providing?
		Do you have funding for the project?
	Roosevelt Park	Who is doing the storm drain work for the project?
		Please, make sure that the flap gates adjacent and within the project scope are working properly.
		Is anyone removing trash within creek?
		What about trash rafts? Is anyone removing them? What about utilizing trash racks?
		There are trash islands observed along Julian Street and they have been there for a while now.
		What are the regulations on how often you need to clean the creek?
		Would trash/creek clean ups be part of the project maintenance plan?
		Why not promote a joint maintenance program with City/VW/schools that would address trash issues?
	William Street Park	It would be a good idea for the vegetated berm to provide habitat for birds and other critters like butterflies and hummingbirds.
		We should contact a California Native plant store that knows about native plants that we could include in the vegetated berm
		How many access points would the vegetated berm at William Street have? Access for police and public is very important.
		Can berm be wider so that police can drive on top?
		Have we considered raising the street instead of the William Street berm?
	Selma Olinder Park and Olinder Elementary School	For Selma Olinder Park, walls along school can cause issues since students utilize the ball field.
		With the onset of climate change, what happens if flooding is massive?
		Dog park on Selma Olinder flooded first, need to include park in the flood protection alternative
		How long are passive barrier segments?
		What happens to trees that are in the way of the project?
		Any other ideas for area behind Olinder Elementary School that does not include walls?
	Coyote Meadows	What happened to the previous floodwall that was proposed for Coyote Meadows?
		How does the project affect the Coyote Creek Trail project?
		Can water go through berm in opposite direction? Basically, moving floodwaters on dry side back to creek. Can this be done?
		Are radio towers within Coyote Meadows being removed?
		Did Congresswoman Lofgren say she would help with local/federal permits?
	Kelly Park	We are glad that we are not seeing walls all along the various parks
		What is the schedule for the Anderson Dam project?
		Please consider protecting Japanese Park and ponds at Kelley Park
		Please consider protecting zoo and friendship garden
		Please focus on Anderson Dam and preserve parks
		Homeless people should have regular trash service



## APPENDIX C. COYOTE CREEK STEADY STATE MODEL TECHNICAL MEMORANDUM





# TECHNICAL MEMORANDUM

**PROJECT:** Coyote Creek Flood Protection Project **DATE:** June 26, 2020

**SUBJECT:** Coyote Creek Steady State Model- Existing and Proposed Conditions (DRAFT)

**PREPARED BY:** Melissa Reardon

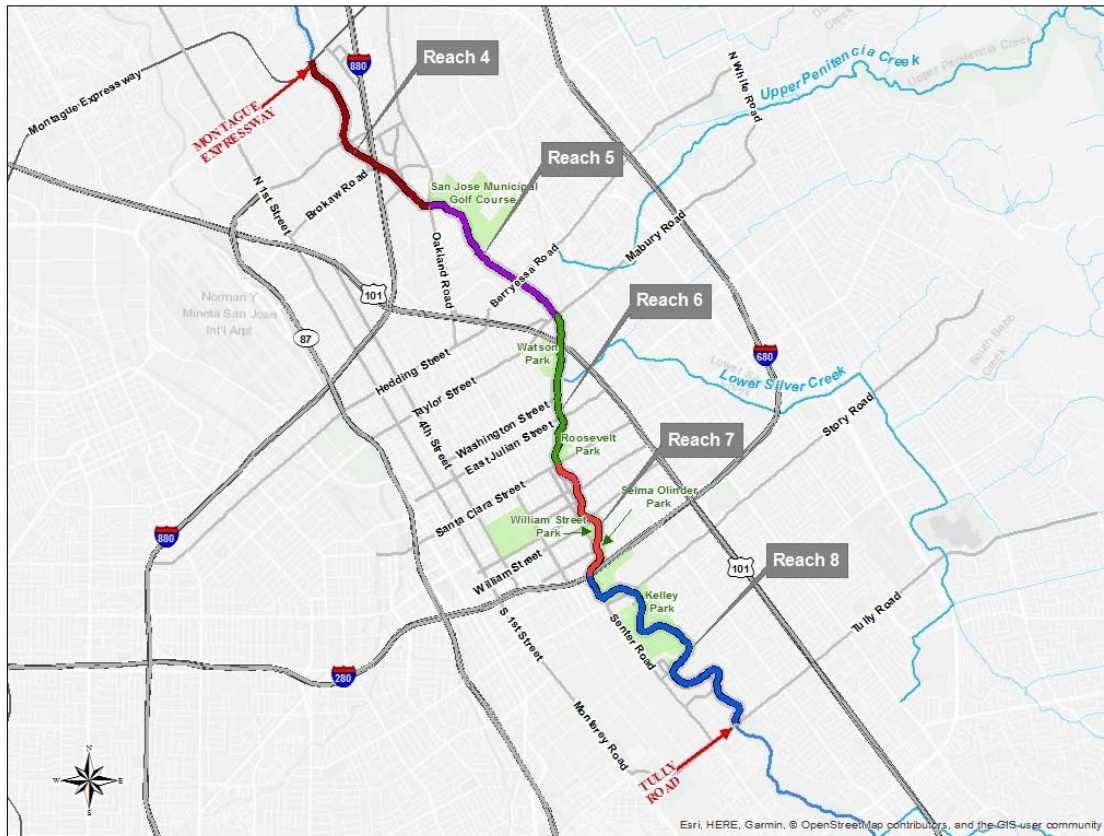
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## 1. INTRODUCTION

This memorandum documents the development of a steady state HEC-RAS model for Coyote Creek between Montague Expressway and Tully Road for the Coyote Creek Flood Protection Project (Project). This model is used to compute water surface elevations (WSELs) with Project elements and identify any potential design issues. The Project proposes to construct floodwalls, berms, and passive barriers to provide flood protection for a storm event with approximately a 20-year return period. In addition, the Project proposes to elevate or acquire select properties along the creek. The Project elements are grouped into five reaches, as identified in Figure 1. Both models were developed with HEC-RAS version 5.0.7.

For this analysis, two conditions were modeled: Existing Conditions and Preferred Project Alternative Conditions, referred to herein as "Proposed Conditions" since the Project design will most likely evolve as the design moves forward. The Existing Conditions model was developed based on the model calibrated to the President's Day storm in 2017 (Reference 1), with revisions made to the geometry and flow as described in this memorandum. In the Proposed Conditions model, Project elements were added to the geometry from the Existing Conditions model. WSELs are compared between the two conditions and elevations of Project components are included in this memorandum. The Proposed Conditions model serves as the Preferred Project Alternative model for the Project. Model plan information is included in Section 8.





**Figure 1. Project Extent and Reaches**

## **2. EXISTING CONDITIONS MODEL**

### **2.1. Flows**

The flows associated with the President's Day event of 2017 have been revised since the calibration included in Reference 1. The flows referred to as "Observed Flows" in Reference 2 represent the revised flows and were used to predict water surface elevations from the 2017 President Day's event for the calibration verification documented below.

After model calibration verification, the flows used to design Project elements were based on the 72 hour 20-year Design Storm in Table 2 of Reference 2. Flows were rounded to the nearest hundred cubic feet per seconds (cfs) in the model.

The flows used for calibration of this model and for design are provided below in Table 1.



**Table 1. Calibration and Design Flows**

Approximate HEC-RAS River Station (ft)	Location	Calibration Flows (cfs)	Design Flows (cfs)
47867	Coyote Creek U/S of Tully Road	7300	8300
32189	Coyote Creek at I-280	7250	8400
28960	Coyote Creek at East William Street	7200	8400
21200	Coyote Creek U/S of Lower Silver Creek	7200	8400
20914	Coyote Creek D/S of Lower Silver Creek	7250	9100
16096	Coyote Creek U/S of Upper Penitencia Creek	7250	9100
15766	Coyote Creek D/S of Lower Silver Creek at Berryessa Rd	7550	9500
6632	Coyote Creek at I-880	7400	9500

## **2.2. Model Geometry Revisions**

The geometry from the 2017 conditions steady state model calibrated in Reference 1 has been modified as described in the following sections by reach. The model calibration was then confirmed by comparing calibration flow WSELs predicted from the model to high water marks included in Reference 1.

### **2.2.1. Reach 4**

The cross sections at the Charcot Avenue bridge were revised based on recent surveys done in 2019.

### **2.2.2. Reach 5**

No revisions were made within Reach 5.

### **2.2.3. Reach 6**

Within Reach 6, one cross section was revised based on the cut line and one cross section was interpolated between two cross sections (RS 21200 and 21400) already in the model. This cross section was interpolated to account for a Project element.

### **2.2.4. Reach 7**

Within Reach 7, survey data from a 2019 survey of the area near Williams Street Park were incorporated into the model as new cross sections. The cut lines on the left overbank of a number of these new cross sections were revised so that the cut lines did not intersect or otherwise overlap. The left overbank of cross sections with revised cut lines were then updated



based on 2006 LiDAR contours. The 2006 LiDAR contours were generally within 0.5 feet of the 2019 survey points so it is assumed that the 2006 LiDAR contours still reasonably represent conditions in the left overbank area near Williams Street Park. Several cross sections were also interpolated outside of the Williams Street Park area to account for Project elements.

Buildings that were on parcels identified as being acquired or elevated (Figure 5) were incorporated into the model as blocked obstructions with ineffective flow areas. The buildings are adjacent to the creek on S 17<sup>th</sup> Street, Arroyo Way, William Street, and Brookwood Avenue. While most of the inundated buildings in the model are incorporated in the model using ineffective flow areas, these buildings were shown as blocked obstructions to better highlight the differences from the Proposed Conditions. It is also noted that this model calibrated well to high water marks for the 2017 Presidents Day event, so the impacts of the buildings are somewhat lumped into the roughness and ineffective flow areas. Lastly, as discussed in Section 7, a sensitivity analysis showed there was little difference in WSEL if the buildings were modeled just as ineffective flow areas or as blocked obstructions with ineffective flow areas.

#### *2.2.5. Reach 8*

Within Reach 8, the recently constructed Rocksprings floodwall and berm were added to the model.

### **2.3. Model Calibration**

Because the berm and floodwall in Reach 8 were constructed after the 2017 Presidents Day event, there was concern that the Existing Conditions geometry may not reflect February 2017 conditions. As a result, a “pre-Existing Conditions” geometry was created where the berm and the floodwall were removed from the appropriate cross sections. This “pre-Existing Conditions” geometry was run with the Calibration Flows in Table 1 to confirm that changes to the model did not result in WSELs that were significantly different from the high water marks obtained after the 2017 flood event. The water surface elevations for the calibration is provided in Table 2.



**Table 2. Calibration Model Results**

Approximate HEC-RAS Station (ft)	High Water Mark (ft NAVD88)	Predicted WSEL (ft NAVD88)	Difference between High Water Mark and Predicted WSEL (ft) <sup>1</sup>
47304.49	120.91	120.48	-0.43
41444.49	106.8	106.75	-0.05
41144.49	106.66	106.23	-0.43
40944.49	106.3	105.86	-0.44
40474.49	105.45	104.92	-0.53
39744.49	103.65	104.00	0.35
39144.49	103.67	103.02	-0.65
35040.49	98.49	97.89	-0.60
29104	94.29	93.96	-0.33
29001	94.53	93.90	-0.63
27328	91.45	91.84	0.39
20515	84.5	84.61	0.11
18763	82.5	82.41	-0.09
17951	79.64	79.73	0.09
15766	74.62	74.69	0.07
13762	68.5	68.85	0.35
12430	63.1	63.09	-0.01
8540	53.46	53.47	0.01
4694	46.3	46.11	-0.19
3435	44.7	42.36	-2.34
2100	40.85	40.74	-0.11
848	37.6	37.50	-0.10
441	35.8	35.71	-0.09

Notes: 1. The difference is negative when the predicted water surface elevation is less than the high water mark. The difference is positive when the predicted water surface elevation is greater than the high water mark.

As with the model from Reference 1, the model developed for this memorandum predicts WSELs that are generally within half a foot of the measured high water marks, as shown in Table 2. One exception is at the location downstream of Charcot Avenue (Station 3435), where the water surface elevation is underpredicted by more than 2 feet.

The root mean square error (RMSE) of the entire set of 23 high water marks is 0.59 ft. When the outlier downstream of Charcot Avenue is removed, the RMSE error is 0.35 ft. Given the low values for the root mean square error, the model calibration is deemed reasonable.

### 3. PROPOSED CONDITIONS MODEL

#### 3.1. Flows

Table 1 provides the flow distribution used for the Proposed Conditions Model. The calibration flows were not used in the Proposed Conditions model.



### 3.2. Geometry Revisions

The Existing Conditions model was revised to incorporate Project elements. The following sections describe the Project elements by reach and the method used to model the elements.

For this modeling effort, the elevation of flood protection elements was set such that there was no spilling beyond the elements. In the model, the elevation of flood protection elements was set to approximately 1 foot above the water surface elevation, or to provide approximately 1 foot of freeboard. However, this should not be interpreted as a required freeboard for design purposes and the elevation of flood protection elements used in the model are not necessarily the final elevations. As stated before, the intent of this analysis is to determine the WSELs that will ultimately be used in the design of the Project.

#### 3.2.1. Reach 4

Within Reach 4, approximately 1,500 feet of flood protection elements are proposed for the west bank of Coyote Creek near Charcot Avenue. In addition, approximately 950 feet of elements are proposed for the east bank. The elements primarily consist of floodwalls but also include passive barriers across the Charcot Avenue bridge, as shown on Figure 2.

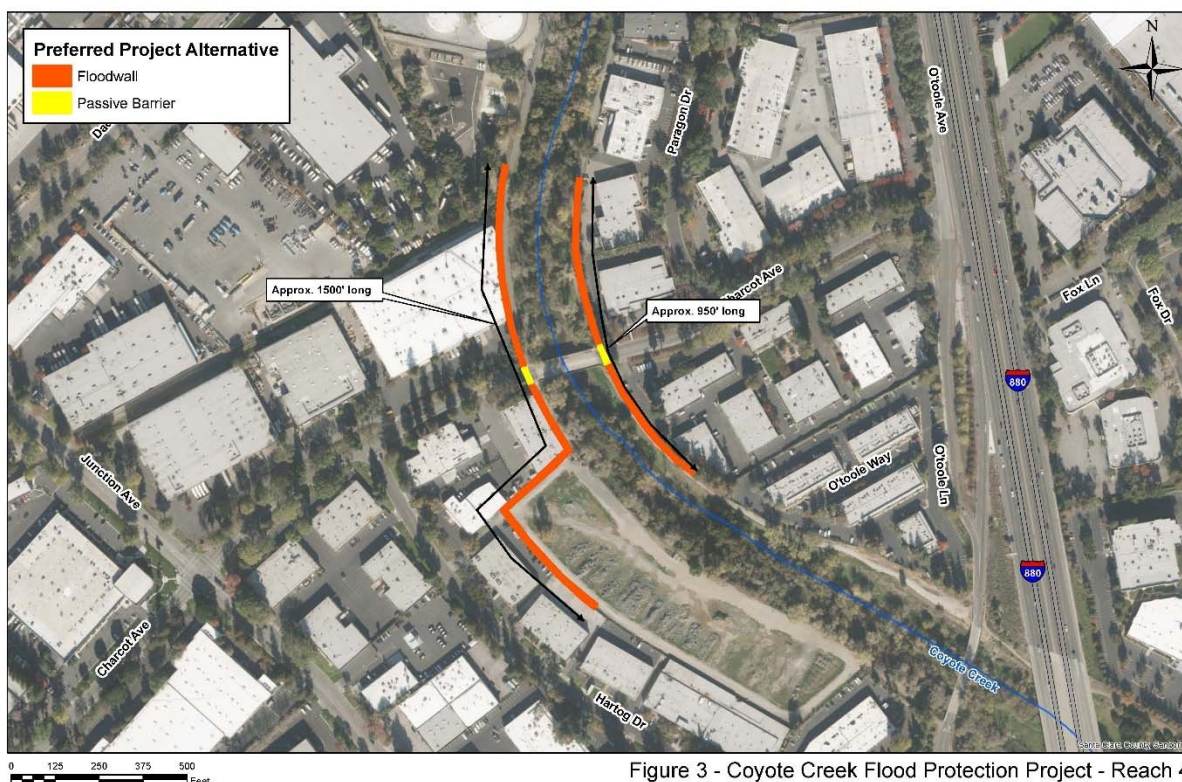


Figure 3 - Coyote Creek Flood Protection Project - Reach 4

**Figure 2. Reach 4 Flood Protection Elements**

In the model, the floodwalls and passive barriers were modeled as vertical HEC-RAS levees with the elevations set to provide approximately 1 foot of freeboard above the creek water surface. These HEC-RAS levees were located within the model cross section based on



approximate centerline GIS data provided by the Project design team, survey points for the original model, and 2006 LiDAR contour data.

### 3.2.2. Reach 5

As shown in Figure 3, flood protection elements in Reach 5 include a section of raised levee and floodwalls on both the west and east banks of Coyote Creek. Approximately 350 feet of raised levee is proposed for the west bank near the South Bay Mobile Home Park and approximately 4,500 feet of floodwall is proposed for the west bank from the South Bay Mobile Home Park to Mabury Road. On the east bank, approximately 350 feet of floodwall is proposed along Notting Hill Drive.

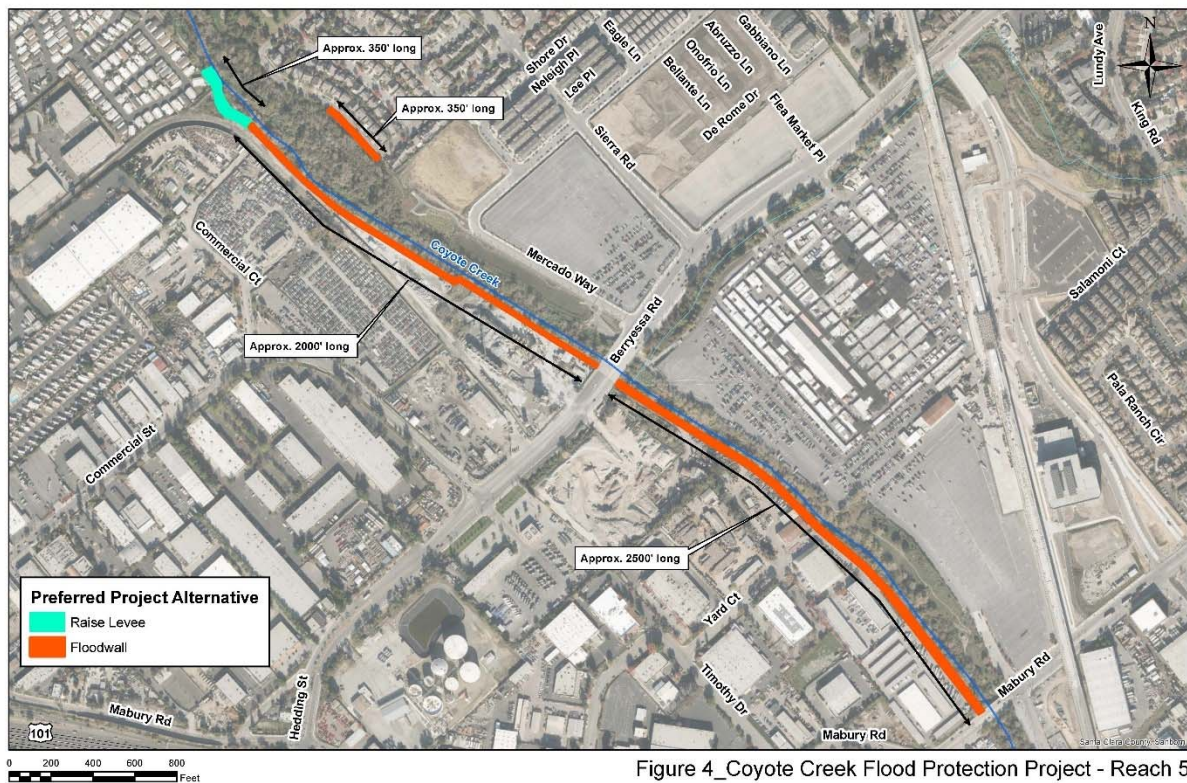


Figure 4\_Coyote Creek Flood Protection Project - Reach 5

**Figure 3. Reach 5 Flood Protection Elements**

The levee near the South Bay Mobile Home Park was incorporated into the model by revising the cross section data for three cross sections. For all of the cross sections, it was assumed that the top elevation of the levee was 71 feet, the top width was 12 feet, and the centerline of the top of the levee followed the approximate centerline GIS data provided by the design team. The side slope was 2:1 (H:V) for the two cross sections downstream of the mobile home park, but immediately adjacent to the mobile home park, the side slopes were increased to 1:1 (H:V) so that the levee footprint fit within Valley Water's right-of-way.



The floodwalls in this reach were modeled as HEC-RAS levees with elevations set to approximately 1 foot above the water surface elevation. These HEC-RAS levees were located in the model cross section based on approximate centerline GIS data provided by the Project design team, survey points for the original model, and 2006 LiDAR contour data.

### 3.2.3. Reach 6

Flood protection elements in Reach 6 include floodwalls along the creek, floodwalls, passive barriers, and vegetated berms bordering structures, and a floodwall along U.S. Highway 101, as shown in Figure 4. Approximately 1,200 and 1,100 feet of floodwall are proposed on the west bank and east bank of Coyote Creek, respectively, between Mabury Road and U.S. Highway 101. Along the south side of U.S. Highway 101, approximately 350 feet of floodwall is proposed. Approximately 1,200 feet of floodwall, 75 feet of passive barrier, and 75 feet of vegetated berm are proposed along the west side of Watson Park and approximately 250 feet of floodwall are proposed to the north of Empire Gardens Elementary School. Approximately 850 feet and 750 feet of floodwall are proposed for the east bank of Coyote Creek to protect infrastructure south of U.S. Highway 101.

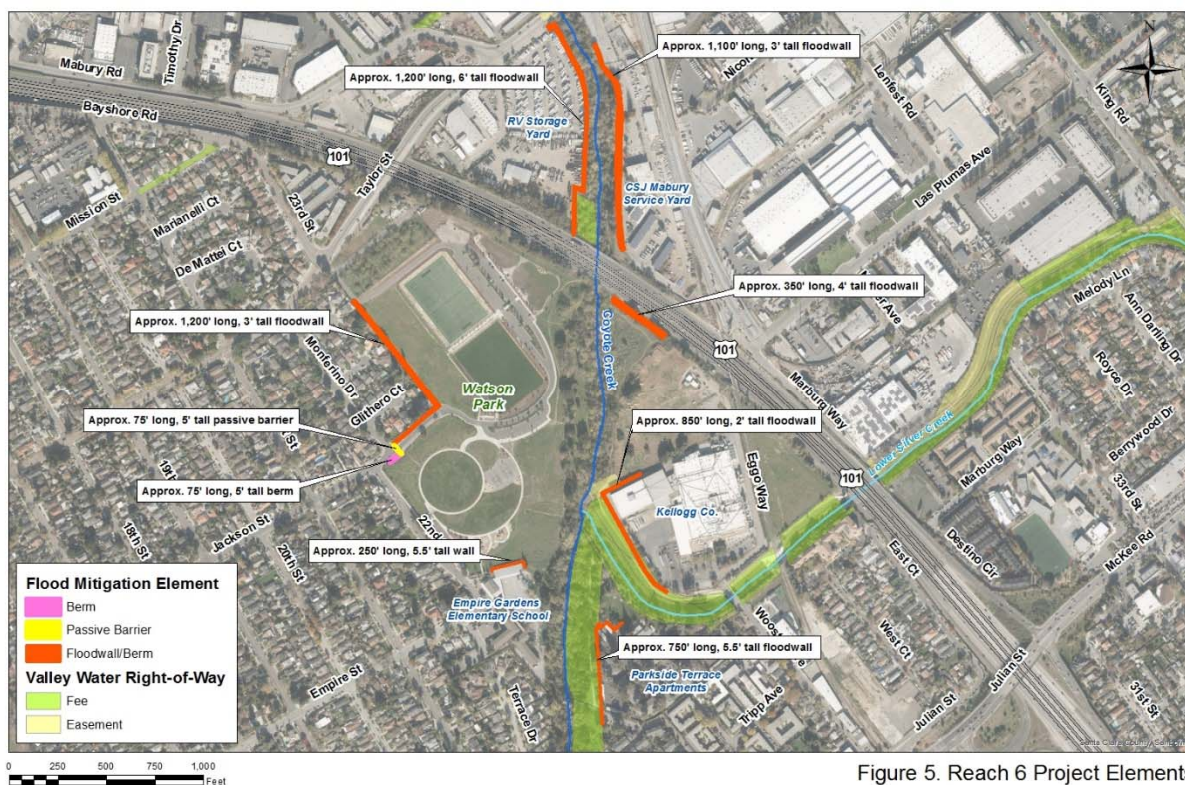


Figure 5. Reach 6 Project Elements

Figure 4. Reach 6 Flood Protection Elements

Floodwalls and passive barriers within this reach were modeled as vertical HEC-RAS levees with elevations set to approximately 1 foot above the water surface. These HEC-RAS levees were located within the model cross section based on approximate centerline GIS data provided by the Project design team, survey points for the original model, and 2006 LiDAR contour data.



### 3.2.4. Reach 7

Reach 7 includes the greatest variety of flood protection elements, as shown in Figure 5. Several parcels along the creek between Santa Clara Street and Williams Street are proposed to be either elevated or voluntarily acquired. Several smaller floodwalls are also proposed to protect structures along this stretch of the creek. A vegetated berm and floodwall is proposed along the western boundary of Williams Street Park. A floodwall is proposed along the eastern bank of the creek, protecting Olinder Elementary School, and a passive barrier within the sidewalk is proposed along Woodborough Drive.

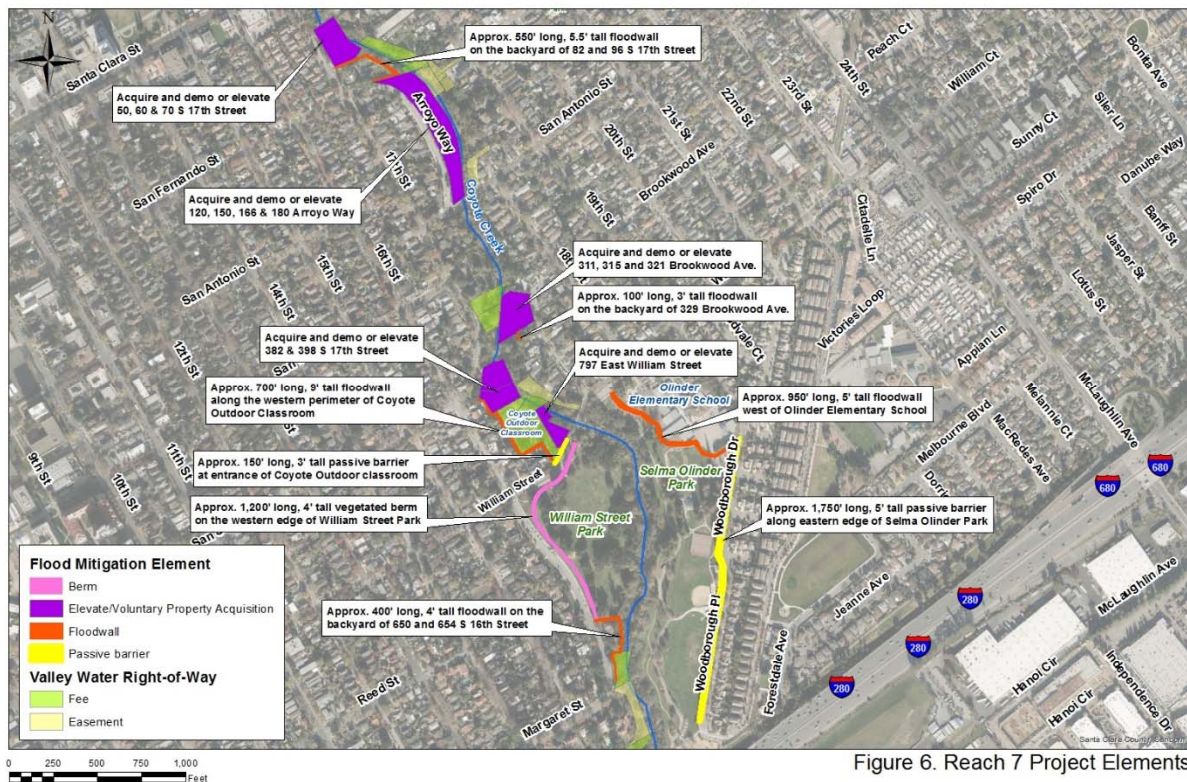


Figure 6. Reach 7 Project Elements

Figure 5. Reach 7 Flood Protection Elements

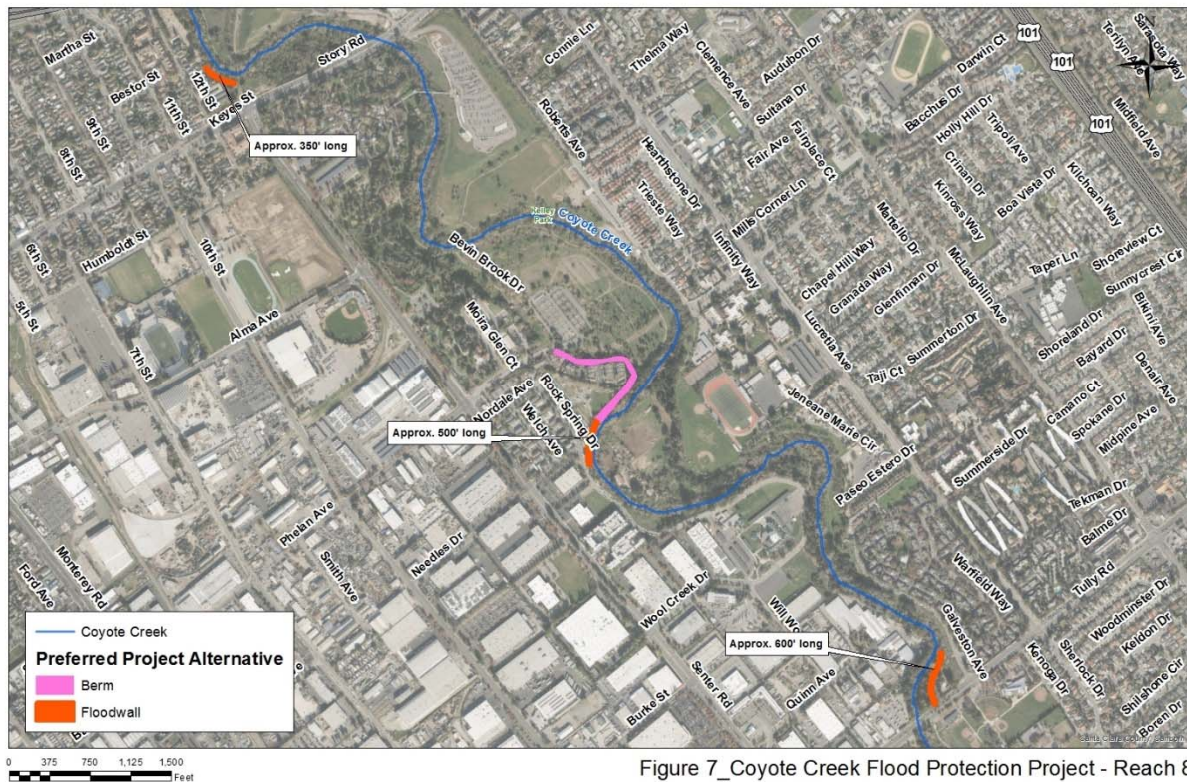
The vegetated berms, floodwalls, and passive barriers proposed in this reach were modeled as vertical HEC-RAS levees with the elevation of the levee set to 1 foot above the water surface elevation. These HEC-RAS levees were located within the model cross section based on approximate centerline GIS data provided by the Project design team, survey points for the original model, and 2006 LiDAR contour data.

Blocked obstructions representing piers of elevated buildings with ineffective areas were used to model the elevated/acquired buildings. Building footprints were based on the Buildings shapefile from the City of San Jose and were projected onto adjacent cross sections. It was assumed that the piers themselves were 1 foot in diameter, but the blocked obstructions were triple the pier width (total 3 feet in width) to reflect the potential for debris accumulation and blockage. Piers were evenly spaced along the length of buildings, approximately 8 to 10 feet apart.



### 3.2.5. Reach 8

Within Reach 8, three floodwalls and a berm are proposed, as shown in Figure 6. One floodwall is located near the intersection of Keyes Street and 12<sup>th</sup> Street and is approximately 350 feet long. The Project proposes to extend the berm constructed to provide flood protection to the Rocksprings neighborhood along the development at Bevin Brook Drive. The floodwall, also constructed to provide flood protection to the Rocksprings neighborhood, would be elevated and extended as necessary. Lastly, a 600 foot long floodwall is proposed near the intersection of Galveston Avenue and Tully Road to protect San Jose Water Company infrastructure in that area.



**Figure 6. Reach 8 Flood Protection Elements**

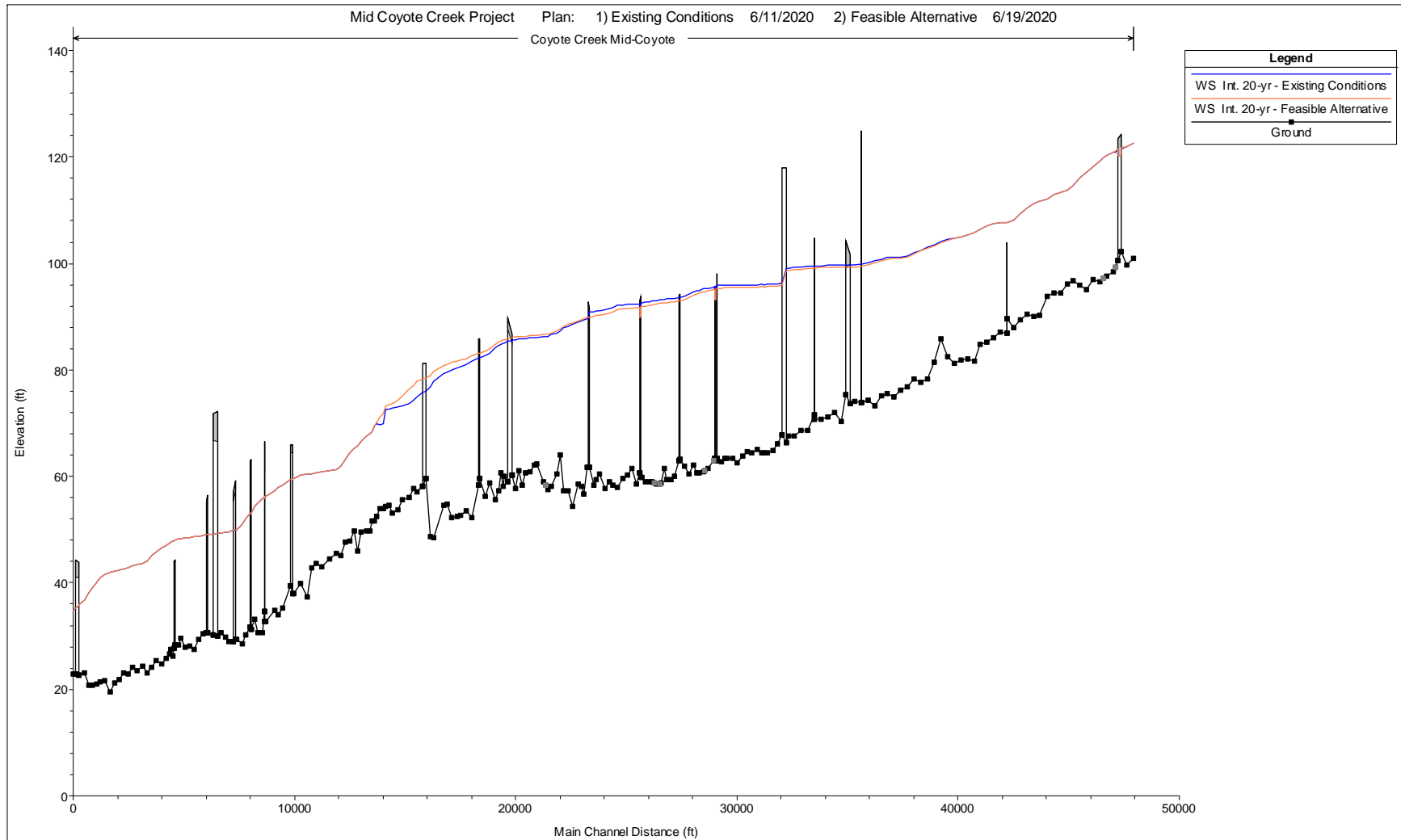
The floodwalls, shown in red in Figure 6, were modeled as vertical HEC-RAS levees with the elevation of the levee set to 1 foot above the water surface elevation. The constructed berm near the Rocksprings neighborhood was incorporated into the Existing Conditions model in the cross section and was unchanged for the Proposed Condition. However, where the berm will be extended around the Bevin Brook Drive development, the berm was modeled as a HEC-RAS levee with the elevation of the levee set to approximately 1 foot above the water surface elevation. The extended berm represents is relatively small compared to the length of the cross sections in this area so a HEC-RAS levee reasonably represents the impact of the extended berm, and would be easier to identify as a change from the Existing Conditions model.



#### 4. MODEL RESULTS

The WSEL profiles along Coyote Creek for the Existing and Proposed Conditions are provided in Figure 6. Water surface elevations under Proposed Conditions are generally the same as those under existing conditions from Montague Expressway to Old Oakland Road and between the Cooksy Farm pedestrian bridge and Tully Road. Between approximately Old Oakland Road and Julian Street, the WSELs under Proposed Conditions are higher than Existing Conditions WSELs; the difference varies between approximately 0.3 foot and 2.9 feet depending on the location. The increase in WSEL here is due directly to the design element; a floodwall is proposed to be placed at the edge of the channel on the west side near Berryessa Road, confining flows that would normally spread out onto a wide floodplain to a much narrower channel. Confining the flows there both increases the flows locally and leads to localized backwater effects upstream. The east bank of Coyote Creek is high enough in this reach to not be flooded by this event. Between Julian Street and the Cooksy Farm pedestrian bridge, the Proposed Conditions WSELs are lower than Existing Conditions WSELs; at some locations, by as much as 1 foot. The design considerations for this apparent reduction are discussed in the following section.





**Figure 7. Modeled Water Surface Elevations for Existing and Proposed Conditions**



## 5. DESIGN CONSIDERATIONS

In the Proposed Conditions model, the elevations of Project elements are set to prevent water from spilling beyond the flood protection elements. As stated before, it is not intended that the elevations of flood protection elements included in the Proposed Conditions model are the final elevations. The design team shall review the Project elements profile and determine the best elevations based on water surface elevations, construction restrictions, and other factors. Once a refined floodwall profile has been developed, it should be input to hydraulics model and the model should be rerun at both the design flow as well as some higher flow events to ensure that the channel downstream of any proposed elements has adequate capacity. In addition, some two-dimensional modeling may be warranted to ensure that the floodplain is not adversely affected by proposed elements.

In developing the Proposed Conditions model, several design aspects should be noted and evaluated in more detail by the design team. Design considerations specific to elements are discussed in the following sections, separated by reach.

### 5.1.1. Reach 4

Within Reach 4, there were no design elements that require additional specific consideration.

### 5.1.2. Reach 5

As mentioned in Section 3.2.2, there were footprint constraints for the proposed raised levee immediately adjacent to the mobile home park. As more information is available, it is recommended that the design team evaluate whether the design included in this analysis will work or whether alternative designs will be required.

### 5.1.3. Reach 6

Within Reach 6, it may be possible to shorten the floodwall on the western side of Watson Park based on the 2006 LiDAR contours in the area. It was noted that the terrain associated with the most recent 2D model for Coyote Creek had lower elevations than the 2006 LiDAR, but it appeared that the terrain elevations had been somehow interpolated in this area. The design team should evaluate whether the water surface elevations and surrounding topography would allow for the shortening of this wall.

Additionally, the floodwall along U.S. Highway 101 should be placed outside of Caltrans right-of-way based on discussions with the design team. The approximate centerline GIS shapefile that was provided indicated that the floodwall would be within the Caltrans right-of-way.

It should be noted that the model indicates that there may be inundation on the west bank of Coyote Creek near the corner of N 18<sup>th</sup> Street and E John Street. Water surface elevations from both the Existing Conditions and Proposed Conditions models show water surface elevations that are at or above local surrounding elevations based on 2006 LiDAR contours. There are currently no structures on the area that is potentially inundated so a flood protection element may not be required at this time.



#### 5.1.4. Reach 7

Acknowledging the known modeling issues discussed in Section 6 for this reach, there are no design elements that require additional specific consideration.

#### 5.1.5. Reach 8

Within Reach 8, the berm that was constructed near the Rocksprings neighborhood provides between 0.5 and 1 ft of freeboard. Additionally, the floodwall previously constructed south of the raised berm provides less than 1 foot of freeboard as modeled in this analysis. As stated, it is not the intent of this analysis to set freeboard requirements or determine final elevations for the Project elements. However, if the design team decides to provide 1 ft of freeboard uniformly throughout the project, the design team should consider raising a portion of the existing berm and raising and extending the floodwall.

### 6. KNOWN MODEL ISSUES

There is an issue with the HEC-RAS computations of bridge losses at the Julian Street bridge for a narrow range of flows, near the design flow, for which the water surface elevation is just below the highest point on the underside of the bridge (i.e, soffit or low chord). Within this range, small changes in flow result in HEC-RAS choosing different loss calculation methods, but the transition between methods is not gradual. The issue is important because accurate estimates of bridge losses at Julian Street cause backwater effects that could impact the design heights of Project elements upstream. Using different loss calculation methods at Julian Street near design flow can result in a 1 ft increase in WSEL. This 1 foot increase at Julian Street causes an increase of half a foot at William Street, located about 1 mile away, where overtopping caused flooding during the 2017 event.

Essentially, the issue is whether HEC-RAS is computing losses correctly in this range of flows, and, if not, how to adjust the model to achieve more accurate results. Below, the issue and initial attempts to resolve it are described. More research is planned to address this issue as the Project moves toward design.

#### 6.1. Sensitivity to Flows

The Julian Street bridge was modeled such that for “low flows” (those for which the WSEL is below the highest point of the soffit of the bridge), the model would calculate the losses under three methods (energy, momentum, and Yarnell) and use the method that produces the highest losses. For the Julian Street Bridge, the momentum method consistently produces the highest losses. However, if HEC-RAS determines that the bridge is under a “low flow” condition, the momentum solution is discarded if the computed WSEL touches the highest point on the soffit, and the higher of the two remaining methods is used.

A sensitivity analysis was conducted where both slightly lower and slightly higher flows than design flow were used with the Existing and Proposed Conditions models to understand the transition at Julian Street bridge. For each geometry condition, there appears to be a “threshold” flow for the Julian Street bridge at which point the momentum solution is discarded and that this



“threshold” flow is close to the design flow for this specific bridge. This “threshold” flow is not the same for both Existing and Proposed Conditions. Since the Proposed Conditions model has higher WSELs downstream of Julian Street than the Existing Conditions model, less flow is required before the calculated WSEL touches the soffit and the momentum solution is discarded. As such, the “threshold” flow is lower for Proposed Conditions than it is for Existing Conditions, as observed in the sensitivity analysis.

For flow lower than the design flow, HEC-RAS selected the momentum solution for both Existing and Proposed Conditions and the WSELs under Proposed Conditions are higher than those under Existing Conditions upstream of Julian Street. The “threshold” flow has not been met for either Existing or Proposed Conditions as HEC-RAS uses the momentum solution for both.

However, the design flow meets or exceeds the “threshold” flow for Proposed Conditions, but not for Existing Conditions. In other words, at the design flow, the momentum solution is discarded under Proposed Conditions but is used under Existing Conditions. For the Proposed Conditions, the HEC-RAS program calculated losses for the Yarnell and energy solutions and chose the energy solution since it had the higher losses. Since the losses calculated with the energy solution are much lower than those using the momentum solution at Julian Street bridge, the WSELs just upstream of Julian Street bridge under Existing Conditions are approximately 1 foot higher than WSELs at the same location under Proposed Conditions.

Finally, for flow slightly higher (2 percent higher) than the design flow, the “threshold” flow was met or exceeded for both Existing and Proposed Conditions and HEC-RAS discarded the momentum solution for both conditions. Notably, under Existing Conditions, the WSELs with the slightly higher flow are lower than WSELs with design flow due to the difference in bridge loss calculations.

## **6.2. Applicability of the Energy Method**

To determine whether the energy method is appropriate for modeling losses through Julian Street bridge, the model was recalibrated by forcing HEC-RAS to disregard the momentum solution and instead evaluate the losses for only the energy and Yarnell methods. There were no high water marks recorded at Julian Street so the appropriateness of the energy solution was evaluated based on high water marks collected further upstream. This resulted in a worse calibration as the RSME increased from 0.35 feet to 0.50 feet, with the outlier downstream of Charcot Avenue excluded. It also resulted in predicted WSELs that were biased to be lower than the high water marks upstream of Julian Street, rather than WSELs that were both above and below the high water marks.

It should be noted that the calibration flows are lower than the design flows. Although this analysis provides an indication that the momentum solution may better predict bridge losses for the calibration flow at Julian Street at the calibration flow, more investigation is needed to 1) provide more underpinning for the appropriate bridge loss method at the design flow, and 2) make a final determination of how to design the Project elements.



## **7. MODEL SENSITIVITY ANALYSIS**

A series of sensitivity analyses were conducted to evaluate different modeling techniques used for Project elements, as described in the following sections. All sensitivity analyses were performed for the same design flow distribution.

### **7.1. Existing Conditions**

#### *7.1.1. Reach 7 Buildings*

Throughout the model, inundated buildings were modeled as ineffective flow areas; however, within Reach 7, as described in Section 2.2.4, buildings that are to be acquired/elevated were modeled using blocked obstructions with ineffective flow areas in the Existing Conditions model. A geometry was developed where the blocked obstructions were removed from the Existing Conditions geometry; otherwise the geometry was unchanged. There was little (0.01 ft) difference in the modeled WSELs between the two models, showing that the impact of using (or not using) the blocked obstructions to represent buildings is minimal.

### **7.2. Proposed Conditions**

#### *7.2.1. Reach 7 Ineffective Flow Areas*

A sensitivity analysis was conducted to evaluate the relative impact of ineffective flow areas between Santa Clara Street and Williams Street using two revised geometries. One geometry (Geometry 1) revised the Proposed Conditions geometry such that ineffective areas associated with buildings to be elevated/acquired were removed, with the exception of the area immediately downstream of Williams Street bridge. In that area, ineffective areas were revised based on theoretical expansion and contraction ratios for the left overbank area. Modeled piers were left unchanged.

The other geometry (Geometry 2) revised the Proposed Conditions geometry such that ineffective areas were added to the model based on best professional judgment of expansion and contraction due to changes in topography. In this geometry, it is assumed that the piers have no impact on the flow's effective area. Modeled piers were left unchanged.

The difference in modeling approaches has little impact on WSELs, resulting in maximum differences of less than 0.1 ft. The differences are outlined in Table 3.

#### *7.2.2. Reach 7 Piers and Blocked Obstructions*

The Project team was curious if modeling the elevated buildings as completely blocked obstructions, as if the buildings were elevated on solid walls rather than piers, resulted in a significant difference in WSELs. For this sensitivity analysis, a geometry (Geometry 3) was created that revised the Proposed Condition geometry such that the blocked obstructions representing buildings mimicked the blocked obstructions in the Existing Conditions geometry. There was little (0.01 ft) difference in WSELs.

#### *7.2.3. Reach 7 Building Elevation Method*



The Project team was interested in the relative impact of different flood protection methods for the buildings identified to be elevated/acquired. One method included the acquisition and demolition of buildings; this scenario was modeled by creating a geometry (Geometry 4) based on best judgement ineffective flow areas (Geometry 2) with the modeled piers removed.

Another method included constructed floodwalls around all of the buildings; this scenario was modeled by creating a geometry (Geometry 5) where piers were removed and replaced with HEC-RAS levees set at the best judgement location given the location of the building within the cross section. Ineffective areas were revised based on best professional judgement of expansion and contraction around these floodwalls.

Model results indicated that both demolition and floodwalls resulted in less than 0.1 ft difference in WSELs compared to the Proposed Conditions model. Maximum and minimum differences are shown in Table 3.

#### 7.2.4. Sensitivity Analysis Summary

A summary of the differences determined in the sensitivity analyses for the Proposed Condition are shown in Table 3. All differences are calculated as:

Difference (ft) = Sensitivity Geometry Model WSEL (ft) – Proposed Conditions WSEL (ft)

**Table 3. Maximum and Minimum Differences in WSEL from Proposed Conditions Sensitivity Analyses**

	Geometry 1	Geometry 2	Geometry 3	Geometry 4	Geometry 5
Brief Description	Ineffective areas removed; theoretical areas D/S of William St bridge	Best professional judgement ineffective flow areas	Buildings as completely blocked obstructions	Best professional judgement ineffective flow areas and piers removed	Floodwalls around all properties; ineffective areas revised based on best professional judgement
Maximum difference (ft)	0.02	0	0	0	0.06
Minimum difference (ft)	-0.07	-0.01	-0.01	-0.02	-0.02

## 8. MODEL PLAN INFORMATION

A summary of the model plans and associated geometry and flow files is provided in Table 4. Geometry and flow files outside of those outlined in Table 4 have been retained for convenience but were not used in this analysis.



**Table 4. Model Plan, Geometry, and Flow Information**

Model	Plan	Geometry	Flow File	Flow Profile
Calibration Model	Calibration Model, p20	Calib_Geometry, g19	2017_Observed_Flow, f05	Observed Flows
Existing Conditions	Existing Conditions Model, p04	Calib_Geometry_with_FW_2019_SurveyV2, g13	ProjectDesignStormDVG, f07	Int. 20-year
Proposed Conditions	Feasible Alternative Model, p18	PrefAlte_Reach 4, 5, 6, 7 _8 Components, g18	ProjectDesignStormDVG, f07	Int. 20-year
Existing Condition Sensitivity	EX without Blocked Obstructions, .p08	EX_withoutBlocked Obstruction, .g26	ProjectDesignStormDVG, f07	Int. 20-year
Proposed Conditions Sensitivity Geometry 1	NoInEff Except WilliamSt, .p02	PrefAlte_all_Effat Theory, .g21	ProjectDesignStormDVG, f07	Int. 20-year
Proposed Conditions Sensitivity Geometry 2	Best Guess Ineffective Area, .p03	PrefAlte_all_InEff BestGuess, .g22	ProjectDesignStormDVG, f07	Int. 20-year
Proposed Conditions Sensitivity Geometry 3	Blocked Obstruction in lieu of piers, .p07	PrefAlte_all_Blocked Obs, .g25	ProjectDesignStormDVG, f07	Int. 20-year
Proposed Conditions Sensitivity Geometry 4	Best Guess+ No Houses, .p05	PrefAlte_all_No Houses, .g23	ProjectDesignStormDVG, f07	Int. 20-year
Proposed Conditions Sensitivity Geometry 5	All Floodwalls, .p06	PrefAlte_all_AllFW, .g24	ProjectDesignStormDVG, f07	Int. 20-year



## 9. REFERENCES

1. Santa Clara Valley Water District, Calibration of Steady State Hec-RAS Model based on high water marks from Presidents Day Storm Technical Memorandum, April 6<sup>th</sup>, 2017
2. Santa Clara Valley Water District, Design Flows for Mid-Coyote Project Team (Addendum 1), October 7<sup>th</sup>, 2019



APPENDIX D. WW75125 – GUIDANCE ON  
ALTERNATIVE EVALUATION AND SELECTION  
FOR NATURAL FLOOD PROTECTION PROJECTS



**Clean, Safe Creeks and Natural Flood Protection Program**



# **Revision 3**

**May 2014**

## **Guidance on Alternative Evaluation and Selection for Natural Flood Protection Projects**

Sara Duckler, P.E., CFM  
Senior Engineer  
Office of Watershed Planning

Originally Created Under the Direction of

**Beau Goldie**  
Deputy Operating Officer

**Jim Fiedler**  
Chief of Operations  
Watersheds

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Guidance On Alternative Selection & Evaluation For Natural Flood Protection Projects

**PROCESS OWNER:** Mary Ann Ruiz

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# **GUIDANCE ON ALTERNATIVE EVALUATION AND SELECTION FOR NATURAL FLOOD PROTECTION PROJECTS**

## **CEO INTERPRETATION OF BOARD POLICY**

### **FOREWORD**

In November of 2000 the voters of Santa Clara County approved a ballot measure to fund the Clean, Safe Creeks and Natural Flood Protection Program with a special tax. The Santa Clara Valley Water District developed the term “natural flood protection” during the formation of this Program. The term articulated the District’s mission to provide water resources management in an environmentally-sensitive manner. It also reflects the multiple objectives that a properly managed river corridor can support.

*“It is an important characteristic of a natural channel to accept both high and low flows with their associated sediment load without long term changes in morphology.”*

—Dr. Luna Leopold; Water, Rivers and Creeks, 1997

A river has energy to convey water and sediment, supporting a dynamic web of life. A superior river corridor design accommodates the transport of water and sediment while supporting the ecological functions. Earlier flood protection works were typically designed to convey large amounts of clean, sediment-free water. We now know that understanding and addressing the major factors of water and sediment conveyance, ecological processes and community needs such as recreation, is critical to ensuring a project’s success. The framework presented in this document provides guidance to planning teams to achieve a balance between natural resource protection, property protection, community benefits and costs. It provides guidance by articulating the ideal project from a variety of perspectives, while assisting the project team to identify the least environmentally damaging practicable alternatives (LEDPA).

The Safe, Clean Water and Natural Flood Protection program reaffirms the District’s long-standing commitment to a broad set of objectives for creek projects. The objectives are not new to the District. However, organizing and clarifying the multiple objectives that the District strives to achieve, and applying a consistent method of decision-making is a new approach, aligned with the ISO standards of documentation and performance. The evaluation framework presented here standardizes the method by which those multiple objectives will be evaluated.

### **Policy Basis**

The NFP evaluation framework provides guidance to implement the Board’s Ends Policy E-3, specifically E-3.1.1 as related to an integrated and balanced approach to natural flood protection:

### **Board Policy: E-3 Natural Flood Protection**

E-3.1.1 Protect parcels from flooding by applying an integrated watershed management approach that balances environmental quality and protection from flooding.



**CEO interpretation for E-3.1.1 states:**

*E-3 Strategies:*

- S 3.1.1.1. Implement the adopted 5-year Capital Improvement Plan for natural flood protection projects to protect parcels.

CEO Direction

- D 3.1.1.1.a Flood protection projects will consider appropriate flood return periods, benefit-cost ratio, environmental values, and community interests to determine the optimal project scope.

- S 3.1.1.2. Identify and implement potential mitigation banking opportunities in order to streamline future mitigation requirements for flood protection projects.

- S 3.1.1.3. Perform updated flood risk reduction studies to calculate peak flows and develop hydrographs for each watershed.

- S 3.1.1.4. Develop/update flood protection facility design criteria which incorporate the physical and dynamic equilibrium of streams.

CEO Direction

- D 3.1.1.4.a The following criteria are balanced when selecting the preferred alternative to modify or maintain creeks to provide flood protection:

1. Ecological functions and processes, including habitat goals, are supported.
2. Natural stream functions and processes including stability and dynamic equilibrium of stream are preserved or rehabilitated.
3. Maintenance requirements are minimized
4. Projects are integrated within the watershed as a whole.
5. The quality and availability of water is protected.
6. Water Supply functions are preserved or enhanced
7. Cooperation with local agencies achieves mutually beneficial goals.
8. Community benefits are provided beyond flood protection.
9. Life-cycle costs are minimized.



- S 3.1.1.5. Provide mitigation for impacts from capital and maintenance projects that comprehensively supports local riparian habitats.
- S 3.1.1.6. Identify and incorporate stream rehabilitation measures into capital projects and operations to avoid, minimize and/or impacts to watersheds, streams, and natural resources.

The Board's policy to balance environmental quality and flood protection is embodied in the ten objectives specified under the CEO's direction D 3.1.1.4.a. Priority ranking of the objectives is not indicated. Overall weighting of these objectives will be determined on a project-specific basis. Setting relative weights will be a collaborative effort between the project team, the Deputy Operating Officer, and the community affected by the project.

Ultimately, the District Board of Directors will decide how best to balance the benefits and costs of a specific project, including whether to approve a specific flood protection project within a given community. The evaluation framework provides a standardized method to display the relative merits of each alternative.

The use of this evaluation framework should assist the project team in identifying and validating the least environmentally damaging practicable alternative (LEDPA), consistent with the U.S. Army Corps of Engineers 404(b)(1) guidelines.

### **Overview of Evaluation Framework**

The alternative evaluation framework provides guidance to staff by means of tiered elements. These elements provide a framework for evaluating and selecting between defined, practicable alternatives for capital flood protection projects. The elements are:

1. A description of natural flood protection
2. A set of objectives that collectively describe the Board's policy to balance environmental quality and flood protection
3. Criteria to assess achievement of each objective
4. A standardized rating scale that guides evaluation of each criterion

The description, objectives, and rating criteria are presented on the following pages. The individual rating scales—guidance for standardized rating of each criterion—are presented in this document, corresponding to the delineated objectives.

## **NATURAL FLOOD PROTECTION DESCRIPTION, OBJECTIVES AND CRITERIA**

### **Description**

Balancing environmental quality, community benefit and protection from creek flooding in a cost effective manner through integrated planning and management that considers the physical, hydrologic and ecologic functions and processes of streams within the community setting is "Natural Flood Protection."



## Objectives

The following list of objectives is related to Board Policy and CEO Interpretation. Consistent with CEO Direction D-3.1.1.4, described above, this Evaluation Framework focuses on specific Objectives, each described by a set of Criteria that is evaluated according to pre-established descriptors. Relative weights for the objectives will be determined specifically on a project-by-project basis.

1. Homes, schools, businesses and transportation networks are protected from flooding and erosion.
2. Projects are integrated within the watershed as a whole.
3. Ecologic functions and processes are supported.
4. Geomorphic stream functions and processes are integrated into project design.
5. Maintenance requirements are minimized.
6. The quality and availability of water are protected for ecological and water supply functions.
7. Cooperation with other local agencies achieves mutually beneficial goals.
8. Community benefits beyond flood protection are realized.
9. Life-cycle costs are minimized.
10. Environmental impacts are avoided, minimized or mitigated.

Each objective is measured through evaluation of one or more criteria.

## Criteria

Each criterion is assessed against a standardized scale, presented later in this document. Individual criteria associated with each objective are listed below, with brief explanations of what they assess. The rating guidance sheets presented later in this document provide more detailed descriptions of the attributes being measured and also describe examples of exceptional achievement.

### Objective Topics, Described

1. **Flood Protection**  
Focuses on providing protection to lives and property against potential flood damage, resilient to future changes.
2. **Watershed Context**  
Assesses how appropriate a project is to its location within the watershed and the physical, ecological and social contexts.
3. **Ecology**  
Examines the potential to protect, enhance, or restore the natural resource benefits of streams and the watershed in ecological terms.
4. **Geomorphology/Stable Channel**  
Addresses the ability to effectively manage water and sediment from the watershed under both extremely high flows and routine low flows.
5. **Maintenance**  
Focuses on minimizing the long-term obligation of operating and maintaining projects once they are constructed.
6. **Water Quality and Quantity**  
Addresses water-supply related goals, including quality and quantity of surface and groundwater associated with streams.
7. **Local Partner Agencies**  
Measures how effectively a potential project meets goals of both the District and the partner communities/agencies affected by the project.
8. **Community Benefits**  
Addresses the full range of community benefits beyond flood protection that might be integrated into a creek project.
9. **Life-Cycle Costs**  
Examines project costs as a long-term investment rather than a one-time cost.
10. **Environmental Impacts**  
Helps to identify the Least Environmentally Damaging Practicable Alternative.



**Objective 1: Homes, Schools, Businesses and Transportation Networks Are Protected From Flooding and Erosion**

*1.1. Safety*

Protection of public safety if conditions exceed design assumptions

*1.2. Economic Protection*

Protection from damage due to floodwater, erosion or sediment for homes, schools, businesses, transportation systems and other infrastructure

*1.3. Durability*

Future District effort required to maintain design level of protection

*1.4. Resiliency*

Adaptability to future changes external to District activities

*1.5. Local Drainage*

Support of local storm drain systems

*1.6. Time to Implementation*

Practicability of implementation accounting for logistical, negotiation and cost issues

**Objective 2: Integrate Within the Context of the Watershed**

*2.1 Meets Local Watershed Goals*

Ability to meet watershed goals as defined in a process that examines the watershed as a whole and accounts for opportunities and constraints specific to the project area. Published documents such as a Watershed Stewardship Plan, Master Plan, local Basin Plan, Environmental Monitoring and Assessment Report, or General Plan are consulted for opportunities and constraints specific to the project area.

**Objective 3: Support Ecologic Functions and Processes**

*3.1. Meets Local Habitat Goals*

Ability to meet habitat goals as defined from examining the watershed as a whole and accounting for opportunities and constraints specific to the project area

*3.2. Quality of Habitat*

Quality and variety of habitat provided by alternative



3.3. *Sustainability of Habitat*

Intensity of future human intervention required to maintain the target habitat quality; opportunity for habitat to self-adjust appropriately to future change

3.4. *Connectivity of Habitat*

Integration of habitat elements into surrounding habitat landscape and within project area

**Objective 4: Integrate Physical Geomorphic Stream Functions and Processes**

4.1. *Floodplain*

Inclusion of an appropriately-sized overflow area within the flood conveyance corridor that effectively conveys high flows and dissipates erosive energy (“multi-stage” channel)

4.2. *Active Channel*

Appropriateness of size and configuration of the “active channel” relative to watershed inputs (water and sediment) and reach characteristics

4.3. *Stable Side Slopes*

Stability of channel side slopes using geotechnical or biotechnical methods

4.4. *Upstream/Downstream Transitions*

Stability of channel’s integration with upstream and downstream reaches

**Objective 5: Minimize Maintenance Requirements**

5.1. *Structural Features*

Maintenance requirements associated with structural features within project corridor

5.2. *Natural Processes*

Maintenance requirements associated with vegetation growth, erosion and sediment processes

5.3. *Urban Flows*

Maintenance requirements resulting from smaller, more frequency storm events and outfall flows

5.4. *Access*

Incorporation of adequate access for maintenance crews and equipment



**Objective 6: Protect the Quality and Availability of Water**

*6.1. Water Availability*

Impact on ground-water recharge and on ability to maintain or improve the water supply functions in the project area

*6.2. Groundwater Quality*

Groundwater quality protection from contamination and the threat of contamination by preventing contaminant entry into groundwater

*6.3. Instream Water Quality*

Water quality protection through vegetation and instream hydraulic complexity

*6.4. Storm-Water Management*

Ability to enhance water supply and quality and reduce peak flows through local retention of rainfall and pollution prevention programs

*6.5. Flow Regime*

Ability to maintain geomorphically- and biologically-appropriate range of flows in terms of quantity and timing

**Objective 7: Cooperate With Other Local Agencies to Achieve Mutually Beneficial Goals**

*7.1. Mutual Local Goals*

Ability to achieve the project-specific goals and objectives developed jointly by the District and local agencies/municipalities

*7.2. Supports General Plan*

Ability to support goals and policies as stated in General Plan of partner agencies

**Objective 8: Maximize Community Benefits Beyond Flood Protection**

*8.1. Community Safety*

Overall safety for appropriate access and recreation

*8.2. Recreation*

Quality of recreation experience provided by alternative

*8.3. Aesthetics*

Quality of aesthetic form provided by alternative



*8.4. Open Space*

Incorporation of open space into alternative design

*8.5. Community Support*

Alternative reflects community concerns or feedback

**Objective 9: Minimize Life-Cycle Costs**

*9.1. Capital Cost*

Net Present Value of estimated capital cost

*9.2. Maintenance Cost*

Net Present Value of all maintenance costs over the life of the project

*9.3. Grant or Cost-Sharing Opportunities*

Net Present Value of grant or cost-sharing opportunities for project or project components

**Objective 10: Impacts Are Avoided, Minimized or Mitigated**

*10.1 Compliance With San Francisco Bay or Central Coast Basin Plan*

Assesses potential effects of Alternative on water quality via regulatory standards (Basin Plan)

*10.2 Identify the Least Environmentally Damaging Practicable Alternative (LEDPA)*

Determines the preliminary LEDPA and ensures it is carried forward

**BACKGROUND**

**Purpose**

In developing new flood protection projects, it is necessary to have a specific description of “natural flood protection” with clear objectives and measurable criteria, consistent with regulatory requirements.

The evaluation framework presented here provides a standard means of evaluating potential flood protection projects (alternatives) for their ability to achieve the multiple objectives that comprise our understanding of “natural flood protection.” With a clear and consistent framework for assessing possible alternatives, the selection of the most suitable alternative is standardized and will meet state and federal regulatory requirements.

When a new flood protection project is planned, the team formulates several approaches. These are called alternatives. At first, they are roughly described and called conceptual alternatives. As the team collects more information, some alternatives



are eliminated because they are impractical or ineffective, and some remain on the table for further development. Those remaining few are called practicable alternatives.

The ultimate goal of a planning study, which includes engineering, geomorphic and environmental studies, is to identify the most acceptable of the practicable alternatives to move forward into design and construction. This includes identifying the “Least Environmentally Damaging Practicable Alternative” (LEDPA), which should be selected unless there are substantial and overwhelming reasons not to. This decision process is dependent on comparing alternatives to clearly identify the one that best meets the project objectives, the desires of the community, and minimizes net impacts to the environment, consistent with pertinent regulatory requirements for permitting of flood protection projects under state and federal jurisdiction.

This evaluation framework provides a consistent format with a clear set of objectives and measurement criteria, allowing different alternatives to be easily compared. For decision-makers, stakeholders and the public, this framework also provides transparency on the tradeoffs inherent to providing natural flood protection in our community. In concert with the evaluation approach presented with this framework, a complete analysis under the California Environmental Quality Act (CEQA) (or NEPA if a federal agency is involved) is required. The multiple-objective approach outlined in this framework is compatible and complementary to the required CEQA analysis of potential project impacts.

### **Alignment With Other Agency Guidance**

The multi-objective approach to planning flood protection projects outlined here aligns with recommendations made by the California Floodplain Management Task Force (California Floodplain Management Report, December, 2002. Available on the web at [fpmtaskforce.water.ca.gov](http://fpmtaskforce.water.ca.gov)). The Task Force was appointed by Governor Gray Davis; District Board Director Zlotnick was a Co-Vice Chair. The report offers a series of recommendations on multi-objective floodplain management, compatible with the objectives outlined here.

The rating criteria were developed in recognition of guidance from the San Francisco Regional Water Quality Control Board (Technical Reference Circular W.D. 02-#1, April 2003; “A Primer on Stream and River Protection for the Regulator and Program Manager”; available on the web at: [http://www.waterboards.ca.gov/sanfranciscobay/water\\_issues/programs/stream\\_wetland/streamprotectioncircular.pdf](http://www.waterboards.ca.gov/sanfranciscobay/water_issues/programs/stream_wetland/streamprotectioncircular.pdf)). The objectives also support the Santa Clara Basin Watershed Management Initiative’s Watershed Action Plan (August, 2003; available on the web at: [www.scbwmi.org/](http://www.scbwmi.org/)).

The multi-objective approach to planning will assist in developing, identifying and evaluating the least environmentally damaging practicable alternative (LEDPA), consistent with U.S. Army Corps of Engineers guidelines 404(b)(1).

### **Collaborative Development of This Evaluation Framework**

The “natural flood protection” description and evaluation framework resulted from a collaborative process in 2003 to compile knowledge and experience from over fifty technical experts, both internal and external to the District. External participants



included representatives from the environmental advocacy community, the San Francisco Regional Water Quality Control Board, local cities, the Guadalupe-Coyote Resource Conservation District, nonprofit science and watershed groups and the Environmental Protection Agency. Internal participants included forty-four technical staff from throughout the District. The process comprised twenty-one facilitated work-sessions, in which specific recommendations were collected, prioritized and developed into appropriate and useful measurement objectives and criteria. The final collection of objectives and criteria was reviewed by all participants—internal and external and presented to the Watershed Management Initiative (WMI) Core Group in 2004.

The project team would like to acknowledge and thank the original members of the technical teams who worked positively and collaboratively toward defining specific attributes of a “natural flood protection” project. The following page lists participants both internal to the District and external. These people each attended several demanding working meetings, providing input and guidance as this framework was developed.

### **Updates to This Document**

Documents such as this are monitored under the Quality and Environmental Management System (QEMS) that are routinely reviewed, reassessed, and improved. A corrective and preventative action request (CPAR) was issued in 2010 for this document with the aim of incorporating updated Board policy and CEO interpretations, and also making modifications to simplify the evaluation process. This was converted to an “Opportunity for Improvement” (OFI) in 2013, before the CPAR had been completed.

Revisions (March/April 2014) resulted from: updates in Board policies and CEO interpretations; interviews with District employees that have experience with the process; and many workshops and discussions with stakeholders to solicit suggestions for improvement. An additional objective to highlight important environmental regulatory requirements was added as Objective 10.



## 2003—Technical Participants

District Staff	Unit	Division
Jae Abel	Ecological Services	WMD
Rick Austin	Vegetation Management	TS
Ray Bramer	Lower Peninsula/West Valley	WMD
	Watershed Field Operations	
Frances Brewster	Water Quality	WU
Debra Caldon	Watershed Planning	WMD
Rick Callender	Government Relations	OPA
Wendy Chang	Hydrologic Engineering	CPSD
Usha Chatwani	Community Projects Review	WMD
Mike Coleman	Watershed Planning	WMD
Frank Cordova	Coyote/Uvas Llagas	WMD
	Watershed Field Operations	
Melissa Dargis	Lower Peninsula/West Valley	WMD
	Watershed Program Support	
Sara Duckler	Watershed Planning	WMD
Beth Dyer	Watershed Planning	WMD
Al Gurevich	Guadalupe Watershed	WMD
	Program Support	
Tiffany Hernandez	Watershed Planning	WMD
Seena Hoose	Groundwater Management	WS
Judy Ingols	Vegetation Management	TS
Scott Katric	Coyote/Uvas Llagas Watershed	WMD
	Program Support	
Rick Lindquist	Guadalupe Watershed	WMD
	Field Operations	
Mala Magill	Office of Public Affairs	OPA
Michael Martin	Watershed Planning	WMD
Brian Mendenhall	Watershed Planning	WMD
Mark Merritt	Operations Planning and Analysis	WS
Karen Morvay	Water Use Efficiency	WS
Mike Munson	Structural Engineering	CPSD
Terry Neudorf	Guadalupe Watershed	WMD
	Program Support	
Ngoc Nguyen	Watershed Management Capital Program	CPSD
Doug Padley	Ecological Services	WMD
Carol Presley	Coyote/Uvas Llagas Watershed	WMD
	Program Support	
Gale Rankin	Ecological Services	WMD
Kenn Reiller	Guadalupe Watershed	WMD
	Program Support	
Afshin Rouhani	Hydraulic Engineering	CPSD
Dipankar Sen	Countywide Watershed Programs	WMD
John Shay	Ecological Services	WMD
Pat Showalter	Lower Peninsula/West Valley	WMD
	Watershed Program Support	
Bill Smith	Coyote/Uvas Llagas Watershed	WMD
	Program Support	
Linda Spahr	Ecological Services	WMD
Bill Springer	Countywide Watershed Management	WMD
Mary Stone	Regulatory Compliance Program	WMD
Ken Stumpf	Operations Planning and Analysis	WS
Sue Tippets	Community Projects Review	WMD
Gerry Uenaka	Community Relations	OPA
Laura Young	Countywide Watershed Programs	WMD
Sarah Young	Countywide Watershed Management	WMD



## External Participants

### 2003

**Audubon Society**  
Craig Breon

**City of Sunnyvale**  
Gerri Caruso

**CLEAN South Bay**  
Trish Mulvey

**EPA**  
Luisa Valiela

**GCRCD**  
Larry Johmann

**SFRWQCB**  
Paul Amato  
Richard McMurtry  
Steve Moore  
Mike Napolitano

**SF Estuary Institute**  
Robin Grossinger

**San Francisquito Watershed Council**  
Katie Pilat

**Silicon Valley Mfg Group**  
Margaret Bruce



## **APPLYING THE EVALUATION FRAMEWORK**

The framework is designed to be flexible and to provide guidance during the capital project planning and implementation process.

### **Guidance for Planning Projects**

The objectives and criteria, particularly the criteria rating guidance, clearly describe the functions and features of a successful natural flood protection project. This is useful in the initial scoping phase because bringing multiple objectives into focus at the beginning of the planning process is critical to developing an efficient and integrated project that balances the objectives.

### **Selection of Project Alternative**

The evaluation framework provides a clear and repeatable method for comparing and selecting alternatives during the comparison, evaluation and selection phases of a planning study. It provides a method of evaluating how each practicable alternative could support the goal of providing natural flood protection. The organized system assists staff, decision-makers, stakeholders and the general public in transparently viewing and evaluating the tradeoffs and balances that are inherent to providing natural flood protection in a populated environment.

The evaluation framework also provides a clear means of assessing existing conditions, known as the “No Project” alternative. Comparing the baseline condition to the proposed alternatives will highlight how and where improvements to the existing creek system might best be implemented.

## **WEIGHTING**

### **Customizing Framework—Designating Weights for Individual Communities**

The evaluation framework itself is dimensionless and does not provide a numeric score for any individual objective or for any project alternative as a whole. The framework neutrality retains the required flexibility to support the appropriate objectives, given the opportunities and constraints for each specific area in which projects are proposed. It does this by providing a means to accept relative weights for individual objectives based on watershed and community characteristics.

Relative weights for each objective (for example: High, Medium, Low or N/A) will be developed and incorporated into the alternative evaluation framework on a project-specific basis. This provides guidance to planning staff, by indicating up-front which aspects should be given most emphasis in developing alternatives. It will also support an in-depth comparison between alternatives, in which valuing certain objectives over others will facilitate making a supportable decision.

Another feature of the framework is that additional objectives or criteria can be added to the system for individual projects. These would be based on watershed and community characteristics and project opportunities, and could be incorporated directly into the evaluation framework. The base framework provides a simple format that should be used for any supplemental objectives or criteria that might be added.



## Establishing Relative Weights for Objectives

Developing project-specific weights for the ten objectives is an iterative process. In summary:

1. Initial relative weights (high, medium, low importance or not applicable) for each of the objectives are set by the project team in cooperation with the Deputy Operating Officer.
2. The weights are fine-tuned through interactions with the community being served, for example: project-specific advisory committees, community meetings, local agency meetings, etc., as appropriate.

The implementation of these steps is discussed below.

During the initial development of the Project Plan, the appropriate Deputy will work with the project team to establish two important parameters:

- Specific Project Goals—These are largely used in the development and winnowing of *conceptual alternatives*.
- Relative Weights for Objectives—These are used in the development, comparison and selection of *practicable alternatives*.

### *Specific Project Goals (Higher-Level Than Objectives) Are Used to Outline Conceptual Alternatives*

Typically, specific project goals will have already been set, for instance by the Safe, Clean Water and Natural Flood Protection Program. They might include (for example) protection up to the 1% flood for a specific number of parcels, in a specified area for a specified budget. These are considered “given” and are not subject to change without substantial discussion. Specifying the project goals allows the project team to screen a wide and diverse range of conceptual alternatives, including non-structural (generally 10–20) down to a smaller set of practicable alternatives (generally 4–8).

The first-cut winnowing of conceptual alternatives focuses on the ability of potential project approaches to meet the *project goals*. The “natural flood protection” objectives should be used at this stage for guidance, while the defined project goals are used to winnow. Project alternatives that meet the project goals should be practicable in terms of cost, technical feasibility, applicability and solving the appropriate problems; the most promising are further studied as “practicable alternatives.”

### *Relative Weights of Objectives Are Used for Practicable Alternatives*

Project-specific relative weights for the objectives (High, Medium, Low or N/A) will be used for evaluation/selection between the much smaller set of *practicable alternatives* (generally 4–8 total).



When the alternatives have been narrowed to those most practicable, the objectives and their assigned relative weights will be used in a more systematic and detailed manner, as outlined in this document. The relative weights (High, Medium, Low or Not Applicable) will assist in choosing between several practicable alternatives, all of which would address the basic problems that the project is intended to resolve (the specific project goals).

The community outreach element of the planning process should guide the “fine-tuning” of the relative weights (as described above). The project planning team will consult with the Deputy on adjusting the initially-assigned relative weights based on input from the community, public meetings, local agency input and/or technical advisory teams. The alternatives comparison matrix can then emphasize established values by presenting the objectives according to their relative importance. This is also an important time to consider the LEDPA—how to define and identify it.

Alternatives will be developed and subsequently compared based primarily on higher-value objectives, with the lower-valued objectives providing valuable information regarding balances and tradeoffs

Ultimately, the Santa Clara Valley Water District Board of Directors must decide what factors are most important in approving an alternative for a flood control project. However, the Board is best prepared to make these decisions when well-informed on the project-specific values of the community being served. The evaluation framework and associated documentation provide a standard view of the degree to which objectives are met by each alternative. The Board—and the public—can use this to evaluate the merits of each alternative and discuss them within a broader understanding of the tradeoffs and implications.

## **RATING**

### **Use of the Evaluation Framework for Alternative Comparison and Recommendation**

The project team should be familiar with local conditions and constraints, and should have access to project documents and results from community outreach efforts. The project team should be multi-disciplinary and prepared to rate each alternative against each objective and associated criteria.

#### *Step 1: Rate Alternatives Against Criteria*

Each criterion has an individual rating scale which provides specific guidance to the project rating team, defining a customized scale from outstanding to unacceptable. Each customized scale provides guidance for rating specific attributes, based on recommendations from the technical collaborators both internal and external to the District. The standard format for the rating scale is illustrated in Figure 1, in the form of an example rating sheet. A customized rating scale for each criterion helps to assure consistent ratings, even on subjective criteria.



Within the individual objectives, criteria are pre-weighted to facilitate developing a single rating for the objective. It is possible, through consensus of the technical and/or outreach team(s), to modify these “default” preset criteria weights. While possible, this approach is not recommended, as the purpose of pre-designating weights is to avoid asking the community or the technical advisors to get into the details of several dozen criteria. Their efforts should instead focus on determining the project-specific relative importance of the objectives.

Appendix C contains appropriate forms for the criteria rating and justification process.

### *Step 2: Roll Up Criteria Ratings to Get Ratings on the Objectives*

The *criteria* ratings for each individual objective are assimilated into a summary *objective* rating. This is done with the aid of pre-set weights for the individual criteria within a given objective. The weights are set only within the context of the objective that they support. The criteria weights do not carry forward toward rating the alternatives as a whole, because individual objectives will be weighted differently for each project. Figure 2 illustrates a hypothetical comparison rating of four alternatives for a single objective with six criteria.

In some cases, a single criterion with a rating of “unacceptable” could translate up to an objective or even an alternative rating of “unacceptable.” An alternative that receives this rating does not meet the most basic project objectives, or would violate state or federal standards and should not be considered further. *Generally, these types of alternatives would be eliminated early in the planning process, at the conceptual alternatives stage.* The planning team should be aware of factors that would eliminate a project alternative from further consideration.

Appendix D contains forms for summary ratings for each objective.

### *Step 3: Alternatives Comparison Matrix—Compare by Objective*

Finally, the summary rating for each objective is reported on an alternatives comparison matrix. The matrix includes the summary rating for all objectives, for each alternative. The matrix offers a concise and standardized means to compare project alternatives, simplifying a complex analysis into a single, visual synopsis. A hypothetical alternatives comparison matrix for this system is illustrated in Figure 3. An example of a typical alternatives comparison matrix under the District’s previous evaluation system is presented as Figure 4 for comparison to this updated system.

The Alternatives Comparison Matrix can be used to identify the LEDPA, which should be carried forward for additional analysis, when identified.

Appendix E contains the Alternative Comparison Matrix Form.

One of the benefits of this system is that reviewers can examine projects and project attributes in as much or as little detail as desired.



## **Documenting Rating Decisions**

When evaluating alternatives, the evaluation team must document and support each rating decision, and considerations applied. This could be a brief reference using the terms contained within the rating guidance sheet itself, or it could be an explanation of the decisions and tradeoffs reflected in the proposed design. Documenting each rating on the forms provided (Appendix C) offers an organized means to describe each alternative in standard terms, further illuminating tradeoffs and cross-benefits. Figure 5 presents an example of an alternative rating documentation and justification table for one objective. A similar table would be prepared for each of the ten objectives, for each alternative. The complete set of rating documentation and justification tables will provide a complete and standardized summary of important attributes for each alternative. Appendix C contains blank rating documentation and justification tables for each of the ten objectives.

The result of thoughtfully evaluating and documenting the evaluation process will identify the tentatively preferred alternative and the preliminary assessment/ identification of the LEDPA.

## **Cross-Benefits of Supportive Criteria**

Most of the criteria within this framework support more than a single objective. The optimum project design is not a collection of some forty individual features, but a simple and integrated system in which major design elements support the functions and processes of other elements. One example is objective 4, which promotes a self-sustaining, regionally appropriate geomorphic design. If the channel is designed in harmony with the hydraulic and sediment transport elements of the watershed, it will in turn support higher quality habitat (objective 3), have lower maintenance requirements (objectives 5 and 9), support the watershed functions as a whole (objective 2), support water quality protection goals (objective 6) and likely provide recreational or other community benefits (objective 8). Clearly, many of the criteria support one another; although some do conflict. The classic example of conflict is the inherent tension between providing pristine habitat and providing recreation opportunities (objectives 3 and 8).

Appendix F presents a simple Support/Conflict matrix that provides an overview of which criteria support others. The matrix presents a picture of the interrelatedness of the objectives and criteria. There are close to 800 combinations of criteria, one compared to another. On balance, 97% of the criteria combinations are either mutually supportive or neutral, with only 3% of the criteria combinations inherently subject to conflict. The most supportive criteria indicate project aspects that will provide strong benefits across a broad range of measures. This information supports an integrated and holistic design approach to achieving many objectives by optimizing some of the most basic ones.











## **Implementing the CEO Interpretation**

Achieving natural flood protection will require capital planning work to include appropriate geomorphic and ecologic/biotic studies to analyze the unique conditions of the creek within its watershed. It will also require inclusion of the community in the planning process to capture and incorporate local community values and relative importance of the objectives. This work is already underway for many planning projects.



This document is available electronically in the ISO/QEMS on-line document repository (as WW75125, a Level Three, work-instruction document). It is incorporated by reference into the Capital Program Services Division's project planning process (document number W73002 "Planning Phase WBS").





































Objective 1: Provide Protection From Flood Damage	
<b>Criterion 1.1 Safety</b>	<b>Assesses:</b> Protection of public safety if conditions exceed design assumptions
Rating Guidance	
 Outstanding  Very Good  Adequate  Fair  Poor  Unacceptable	
	<p><b>Alternative continues to provide for public safety when flows exceed design flow or if design assumptions prove inaccurate. For example:</b></p> <ul style="list-style-type: none"> <li>a) Overall, flood hazard is reduced relative to no-project condition up to 500-year event;</li> <li>b) Alternative does not contain features susceptible to catastrophic failure for flows larger than design flow (up to 500-year event). Examples: top of flood conveyance channel is at or below adjacent grade, relocation and/or flood-proofing incorporated;</li> <li>c) Failure of alternative or flows in excess of design flow would result in only “nuisance flooding”;</li> <li>d) Alternative includes means to reduce peak flows; such means would continue to function for consecutive storms.</li> </ul>
	<p><b>Alternative improves safety compared to existing conditions when flows exceed the design flow or if design assumptions prove inaccurate. For example:</b></p> <ul style="list-style-type: none"> <li>a) Same as “a” above to a lesser extent (e.g. 200 year event);</li> <li>b) Structural features of alternative that are subject to failure from high flows are designed to fail in a known and safe way (design a weak link into system for safety);</li> <li>c) Failure of alternative or flows in excess of design flow would not impact emergency vehicle access; would not result in fast-moving or deep water in developed areas;</li> <li>d) Alternative includes means to reduce peak flows; such means would not detract from function of alternative if consecutive storms occurred.</li> </ul>
	<p><b>Alternative provides safety only up to design flow</b></p> <ul style="list-style-type: none"> <li>a) Overall, flood hazard is unchanged relative to no-project condition for flows exceeding design flows;</li> <li>b) Damage/hazards resulting from conditions exceeding design assumptions (e.g. flows exceeding design flow) have not been assessed;</li> <li>c) Failure of alternative or flows in excess of design flow would not impact emergency vehicle access; would not result in fast-moving or deep water in developed areas.</li> </ul>
	<ul style="list-style-type: none"> <li>a) Overall, flood hazard is increased relative to no-project condition for flows exceeding design flows;</li> <li>b) Flows exceeding design flows present risk of catastrophic failure of structural elements, causing risk to health &amp; safety;</li> <li>c) Failure of alternative or flows in excess of design flow would result in fast-moving or deep water in developed areas; major disruption of transportation network.</li> </ul>

**Figure 1:** Example rating scale, providing guidance for evaluation of a single criterion. Customized rating scales such as this have been developed for each of the forty criteria.



## Objective Rating Matrix

Objective 1: Provide Protection From Flood Damage							
 Outstanding  Very Good  Adequate  Fair  Poor  Unacceptable							
Alternative	Criteria and Weights						Summary Rating
	Safety (30)	Economic Protection (30)	Durability (10)	Resiliency (10)	Local Drainage (10)	Time to Implementation (10)	
Alternative 1							
Alternative 2							
Alternative 3							
Alternative 4							

**Figure 2:** This matrix shows a hypothetical example of the combination of all criteria from a single objective. Based on pre-determined weights, the Summary Rating is compiled for each Alternative. This Summary Rating will then be presented in an Alternatives Comparison Matrix.

Blank matrices for each objective can be found in Appendix D.



## Alternatives Comparison Matrix

Alternative	Objective									
	Protection from Flood Damage	Watershed Context	Ecology	Geomorphology	Maintenance	Water Quality & Availability	Other Agency Support	Community Benefits	Life-Cycle Costs	LEDPA
Alternative 1									\$NPV	
Alternative 2									\$NPV	
Alternative 3									\$NPV	
Alternative 4									\$NPV	

**Figure 3:** This example Alternatives Comparison Matrix shows the Summary Ratings for each of the ten objectives for four different Alternatives.

A blank Alternatives Comparison Matrix can be found in Appendix E.



## Comparative Summary of Feasible Alternatives (Previous System)

Issues and Concerns		Widened Gabion Channel with Mitigation Bench	Gabion Bypass Channel	Earth Bypass Channels (East and West Banks)
1. Project Cost				
A.	Right of Way	\$ 4.8 million	\$ 4.8 million	\$10.2 million
B.	Construction	\$ 4.1 million	\$ 4.3 million	\$ 3.5 million
C.	Mitigation on site	\$ 0.1 million	\$ 0.0 million	\$ 0.5 million
	Mitigation off site	\$ 1.5 million	\$ 0.6 million	\$ 0.0 million
D.	Total Cost	\$10.5 million	\$ 9.7 million	\$14.2 million
2. Physical Environment				
A.	General Description	East bank would be excavated 5 feet above stream bottom and bank would be lined with gabions. Earth bench and gabion bank would be partially revegetated.	Natural stream channel would be undisturbed except at erosion sites. Parallel bypass channel to the east with gabion banks would be constructed.	Natural stream undisturbed except at erosion sites. Earth bypass channels would be constructed to the east and west.
B.	Erosion	Revegetated bench area subject to possible erosion during high flows.	Existing erosion sites repaired. Decrease erosion in natural stream due to diverted flows.	Existing erosion sites repaired. Decrease erosion in natural stream due to diverted flows.
C.	Sedimentation	Slight decrease in sedimentation due to east bank gabion lining.	Decrease in sedimentation due to decreased erosion in natural stream.	Decrease in sedimentation due to decreased erosion in natural stream.
D.	Water Quality	Slight decrease in turbidity during high flows.	Decrease in turbidity due to decreased erosion in natural stream.	Decrease in turbidity due to decreased erosion in natural stream.
E.	Maintenance	Improved access and less intensive maintenance.	Less intensive maintenance in the natural channel and moderately intense maintenance in the bypass due to sedimentation/erosion. Access to existing stream improved.	Less intensive maintenance in existing stream. Moderately intense maintenance in bypass channels.
3. Biological Environment				
A.	Fish Habitat	Loss of upper bank habitat on east bank due to excavation. Dense revegetation on bench.	Habitat value of natural stream would increase due to decreased maintenance activities.	Habitat value of natural stream would increase due to decreased maintenance activities.
C.	Wildlife Habitat	Loss of upper east bank vegetation. Dense revegetation on a portion of the bench. 0.9 acre impact, 0.6 acres revegetated on site, and 2.1 acres revegetated off site.	Habitat value in natural stream would improve due to less intensive maintenance. Loss of vegetation at diversion structure site. 0.3 acres impact, 0.9 acres revegetated off site.	Habitat value in existing stream would increase over time due to less intensive maintenance and expanded riparian corridor. Revegetation on bypass channel banks. 0.8 acres impact, 2.5 acres of revegetated on site.
4. Socio-Cultural Environment				
A.	Right of Way	Loss of 23 properties. Right-of-way width of 220 feet.	Loss of 23 properties. Right-of-way width of 220 feet.	Loss of 41 properties.
B.	Aesthetics	Would remove existing riparian vegetation on east bank, allow for some dense planting areas on bench, and create open space.	Would preserve natural riparian habitat and create open space.	Would preserve and expand natural riparian corridor, provide buffer between natural channel and development as per recommendation in City's Riparian Corridor Policy Study, and create open space.
C.	Recreation Potential	Possible linear pathway on top of bank adjacent to Mackey Avenue.	Possible linear pathway on top of bank adjacent to Mackey Avenue.	Possible linear pathway on both east and west top of banks of the natural channel.

**Figure 4:** Previous system of alternatives comparison matrix. Matrix gave good information, but without standard rating criteria or a standardized format.









Example Rating Documentation and Justification Table

Alternative \_\_\_\_\_

Objective 1: Provide protection from flood damage

Summary Rating: \_\_\_\_\_

 Outstanding  Very Good  Adequate  Fair  Poor  Unacceptable					
No.	Criteria	Description	Assigned Weight	Assigned Rating	Comments/Justification
C1.1	Safety	Protection of public safety if conditions exceed design assumptions	30		_____
C1.2	Economic Protection	Protection from damage for homes, schools, businesses, transportation systems and other infrastructure	30		_____
C1.3	Durability	Future District effort required to maintain design level of protection	10		_____
C1.4	Resiliency	Adaptability to future changes external to District activities	10		_____
C1.5	Local Drainage	Support of local storm drain systems	10		_____
C1.6	Time to implementation	Time to implementation relative to other alternatives	10		_____
<b>Summary Rating</b>					_____

**Figure 5:** Example Rating Documentation and Justification Table. One table would be prepared for each objective, for a total of ten for each Alternative. If there are five Alternatives, a total of 9 x 5 or 45 tables will be prepared, each with supporting documentation. Blank Rating Documentation and Justification Tables for each Objective can be found in Appendix C.



# Criteria Rating Guidance

## INTRODUCTION













The following ten sections provide guidance for rating the criteria that comprise the ten natural flood protection objectives. A rating guidance sheet has been developed for each of the forty criteria. The rating team will evaluate practicable alternatives against each criterion in an objective to arrive at a summary rating for each of the ten objectives. The summary objective ratings are then presented in the Alternatives Comparison Matrix (See Figure 3).

The rating guidance sheet provides standardized guidance for applying the ratings of Outstanding, Very Good, Adequate, Fair, Poor or Unacceptable to each of the criterion. The criteria weights provide guidance on combining the individual criteria ratings into a summary objective rating. (Figure 6 provides a guide to the criteria rating guidance sheets). The criteria rating should be documented using the Rating Documentation and Justification tables found in Appendix C. Each alternative should have a Rating Documentation and Justification table for each of the ten objectives. When all alternatives have been fully rated on all ten objectives, an Alternatives Comparison Matrix can be prepared (Figure 3). A blank Alternatives Comparison Matrix is available in Appendix E.

The criteria rating tables provide qualitative descriptions for four of the six rating categories. Two of the rating categories (Very Good and Fair) are always left blank, leaving the rating team an opportunity to designate a criterion that is essentially “in-between” categories that have been specified. Figure 6, below, demonstrates how the rating guidance sheets are designed.

Rating guidance sheets for all criteria were developed through a collaborative effort of eight technical teams, consisting of experts both internal and external to the District. Members of each team were selected for their known expertise in the specific topics outlined by the objectives.



Objective X: Title of Objective	
<b>CX.Y</b> Criterion Number	<b>Assesses:</b> Provides a description of the criterion and what it should assess
<b>Rating Guidance</b>	
 <b>Outstanding</b>  <b>Very Good</b>  <b>Adequate</b>  <b>Fair</b>  <b>Poor</b>  <b>Unacceptable</b>	
	<b>Outstanding</b> This section describes the attributes of an Outstanding project alternative. Such an alternative would match the ultimate intention of the criterion. Lists are generally provided to qualitatively describe an Outstanding project alternative, but are subject to interpretation by the project rating team. An Outstanding alternative typically greatly improves conditions as compared to existing conditions.
	<b>Very Good</b> This section is left blank, to provide the project team a means of rating an alternative that is in-between “Outstanding” and “Adequate” as described in the rating guidance sheet.
	<b>Adequate</b> This section describes the attributes of an Adequate project alternative. Such an alternative generally meets the intention of the criterion, but would not provide an impressive example of achievement. Lists are generally provided to qualitatively describe an Adequate project alternative, but are subject to interpretation by the project rating team.
	<b>Fair</b> This section is left blank, to provide the project team a means of rating an alternative that is in-between “Adequate” and “Poor” as described in the rating guidance sheet.
	<b>Poor</b> This section describes the attributes of a project alternative that barely meets the intention of the criterion.
	<b>Unacceptable</b> This section describes the attributes of a project that fails to meet the intention of this criterion. Depending on the importance of the criterion, it may eliminate the project alternative from further consideration, or it may simply result in a lower overall rating for the objective.

**Figure 6:** Guide to the criteria rating guidance sheets. This table explains how the rating guidance sheets are organized and how the rating team will use them to guide rating of individual criteria.



# Objective 1

## PROVIDE PROTECTION FROM FLOOD DAMAGE

This objective focuses on providing protection to lives and property against the devastation of large flood events, in support of Board policy that homes, schools, businesses and transportation networks are protected from flooding and erosion.

The level of flood protection seems deceptively simple to measure: is the design flow contained with adequate freeboard, and does the project meet FEMA requirements? Yet protecting a community from the devastation of flooding is a much more complex responsibility. Factors beyond the control or present knowledge of the design team will eventually occur. While it is not generally feasible to provide full protection against any foreseeable event, the design should continue to provide residual protection for events or occurrence beyond the design parameters. Plans that account only for the design event and neglect the actuality of larger events or of unforeseen occurrences could have catastrophic consequences—such as a levee failure. Such failures may pose conditions worse than they would have been without the project.

This evaluation system is not meant to replace standard District engineering and design practices such as choosing design flow or providing adequate freeboard or erosion protection. Rather, it elucidates those aspects of an alternative that would make for a better or worse project, allowing an informed selection between practicable alternatives.

The criteria for this objective collectively measure the longevity, durability and resilience of a flood protection project over time and also evaluate the benefits to public safety if an event larger than the design event occurs. The project should improve the safety of the local community; provide truly long-term benefits; minimize reliance on future funding sources; support foreseeable changes in the local watershed; and be compatible with local storm-drain systems that rely on the creek for stormwater management.

A project that can provide these assurances to the community will provide a safe means of flood protection over the long term. Individual criteria and their weights within this objective are:

### 1.1. Safety (30)

Protection of public safety if conditions exceed design assumptions

### 1.2. Economic Protection (30)

Protection from damage due to floodwater, erosion or sediment for homes, schools, businesses, transportation systems and other infrastructure

### 1.3. Durability (10)

Future District effort required to maintain design level of protection



**1.4. Resiliency (10)**

Adaptability to future changes external to District activities

**1.5. Local Drainage (10)**

Support of local storm drain systems

**1.6. Time to Implementation (10)**

**Appendix B-1 contains additional notes on the topics covered here.**



Objective 1: Provide Protection From Flood Damage





**C1.1**  
**Safety**

**Assesses:** Protection of public safety if conditions exceed design assumptions

Design assumptions include flows, n-values, hydrograph shape, watershed inputs, etc.

**Rating Guidance**

 **Outstanding**
 **Very Good**
 **Adequate**
 **Fair**
 **Poor**
 **Unacceptable**

	<p><b>Alternative continues to provide for public safety when flows exceed design flow or if design assumptions prove inaccurate. For example:</b></p> <ul style="list-style-type: none"> <li>a) Overall, flood hazard is reduced relative to no-project condition for flows 1.5 times design flow;</li> <li>b) Alternative does not contain features susceptible to catastrophic failure for flows larger than design flow (e.g. up to 1.5 times design flow). Examples of acceptable features: top of flood conveyance channel/ design water surface is at or below adjacent grade, relocation and/or flood-proofing has been incorporated, there is no pressure flow in culverts;</li> <li>c) Failure of alternative or flows in excess of design flow would result in only “nuisance flooding”—not imperil safety or emergency vehicle access;</li> <li>d) Alternative includes means to reduce peak flows; such means would continue to function for consecutive storms.</li> </ul>
	<p><b>Alternative improves safety compared to existing conditions when flows exceed the design flow or if design assumptions prove inaccurate. For example:</b></p> <ul style="list-style-type: none"> <li>a) Same as “a” above, but to a lesser extent (e.g. 1.2 times design event);</li> <li>b) Structural features of alternative that are subject to failure from high flows are designed to fail in a known and safe way (design a weak link into system for safety);</li> <li>c) Failure of alternative or flows in excess of design flow would not impact emergency vehicle access; would not result in fast-moving or deep water in developed areas;</li> <li>d) Alternative includes means to reduce peak flows; such means would not detract from function of alternative if consecutive storms occurred.</li> </ul>
	<p><b>Alternative provides safety only up to design flow</b></p> <ul style="list-style-type: none"> <li>a) Overall, flood hazard is unchanged relative to no-project condition for flows exceeding design flows;</li> <li>b) Damage/hazards resulting from conditions exceeding design assumptions (e.g. flows exceeding design flow) have not been assessed.</li> </ul>
	<ul style="list-style-type: none"> <li>a) Overall, flood hazard is increased relative to no-project condition for flows exceeding design flows;</li> <li>b) Flows exceeding design flows present risk of catastrophic failure of structural elements, causing risk to health &amp; safety;</li> <li>c) Failure of alternative or flows in excess of design flow would result in fast-moving or deep (over 2 feet) water in developed areas; major disruption of transportation network.</li> </ul>







Objective 1: Provide Protection From Flood Damage

**C1.2**  
**Economic**  
**Protection**

**Assesses:** Protection from damage due to floodwater, erosion or sediment for homes, schools, businesses, transportation systems and other infrastructure

**Rating Guidance**

 **Outstanding**
 **Very Good**
 **Adequate**
 **Fair**
 **Poor**
 **Unacceptable**

	<p>a) <u>If design flow is 1% or greater:</u> Alternative exceeds federal standards for flood protection facilities. Exceeds most FEMA requirements for Letter of Map Revision. Exceeds most Corps conveyance and structural requirements.</p> <p><u>If design flow is less than 1%:</u> Exceeds most non-conveyance requirements of Corps and FEMA (structural, operational, geotechnical, etc.)</p> <p>b) Instream features of the project itself, including bed and banks, not subject to damage (i.e. erosion) from flows up to and including design flow.</p>
	<p>a) <u>If design flow is 1% or greater:</u> Meets federal standards for flood protection facilities. Meets all FEMA requirements for Letter of Map Revision. Meets all Corps conveyance and structural requirements.</p> <p><u>If design flow is less than 1%:</u> Meets all non-conveyance requirements of FEMA/ Corps (structural, operational, geotechnical, etc.) Flows up to design flow are contained within project area.</p> <p>b) Instream features of the project itself, including bed and banks, may be subject to minimal, easily repairable damage (i.e. erosion) from design flow. Potential instream damage would not impact development or the community.</p> <p>c) If alternative does not meet FEMA Letter of Map Revision standards, flows up to design flow are contained within project area. Federal structural standards are met. Flows up to and including design flow would not enter buildings or disrupt transportation networks.</p>
	<p>a) Flows less than the design flow may cause damage (i.e. erosion) to instream features, including bed and banks.</p> <p>b) Design flows are not contained within project area, but would not cause substantial damage ('nuisance flows' of less than one foot).</p>
	<p>a) Flows less than the design flows would likely cause substantial damage to instream features, including bed and banks. (Such project would most likely have been eliminated during conceptual alternatives analysis phase.)</p> <p>b) Alternative would not meet Corps or FEMA requirements for structural stability or flow conveyance.</p>







Objective 1: Provide Protection From Flood Damage

**C1.3**  
Durability

**Assesses:** Future District effort required to maintain design level of protection

**Rating Guidance**

 **Outstanding**
 **Very Good**
 **Adequate**
 **Fair**
 **Poor**
 **Unacceptable**

	<p>Level of protection is virtually independent of future actions:</p> <ul style="list-style-type: none"> <li>a) Designed to be virtually maintenance-free.</li> <li>b) Has a viable, easily permitable, practical Operation and Maintenance Plan.</li> <li>c) Protection does not rely on real-time intervention during a flood event.</li> </ul>
	<p>Level of protection is dependent on future actions; they are realistic to apply:</p> <ul style="list-style-type: none"> <li>a) Periodic maintenance specified in a defined cycle of 3 or more years between major activities.</li> <li>b) Operation and Maintenance Plan preserves capacity, but may have some complexity in permitting or implementation.</li> <li>c) If any, flood protection “intervention” mechanisms are automatically operated and meet FEMA standards (Section 65.10(c) of NFIP). Risk of intervention system failure has been evaluated and is acceptable from a safety perspective. Also see District Engineering Policy 3-250 “Guideline for Allowing Use of Flood Control Measures the Rely on Human Intervention or Operations Plan.”</li> </ul>
	<p>Level of protection is dependent on future actions; they would be difficult or costly to apply and sustain:</p> <ul style="list-style-type: none"> <li>a) Frequent maintenance specified—less than 3 years between major activities.</li> <li>b) Operation and Maintenance Plan preserves capacity, but difficult to permit or implement.</li> <li>c) Relies on real-time human intervention to provide flood protection; procedures are reliable and practical to implement.</li> </ul>
	<p>Level of protection is dependent on intense level of future actions requiring extensive knowledge and preparation, making them subject to potential failure.</p> <ul style="list-style-type: none"> <li>a) Intense active maintenance required to preserve capacity—e.g. annual vegetation or sediment removal.</li> <li>b) Operation and Maintenance Plan difficult to permit or unacceptable to regulatory agencies, community.</li> </ul> <p>Relies on real-time human intervention to provide protection. Field crew review indicates necessary interventions would be impractical to implement.</p>







Objective 1: Provide Protection From Flood Damage

**C1.4**  
**Resiliency**

**Assesses:** Adaptability to future changes external to District activities (e.g. future development, vegetation growth)

**Rating Guidance**

 **Outstanding**
 **Very Good**
 **Adequate**
 **Fair**
 **Poor**
 **Unacceptable**

	Channel design would accommodate additional (future) features that would allow for potential future increased capacity needs, including future vegetative conditions. There is an ability to add capacity, if needed, in the future without changing the basic design or land acquisition requirements. For example, the foundations of levees or floodwalls are adequate to support <u>future</u> add-ons, as may be required.
	Channel design conveys runoff as generated by full build-out of existing general plans.
	Channel designed to convey runoff from existing development.
	Channel design does not convey current design flows.







Objective 1: Provide Protection From Flood Damage

**C1.5**  
Local  
Drainage

**Assesses:** Support of local storm drain systems

**Rating Guidance**

 **Outstanding**
 **Very Good**
 **Adequate**
 **Fair**
 **Poor**
 **Unacceptable**

	<p>Alternative design improves local drainage (storm drain conveyance), where applicable, as determined by careful review of local drainage system for affected city including current and planned future improvements (i.e. “interior drainage analysis” shows improvement over existing local drainage operations, and to future operations if information is available. This would occur, for example, if water levels in the creek were reduced due to the project, allowing easier flow from stormdrains. Other approaches could have similar beneficial results. This level of analysis is typically done for a FEMA LOMR, but a preliminary analysis should be done for the alternatives to ensure that no unanticipated problems will be revealed during the LOMR analysis).</p> <p>Alternative does not inhibit or impose restrictions on flow or operations of local drainage systems.</p>
	<p>Alternative accommodates most existing local drainage inputs without causing temporary street flooding. Alternative does not exacerbate any existing problems with storm-drains and localized street-flooding.</p>
	<p>Alternative accommodates local drainage, but may retard flows to creeks during high flow events, causing temporary “nuisance flooding” in local streets.</p>
	<p>Alternative does not account for local drainage systems.</p>



Objective 1: Provide Protection From Flood Damage

**C1.6**  
Time to  
Implement

Assesses: Time to implementation

**Rating Guidance**

 **Outstanding**
 **Very Good**
 **Adequate**
 **Fair**
 **Poor**
 **Unacceptable**



Least amount of time to implementation *compared to other alternatives*.



Time to implementation is approximately equal with most other alternatives.



Longest time to implementation compared to other alternatives.



Indefinite time to implementation due to funding, regulatory restrictions or other complications.



## Objective 2

### **INTEGRATE WITHIN THE WATERSHED**

This objective measures how well a project is integrated into its watershed as a whole. This objective is consistent with the District's mission of watershed stewardship and protection. Integration within a watershed context implies an understanding of watershed processes—physical, ecologic and social—and how appropriate a project is to its location within the watershed and those processes. These understandings must look beyond the current condition to projected changes in the watershed from natural or human-induced alterations.

Physical processes include watershed inputs and downstream receptors including hydrologic, geologic and tidal influences. Successful integration of these processes is largely measured by objective number three. Ecologic processes include understanding the historic and current potential for successful ecologic systems within the watershed and at the project location. These are largely measured by objective number two. Social processes include understanding and meeting the desires of the various communities that we serve. These are measured with objectives seven and eight. Integrating within the watershed also means that a project does not create negative impacts to upstream or downstream reaches in terms of flooding, maintenance requirements, the sediment balance, ecological conditions or water quality.

In many ways, this objective encompasses the goals implied by all of the other objectives combined. For that reason, there is a single criterion that simply measures whether the local watershed processes are understood and if a project has been shaped to work with, and not against, those processes.

#### **2.1. Meets Local Watershed Goals (100)**

Ability to meet watershed goals as defined in a process that examines the watershed as a whole and accounts for opportunities and constraints specific to the project area.

**Appendix B-2 provides additional notes and information on this topic.**













Objective 2: Integrate Within the Watershed

**C2.1**  
**Meets Local**  
**Watershed**  
**Goals**

**Assesses:** Ability to meet watershed goals as defined in a process that examines the watershed as a whole and accounts for opportunities and constraints specific to the project area

**Rating Guidance**

 Outstanding  Very Good  Adequate  Fair  Poor  Unacceptable	
	The alternative substantially advances watershed goals established as described above.
	The alternative advances some watershed goals, and is not in conflict with any watershed goals established as described above.
	The alternative conflicts with more than one major watershed goal established as described above.
	<p>The project is in conflict with a number of watershed goals established as described above.</p> <p>OR</p> <p>Watershed goals have not been created.</p>

**Note:** An example of watershed goals are those that could be defined through a watershed stewardship planning process specific to the watershed and/or creek under study. For example, in 2005 the District completed a watershed stewardship planning processes for the Lower Peninsula, West Valley and Guadalupe Watershed areas, with specific watershed investigations and plans for Calabazas, Stevens and Alamitos Creeks in those watersheds. In 2002, a Watershed Stewardship Plan was developed for the Coyote Watershed. In 2005, an historical ecological survey was completed for Santa Clara Valley, with emphasis on Coyote Creek watershed and the Baylands. **These documents should provide adequate context.**

Other documents could be used by the project team to understand local goals in order to establish an appropriate context in which to evaluate.

This objective addresses the District's mission of watershed stewardship by examining a project's potential to protect, enhance or restore the natural resource benefits of streams and the watershed. The physical structure of a creek changes through space and time, depending on the position within the watershed and the watershed's history. Biological communities reflect those changes. When appropriate ecologic functions are identified and incorporated into a project, the reach can become a self-sustaining habitat mosaic with improved connections to surrounding habitats. A self-sustaining habitat would have the ability to successfully rebound after change occurs, whether natural or human-induced. Providing the means to support a natural assemblage of native species is a holistic and effective approach to providing the legally required support of special status local species.



## Objective 3

Natural flood protection projects must be evaluated using site-specific target ecological functions and processes that have been established in the context of the watershed as a whole. When the term “appropriate” is used in the rating guidance, it refers to this level of understanding.

A project successful at meeting this objective may also provide benefits in other objectives; for example, healthy streamside vegetation provides channel stability, filters pollutants and moderates water temperatures.

The collection of criteria for this objective measure whether a proposed project would support locally and regionally appropriate habitat, if the habitat would be viable into the future, and if the habitat would be connected with nearby habitat areas. All the above must be based on a good understanding of the riparian system. Individual criteria are:

### **3.1. Meets Local Habitat Goals (25)**

Ability to meet habitat goals as defined from examining the watershed as a whole and accounting for opportunities and constraints specific to the project area

### **3.2. Quality of Habitat (25)**

Quality of habitat provided by alternative

### **3.3. Sustainability of Habitat (25)**

Intensity of future human intervention required to maintain the target habitat quality; opportunity for habitat to self-adjust appropriately to future change

### **3.4. Connectivity of Habitat (25)**

Integration of habitat elements into surrounding habitat landscape and within project area

**Appendix B-3 contains definitions and descriptions of some of the concepts presented here.**






Objective 3: Support Ecologic Functions and Processes

**C3.1**  
**Meets Local**  
**Habitat Goals**

**Assesses:** Ability to meet habitat goals as defined from examining the watershed as a whole and accounting for opportunities and constraints specific to the project area

**Rating Guidance**

 **Outstanding**    **Very Good**    **Adequate**    **Fair**    **Poor**   **X** **Unacceptable**

	The alternative meets or exceeds local habitat goals established as described above.
	The alternative meets some local habitat goals, and is not in conflict with any habitat goals established as described above.
	The alternative may conflict with one or more habitat goals established as described above.
<b>X</b>	The alternative is in conflict with a number of habitat goals established as described above. OR Habitat goals have not been created.

**Note:** A Watershed Stewardship Plan or similar management plan would be an example of a document that establishes habitat goals specific to the watershed area. Watershed Management documents should be developed with this as one end-use in mind. Other documents could be used by the project team to understand local habitat goals in order to establish an appropriate context in which to evaluate.

In 2005, Watershed Stewardship Plans were developed for the Lower Peninsula, West Valley and Guadalupe Watersheds. In 2002, a Watershed Stewardship Plan was developed for the Coyote Watershed.

In 2005, an historical ecological survey was completed for Santa Clara Valley. In 2006 one was completed for the Coyote Watershed.

**These documents should provide adequate habitat context.**







Objective 3: Support Ecologic Functions and Processes

**C3.2**  
**Habitat**  
**Provided**

**Assesses:** Quality of habitat provided by alternative

**Rating Guidance**

 **Outstanding**
 **Very Good**
 **Adequate**
 **Fair**
 **Poor**
 **Unacceptable**

	The alternative would provide relatively undisturbed habitat composed of native plant species and features with a high potential to meet the needs (such as feeding, breeding, resting, movement, cover) for an appropriate and locally native assemblage of fish, amphibians, reptiles, birds, mammals and invertebrates in each phase of their life-cycle. Alternative addresses the special needs of endemic, endangered or special status species.
	The alternative would adequately support the needs for a locally appropriate assemblage of fish, amphibians, reptiles, birds, mammals and invertebrates in each phase of their life-cycle. Alternative addresses the special needs of endemic, endangered or special status species.
	Alternative focuses primarily on the special needs of threatened and endangered species as required by appropriate regulatory agencies.
	The alternative does not provide any habitat value, consists of paved areas or areas with no vegetation.






Objective 3: Support Ecologic Functions and Processes

**C3.3**  
**Sustainability**  
**of Habitat**

**Assesses:** Intensity of future human intervention required to maintain the target habitat quality; opportunity for habitat to self-adjust appropriately to future change

**Rating Guidance**

 **Outstanding**
 **Very Good**
 **Adequate**
 **Fair**
 **Poor**
**X** **Unacceptable**

	<p>All of:</p> <ul style="list-style-type: none"> <li>a) Channel maintenance for capacity is projected to be minimal, allowing vegetation to develop, age and change naturally.</li> <li>b) Channel banks are projected to be dynamically stable in the long-term.</li> <li>c) Vegetative maintenance / intervention has been minimized.</li> <li>d) Vegetation expected to be self-sustaining with appropriate successional changes.</li> </ul>
	<p>All of:</p> <ul style="list-style-type: none"> <li>a) Channel capacity maintenance would require periodic selective thinning of vegetation.</li> <li>b) Same as “b” above.</li> <li>c) Some short-term intervention (i.e. ‘landscaping’) necessary (up to five years) to establish vegetation.</li> <li>d) Same as “d” above.</li> </ul>
	<p>All of:</p> <ul style="list-style-type: none"> <li>a) Regular maintenance for channel capacity is anticipated, compromising vegetation’s ability to develop, age and change naturally.</li> <li>b) Channel bank is expected to remain stable overall, with potential areas of instability that would require periodic rehabilitation.</li> <li>c) Intervention (i.e. ‘landscaping’) necessary to maintain vegetation over long-term.</li> <li>d) Vegetation is self-perpetuating without appropriate successional changes.</li> </ul>
<b>X</b>	<ul style="list-style-type: none"> <li>a) Regular maintenance for channel capacity is anticipated, likely requiring major removal of vegetation.</li> <li>b) Unstable channel banks (erosion, deposition). Cross sectional instability expected over time.</li> <li>c) Frequent maintenance / irrigation of vegetation is necessary for vegetative survival (often indicating an inappropriate match of vegetation to soil/water conditions).</li> <li>d) Due to maintenance or instability, vegetation is not expected to be self-sustaining.</li> </ul>







Objective 3: Support Ecologic Functions and Processes

**C3.4**  
**Connectivity**  
**of Habitat**

**Assesses:** Integration of habitat elements into surrounding habitat landscape and within project area

**Rating Guidance**

 **Outstanding**
 **Very Good**
 **Adequate**
 **Fair**
 **Poor**
 **Unacceptable**

	<p>a) Alternative provides a continuous riparian corridor along the length of the project and is appropriately integrated into the surrounding habitat mosaic.</p> <p>b) Creek and floodplain biological communities are connected laterally along the corridor (when upland biological communities exist).</p> <p>c) Fish passable, where appropriate.</p>
	<p>a) Alternative provides a contiguous, wildlife-accessible corridor connected to surrounding habitat mosaic, with much of the riparian corridor biologically intact. Artificial bridge connections between like habitat types may be necessary.</p> <p>b) Floodplain or bypass neither fully biologically connected to riparian zone, nor completely separated.</p> <p>c) Fish passable, where appropriate.</p>
	<p>a) Alternative does not provide contiguous riparian wildlife corridor and is not connected to surrounding habitat mosaic due to lack of surrounding habitat (this may be indicated by long stretches of underground culvert or unvegetated corridor that are unattractive or impassable by local wildlife)</p> <p>b) Floodplain or bypass not biologically connected to riparian zone.</p> <p>c) Fish passable with use of ladders that will require future maintenance.</p>
	<p>Alternative not integrated into surrounding habitat, although surrounding habitat exists. Removes existing connections. Not passable to fish if passage is appropriate.</p>



## Objective 4

### **GEOMORPHOLOGY: PHYSICAL STREAM FUNCTIONS AND PROCESSES**

While a strong impetus for proposing a facility on a reach of creek is to provide protection against the devastation of large floods, those floods occur relatively infrequently. A modified river corridor in a populated setting should provide protection from those rare but potentially ruinous events; however, that same river corridor must perform equally well in its daily task of conveying water and sediment from the hills to the bays. Over time, the smaller but more routine flows ultimately have a greater impact on a channel's stability and on water quality than do the rare but large events. Because of this, at least equal attention must be given to understanding the forces at work during routine flow events.

This objective addresses the ability of a proposed project to handle the “physical functions and processes” that occur in the watershed, both under the extreme pressures of a high-flow event and under the persistent demands of the more routine flows.

Among the most critical concepts covered in this section is that of a “dynamically stable” active channel. The active channel, also known as the bankfull channel, refers to the size of channel that carries most of the sediment of a stream over a long period of time. This may be a smaller channel within the overall flood conveyance corridor in a multi-phase channel. This is where the important pool and riffle habitats form and where most of the sediment transport occurs. It is the most dynamic portion of the stream system. A dynamically stable channel, therefore, acknowledges that the inner portion of the active channel may be rearranged during flow events, but overall the sediment loads entering the channel are equal to those leaving it. This accounts for the inevitable shifts within the active channel, setting a realistic goal of the channel as stable, but NOT static.

In contrast, an unstable channel is one in which deposition requires regular removal to protect channel capacities and habitat or fish passage; or one in which the banks are collapsing or the bed is eroding down at a rapid rate.

The active channel acts in concert with an adjacent floodplain or overflow area (the “active-channel floodplain”)—within the flood conveyance corridor. This flatter area allows flows larger than the active channel to spread out, but continue to flow downstream. This dissipates the erosive energy while yet conveying large quantities of water. In a multi-phase channel, this active-channel floodplain is an important part of the flood conveyance corridor. Our understanding of this “active-channel floodplain” is quite different from the larger 1% floodplain regulated by FEMA and typically developed with roads and structures. For a typical system, the active channel is expected to overbank once every year or two onto its adjacent active-channel floodplain. When these high flows expand onto the active-channel floodplain, flow is slowed and the intense hydraulic energy is allowed to dissipate without causing damaging erosion to the sidewalls of the active channel or the adjacent floodplain area.

The criteria for this objective focus on this important relationship, assessing overall whether a channel has been properly designed to manage both the rare large events and the smaller, more ordinary flows, and whether energy will be dissipated by the configuration of the channel without causing erosion or flood damage to developed areas.



The criteria contained in this section are based on accepted models of geomorphology. We have relied heavily on the San Francisco Bay Regional Water Quality Control Board's Technical Reference Circular W.D. 02-#1 "A Primer on Stream and River Protection for the Regulator and Program Manager" in formulating the criteria for this objective. However, important caveats apply as some of the more generic concepts are not relevant to all Santa Clara County creeks. **The particulars of many of the criteria in this section are intended to be adjusted on a case-by-case basis to better reflect local conditions, as they become better understood and described.**

For example, many Santa Clara Valley rivers and creeks are naturally and deeply incised into the broad alluvium deposited by these same rivers during a previous (much wetter) period. When streams are naturally incised, the meaning of "bankfull" is not completely clear, nor is the concept of a floodplain at "bankfull height."

It has been suggested that project alternatives should be assessed by a qualified geomorphologist who is well-versed in local conditions and local geology including knowledge of faulting, subsidence, incision (whether natural or human-induced), historic sea level changes, sediment load changes, rainfall quantity changes, tidal processes and a range of other local particulars. This level of expertise may be difficult to come by, but checking with District and project team geologists and geomorphologists would be a good start.

Similarly, appropriate design of a well-functioning channel system requires a thorough understanding of those same systems from the very beginning of the planning process. Collection and analysis of hydrologic, geomorphic and geologic data specific to the watershed under study is critical to properly applying geomorphic principles to a project design. The criteria contained in this section are based on the assumption that such data collection and analysis has occurred and the system is well understood. When the word "appropriate" is used within this criteria rating system, it refers to this level of understanding of the watershed system.

Collectively, the criteria for this objective measure whether a properly sized active channel is integrated with an active-channel floodplain to provide sediment conveyance and energy dissipation, whether the size and planform of the active channel is appropriate to the overall valley slope, whether the project transitions smoothly to adjacent reaches and whether sideslopes are stable by design. Individual criteria are:

#### **4.1. Floodplain (35)**

Inclusion of an appropriately-sized overflow area within the flood conveyance corridor that effectively conveys high flows and dissipates erosive energy (floodplain or "multi-stage" channel)

#### **4.2. Active Channel (30)**

Appropriateness of size and configuration of the active channel relative to watershed inputs and reach characteristics

#### **4.3. Stable Side Slopes (20)**

Stability of channel side slopes using geotechnical or biotechnical methods



#### **4.4. Upstream/Downstream Transitions (15)**

Stability of channel's integration with upstream and downstream reaches

**Appendix B-4 provides additional notes and information on this topic.**







Objective 4: Integrate Geomorphic Physical Stream Functions and Processes

**C4.1  
Floodplain**

**Assesses:** Inclusion of an appropriately-sized overflow area (adjacent floodplain) within the flood conveyance corridor that conveys high flows and dissipates erosive energy (“multi-stage” channel)

**Rating Guidance**

 **Outstanding**
 **Very Good**
 **Adequate**
 **Fair**
 **Poor**
 **Unacceptable**

	<p>Active channel is hydraulically connected to a floodplain at properly sized bankfull level. Properly sized means that sediment transport is accomplished effectively in the active channel (i.e. sized for the dominant sediment discharge) and that higher flows spread onto and flow along the adjacent floodplain. This allows dissipation of hydraulic energy and downstream conveyance of larger quantities of water, up to the design flow. The floodplain is parallel to the conveyance channel, and serves to convey (not merely store) high flows.</p> <p>AND</p> <p>Overflow area (floodplain) is adequate in width to significantly mitigate the erosive forces of the flowing water against the beds and banks through reduction of velocity and shear stress within the active channel and along the floodplain itself.</p>
	<p>Modified floodplain: Multi-stage channel (a smaller channel within a larger channel) allows expansion of flows higher than approximately ¼ to 1/3 of the design flow by providing additional flow area (modified floodplain); but limited right-of-way requires that setback levees or other containment means are necessary. Multi-stage channel means there is a smaller channel sized to convey sediment and ordinary flows within a larger channel sized to convey the design flow. The larger channel may not be wide enough to completely mitigate shear stress for design flows (e.g. 1%), as with an Outstanding alternative, but the ability of moderate to high flows to spread out beyond a tightly confined single-phase channel provides some relief from erosive forces.</p> <p>OR</p> <p>Bypass channel is used to convey high flows, effectively diverting erosive energy from main channel.</p>
	<p>Flow will not spread out laterally (overflow onto floodplain or second-phase channel) until at least ½ of design flow (e.g. 1%) is reached. Multi-stage channel, but not at bankfull level.</p>
	<p>Single-phase channel (no separate active channel, no floodplain of any size) sized to convey design flow (e.g. 1% flow). Channel has flat bottom. Levees or floodwalls are required to convey design flow and are not set back from the top of bank.</p>



Objective 4: Integrate Geomorphic Physical Stream Functions and Processes

**C4.2**  
**Active**  
**Channel**

**Assesses:** Appropriateness of size and configuration of the active channel relative to watershed inputs and reach characteristics

**Rating Guidance**

 **Outstanding**
 **Very Good**
 **Adequate**
 **Fair**
 **Poor**
 **Unacceptable**



Design includes dynamically stable active channel with appropriate dimensions (width, depth, slope, length and meander parameters)

All of:

- a) Active channel is appropriately matched to valley slope with geomorphically appropriate level of sinuosity.
- b) Meander length is appropriately related to active channel width for its watershed (Riley suggests a meander length of 8 to 11 x active channel width is appropriate to East and North SF Bay Area. This can serve as a starting point. Data specific to the South Bay will allow SCVWD to more appropriately customize this range in the future).
- c) Meander curve radii are appropriate to channel width and valley slope. (Riley suggests radius value of 2.3 x active channel width (or within the range of 1.5 to 4.5 x) for East and North SF Bay streams. This may be used as a starting point for defining appropriate South SF Bay range).
- d) Meander amplitudes are appropriate to channel width and valley slope. (Riley suggests 2.7 x active channel width for North and East SF Bay streams. This may be used as a starting point for defining appropriate South SF Bay range).
- e) Sufficient right-of-way accommodates full meander belt width for properly designed active channel width and meander amplitude<sup>1</sup>. (Riley provides a belt width  $\approx 3.7 \times$  active channel width for East and North SF Bay streams. This may be used as a starting point for defining an appropriate South SF Bay range)
- f) Active channel is properly sized to effectively convey expected sediment load (tidal and/or fluvial).  $Q(\text{sediment})_{\text{in}} = Q(\text{sediment})_{\text{out}}$ .
- g) Active channel bed is mobile and substrate size is locally appropriate and diverse, based on location within the watershed and hydraulic energy of channel location (e.g. pool vs. point bar).
- h) Pool-riffle sequence is present (if appropriate to position in the watershed) and based on appropriate geometry—spacing, slope, depth of pools.
- i) Tidal processes are fully accounted for, including range of tidal prism flows and tidal sedimentation processes.
- j) Control structures are unnecessary within active channel.

<sup>1</sup> Based on flows, slope and width/depth ratio



	<p>Active channel is incorporated into design, but site constraints (such as channel entrenchment, private property, adjacent roadways, environmental or other regulatory requirements) prevent construction of a fully-functioning active channel, as described above. Allowances may be made as follows:</p> <ul style="list-style-type: none"> <li>a) Stable active channel width and depth are not compromised.</li> <li>b) Active channel length is at least 80 percent of calculated stable length.</li> <li>c) Compromised slope (oversteepened) is mitigated with small drops (e.g. rock weirs less than 18 inch drop).</li> <li>d) Outside of channel bends are protected (most likely by rock—RWQCB, Riley p. 92)</li> <li>e) Meander curve radii are within normal range for local conditions (Riley suggests a value of 2.3 or within the range of 1.5 to 4.5 X active channel width for North or East SF Bay streams.)</li> <li>f) For extremely limited right-of-way, hardscaped near-vertical walls are used to maximize planform space for flowage, active channel meander and near-stream vegetation (Riley p. 91).</li> <li>g) In highly confined creeks, large roughness elements (boulders, logs) used to force pool/bar development if appropriate (see Montgomery Buffington 1997)</li> </ul>
	<p>Active channel is incorporated into the plan, but due to lack of data or significant site constraints, it is unknown whether it will be fully functioning in its ability to convey the dominant hydraulic and sediment discharge.</p> <p>Some sinuosity is incorporated into channel design, but significantly less than or more than the calculated requirement for the reach.</p> <p>Hydraulic control structures, using hardscape, are required for stability of structure.</p>
<p>X</p>	<p>No separate active channel is incorporated into alternative plan.</p> <p>Right-of-way would not accommodate any meander for active channel, necessitating a straight-line channel.</p> <p>Design includes <u>one or more</u> of the following:</p> <p>Flat bottom; fixed bed; straight-line; uniform slope.</p>







Objective 4: Integrate Geomorphic Physical Stream Functions and Processes

**C4.3**  
Stable Side  
Slopes

**Assesses:** Stability of side slopes using geotechnical or biotechnical methods

**Rating Guidance**

 **Outstanding**
 **Very Good**
 **Adequate**
 **Fair**
 **Poor**
 **Unacceptable**

	All channel side slopes are stable through use of proper side slope ratios appropriate to the geologic materials and expected detrimental forces including hydraulic shear, gravity, overland flow, etc.
	Side slopes are protected from instability through biotechnical means (e.g. log crib walls with willows, root wads, willow wattles).
	Side slopes are protected using hardscape (vegetated hardscape—e.g. planted rip-rap would earn a “fair” rating).
	Channel side slopes (either active channel or conveyance channel) are unstable and unprotected and subject to failure from anticipated adversary forces.







Objective 4: Integrate Geomorphic Physical Stream Functions and Processes

**C4.4**  
**Transitions**

**Assesses:** Stability of channel's integration with upstream and downstream reaches

**Rating Guidance**

 **Outstanding**
 **Very Good**
 **Adequate**
 **Fair**
 **Poor**
 **Unacceptable**

	Channel bottom is integrated so that it transitions seamlessly with stable upstream and downstream reaches. Transitions are achieved without abrupt changes in grade or direction of flow.
	Transition to upstream and/or downstream elevations require a stabilizing grade control. Grade control structures are limited to around 18 inch drop and minimally hardscaped (e.g. rock weirs).
	Existing infrastructure at upstream and/or downstream ends require a hardscaped grade control structure with a drop greater than about 18 inch. Fish passage is provided separately.
	Reaches upstream and/or downstream of the project are unstable and transitions between project reach and adjacent reach(es) are not designed for long-term stability.



## Objective 5

### MINIMIZE MAINTENANCE REQUIREMENTS

In support of Board policy to protect flood control facilities as important assets and to avoid spending inefficiently, this objective focuses on the long-term obligation of operating and maintaining capital projects once they are constructed. Incorporating knowledge and experience from previous projects into the planning and design of new ones applies continuous improvement principles and helps to minimize hard-to-maintain design features. Incorporating this concept suggests early collaboration between the planning team and district field-experienced maintenance workers.

Reducing maintenance requirements by design will also reduce permitting and mitigation requirements, resulting in an even greater savings over the long-term. Furthermore, a project that by design has few long-term maintenance requirements will have an increased performance reliability; this is particularly important when future, long-term funding is uncertain.

This objective recognizes that time and effort applied at the beginning of the planning process to design *out* maintenance will result in positive payback many times the original effort. Not solely a maintenance and operations issue, taking such an approach optimizes several other performance factors, including reliability, durability and life-cycle costs, producing tangible cross-benefits for the creek project as a whole. Such an approach might also support habitat objectives by reducing the intensity of human intervention within sensitive riparian corridors.

The criteria for this objective assess: anticipated maintenance requirements due to structural features such as culverts, bridges or grade control; how well natural processes have been accounted for in the design so that activities such as sediment removal or erosion protection are minimized; how well the project can handle water and sediment flows from more frequent, smaller-than-design flows; and finally whether the project plan provides adequate access for maintenance crews and equipment on those occasions when maintenance would be required.

An outstanding project design would minimize long-term efforts required to keep the project functioning as designed. Individual criteria are:

#### 5.1. Structural Features (25)

Maintenance requirements associated with structural features within project corridor

#### 5.2. Natural Processes (25)

Maintenance requirements associated with vegetation growth, erosion and sediment processes

#### 5.3. Urban Flows (25)

Maintenance requirements resulting from smaller, high-frequency storm events and outfall flows



**5.4. Access (25)**

Incorporation of adequate access for maintenance crews and equipment

**Appendix B-5 provides additional notes and information on this topic.**






Objective 5: Minimize Maintenance Requirements

**C5.1**  
**Structural**  
**Features**

**Assesses:** Maintenance requirements associated with structural features within project corridor

**Rating Guidance**

 **Outstanding**
 **Very Good**
 **Adequate**
 **Fair**
 **Poor**
 **Unacceptable**

	Need for structural features that require routine maintenance has been eliminated by design.
	Need for structural features that require routine maintenance has been reduced compared to existing conditions by design.  OR  Design of required structural features accounts for and minimizes projected routine maintenance.
	Maintenance required for structural features is roughly equivalent to existing conditions.
<b>X</b>	Significant numbers of structural features, requiring routine maintenance are incorporated into design.  AND/OR  More structural features than under existing conditions.







Objective 5: Minimize Maintenance Requirements

**C5.2**  
Natural  
Processes

**Assesses:** Maintenance requirements associated with vegetation growth, erosion and sediment processes

**Rating Guidance**

 **Outstanding**
 **Very Good**
 **Adequate**
 **Fair**
 **Poor**
 **Unacceptable**

	<ul style="list-style-type: none"> <li>a) Expected (modeled) sediment deposition and vegetative growth for 100 plus years will not cause flows to exceed the design capacity including appropriate freeboard.</li> <li>b) Stream bank erosion requiring repairs is not expected.</li> <li>c) Conveyance channel incorporates floodplain area to minimize erosive velocities. (This could be addressed by incorporating a sediment transporting (active or bankfull) channel with a floodplain OR by providing excess capacity.)</li> </ul>
	<ul style="list-style-type: none"> <li>a) Expected (modeled) sediment deposition and vegetative growth for 10 plus years will not cause flows to exceed the 1 percent capacity.</li> <li>b) Some erosion is expected, but emergency erosion repairs will not be necessary.</li> <li>c) Channel incorporates multi-phase channel design or bypass to alleviate high velocity, erosive flows in the main conveyance channel.</li> </ul>
	<ul style="list-style-type: none"> <li>a) Expected (modeled or estimated) maintenance cycle for capacity restoration for sediment or vegetation in any one area is three or less years.</li> <li>b) Maintenance guidelines provided so that locations of sediment maintenance are known, although frequency is not.</li> <li>c) Alternative incorporates few if any areas where high flows are able to spread out and reduce velocities/erosive forces.</li> </ul>
	<ul style="list-style-type: none"> <li>a) Sediment, erosion potential and vegetation growth not modeled or otherwise accounted for.</li> <li>b) Yearly maintenance expected or probable.</li> <li>c) Channel is single-phase with no floodplain or secondary channel to relieve high flow pressure.</li> </ul>







Objective 5: Minimize Maintenance Requirements

**C4.3**  
**Urban Flows**

**Assesses:** Maintenance requirements resulting from smaller, high-frequency storm events and outfall flows

**Rating Guidance**

 **Outstanding**
 **Very Good**
 **Adequate**
 **Fair**
 **Poor**
 **Unacceptable**

	<p>Maintenance requirements from urban flows would be significantly reduced.</p> <p>For example:</p> <ul style="list-style-type: none"> <li>• Outfalls are designed to reduce erosion and sedimentation to a level that maintains a stable channel geometry (for example, outfalls are set back from active channel).</li> <li>• Offstream detention would significantly reduce in-stream sedimentation/erosion impacts.</li> <li>• Design addresses grade control to prevent incision and erosion.</li> </ul>
	<p>Maintenance requirements from urban flows would be somewhat reduced.</p>
	<p>Maintenance requirements from urban flows would be about the same or worse.</p>
	<ul style="list-style-type: none"> <li>• Outfalls will contribute to excessive erosion and sedimentation in the channel. For example, high-output outfalls are placed at right angles to bank and flow directly into channel with no transition zone between outfall and creek flow.</li> <li>• No offstream detention of stormwater, causing accelerated hydromodification of channel.</li> <li>• Design does not address channel incision and/or bank erosion.</li> </ul>







Objective 5: Minimize Maintenance Requirements

**C5.4**  
Access

**Assesses:** Incorporation of adequate access for maintenance crews and equipment

**Rating Guidance**

 **Outstanding**
 **Very Good**
 **Adequate**
 **Fair**
 **Poor**
 **Unacceptable**

	Alternative provides multiple function access corridors and access points, optimized based on an analysis of projected maintenance activities and required maintenance equipment. For example, one extra-wide road might provide equipment access superior to two standard-width roads.
	Access corridors comply with district policy 3-410 of Engineering Policies & Procedures, dated March 1992 and approved by the board October 1972.
	Access corridors are provided, but do not comply with district policy 3-410 of Engineering Policies & Procedures, dated March 1992 and approved by the board October 1972.
	Alternative provides inadequate or no access for maintenance crews and equipment.



## Objective 6

### PROTECT THE QUALITY AND AVAILABILITY OF WATER

This objective addresses a core District mission: ensure clean, safe water in our creeks and bays. The nexus between flood protection and water supply is often overlooked, but with over half of the District's annual water supply stored in local aquifers, the connection between flowing creeks, groundwater recharge and water supply is clearly evident. Similarly, the active role that a natural creek plays in water quality protection has long gone unseen. Guidance provided by the San Francisco Bay Region Water Quality Control Board highlights the role of a properly functioning creek corridor in protecting and even improving surface water quality (See Technical Reference Circular W.D. 02-#1 "A Primer on Stream and River Protection for the Regulator and Program Manager"; October 2002).

Protecting the local quality and availability of water provides cross-benefits for objective 3, which measures ecologic quality and for objective 8, which assesses benefits to the community, including recreation and aesthetics. Many of the physical and riparian vegetative features that support instream water quality also improve performance of other objectives, such as objective 4 which assesses geomorphic stability and again, objective 3, which assesses support of the ecologic system.

The criteria for this objective collectively assess how well a project would support water-supply related goals of the district, including quantity and quality of surface and groundwater. Assessments include whether the project has taken the recharge potential of the site into account; whether instream water quality will be maintained or improved via features that mix, aerate and filter the water as it flows to and through the project corridor; whether the potential to reduce the impacts of urban development have been incorporated into the project and whether any proposed alteration of the natural flow regime would impact biologic or geomorphic processes.

Overall, these four metrics assess the impact that a proposed project would have on the quality and availability of water—both surface water and groundwater. Individual criteria are:

#### **6.1. Water Availability (30)**

Impact on ground-water recharge

#### **6.2. Groundwater Quality (25)**

Groundwater quality protection from contamination and the threat of contamination by preventing contamination entry into groundwater

#### **6.3. Instream Water Quality (30)**

Water quality protection through vegetation and instream hydraulic complexity



**6.4. Offstream Water Management (10)**

Ability to enhance water supply and quality and reduce peak flows through local retention of rainfall and pollution prevention programs

**6.5. Flow Regime (5)**

Ability to maintain geomorphically and biologically appropriate range of flows—Quantity and Timing






Objective 6: Protect the Quality and Availability of Water

**C6.1**  
Water  
Availability

**Assesses:** Impact on groundwater recharge

**Rating Guidance**

 **Outstanding**
 **Very Good**
 **Adequate**
 **Fair**
 **Poor**
 **Unacceptable**

	<p>a) Alternative would result in a net increase in recharge potential (i.e. increased perviousness in SCVWD-mapped recharge zones).</p> <p>b) Alternative would improve functionality or performance of water rights diversions.</p>
	<p>a) No net change in potential recharge for the project area.</p> <p>b) Existing diversions or water rights are not negatively impacted by alternative.</p>
	<p>a) Alternative would reduce the potential for recharge in the project area (i.e. decrease perviousness in SCVWD-mapped recharge zones).</p> <p>b) Existing diversions or water rights are not negatively impacted by alternative.</p>
<b>X</b>	<p>a) Alternative substantially reduces or eliminates the existing potential for recharge in the project area.</p> <p>b) Alternative would degrade performance of diversions or exercising water rights.</p>













Objective 6: Protect the Quality and Availability of Water

**C6.2**  
**Groundwater**  
**Quality**

**Assesses:** Groundwater quality protection from contamination and the threat of contamination by preventing contamination entry into groundwater

**Rating Guidance**

	 Outstanding	 Very Good	 Adequate	 Fair	 Poor	 X Unacceptable
	Alternative maintains the minimum required separation for natural protection of groundwater and contains elements that: <ul style="list-style-type: none"> <li>• Provide structural features with ongoing maintenance to prevent contaminant entry into groundwater; and</li> <li>• Incorporate best management practices (e.g., vegetated swales) with ongoing maintenance; and</li> <li>• Incorporate outreach, education, or other programs that would result in a decrease of pollution potential</li> </ul>					
	Alternative does not maintain the minimum required separation for natural protection of groundwater, however alternative contains elements that: <ul style="list-style-type: none"> <li>• Provide structural features with ongoing maintenance to prevent contaminant entry into groundwater; and</li> <li>• Incorporate best management practices (e.g., vegetated swales) with ongoing maintenance</li> </ul>					
	Alternative does not maintain the minimum required separation for natural protection of groundwater, however alternative includes best management practices with ongoing maintenance.					
	Alternative does not maintain the minimum required separation for natural protection of groundwater and does not include measures or programs to protect groundwater quality.					

**Notes:**

1. Minimum required separation for natural protection of groundwater refers to the thickness of the unsaturated zone from the infiltration point to the highest seasonal water table. The minimum required separation is established by the Board of Directors through resolution or by District policies in consultation with the Groundwater Management Unit in the absence of a board resolution.
2. Best Management Practices refer to measures that remove or reduce pollutants from stormwater prior to groundwater infiltration (see Santa Clara Valley Urban Runoff Pollution Prevention Program C.3 Stormwater Handbook, the Bay Area Stormwater Management Agencies Association "Start at the Source" and/or the California BMP Handbooks).







Objective 6: Protect the Quality and Availability of Water

**C6.3**  
**Instream**  
**Water Quality**

**Assesses:** Water quality protection through vegetation and instream hydraulic complexity

**Rating Guidance**

 **Outstanding**
 **Very Good**
 **Adequate**
 **Fair**
 **Poor**
 **Unacceptable**

	<p>a) Alternative would likely improve instream water quality by creating a hydraulically complex channel and including native riparian vegetation (reference SCVWD-approved list) in appropriate locations to achieve significant benefits to water quality:</p> <ul style="list-style-type: none"> <li>Filter pollutants—protective buffer strip of low, brushy, grassy vegetation on banks and/or in floodplain to slow and filter overland flows.</li> <li>Moderate temperatures—near-stream or canopy-forming vegetation (shaded riverine aquatic).</li> <li>Stabilize the stream banks with (live) root mass.</li> <li>Provide aeration, shade, filtering, mixing and stream bank erosion protection through large- or small-scale hydraulic roughness elements (Scale refers to discrete in-channel features (small-scale), vs. configuration of channel itself (large-scale))</li> <li>Concentrate low flows within a smaller, defined channel to reduce stagnant water and maintain temperature, dissolved oxygen and provide vector control.</li> </ul> <p>b) Vegetation system provides above values short-term and long-term after construction.</p>
	<p>a) Alternative would likely maintain current water quality conditions through the use of appropriate vegetation and hydraulically complex instream elements.</p> <p>b) Vegetation would likely take more than five years to re-establish and provide water quality benefits.</p>
	<p>Alternative would reduce streamside vegetation and instream hydraulic complexity as compared to existing conditions, likely resulting in a reduction in water quality protection.</p>
	<p>Alternative would provide no vegetation or would result in significant loss of streamside and buffer vegetation.</p> <p>Alternative would provide little or no hydraulic complexity to enhance aeration, shade or other water quality parameters.</p>







Objective 6: Protect the Quality and Availability of Water

**C6.4**  
**Offstream**  
**Water**  
**Management**

**Assesses:** Ability to enhance water supply and quality and reduce peak flows through local retention of rainfall and pollution prevention programs

**Rating Guidance**

 **Outstanding**
 **Very Good**
 **Adequate**
 **Fair**
 **Poor**
**X** **Unacceptable**

	<p>Alternative contains elements that, through education, incentives, physical features or other means (such as onsite detention/retention incentives):</p> <ul style="list-style-type: none"> <li>Significantly increases retention and use of rainwater where it falls (thereby improving local water availability and reducing potential for non-point source runoff/ overland flow); and</li> <li>Significantly reduces peak flows to the creeks (thereby reducing the need for flood protection); and</li> <li>Incorporates programs or features that would result in a decrease of pollution potential (e.g. discourages dumping or partners with schools)</li> </ul> <p>(Note: the above-elements could overlap)</p>
	<p>Alternative contains elements that, through education, incentives, physical features or other means:</p> <ul style="list-style-type: none"> <li>Moderately or measurably increases retention and use of rainwater where it falls (thereby improving local water availability and reducing potential for non-point source runoff); and</li> <li>Moderately or measurably reduces peak flows to the creeks (thereby reducing the need for flood protection); and</li> <li>Incorporates programs or features that could result in a decrease of pollution potential (e.g. discourages dumping or partners with schools)</li> </ul> <p>(Note: these elements could overlap)</p>
	<p>Alternative does not contain any such elements.</p>
<b>X</b>	<p>Alternative would discourage local capture of rainfall/runoff.</p>







Objective 6: Protect the Quality and Availability of Water

**C6.5**  
**Flow Regime**

**Assesses:** Ability to maintain geomorphically and biologically appropriate range of flows – Quantity and Timing

**Rating Guidance**

 **Outstanding**
 **Very Good**
 **Adequate**
 **Fair**
 **Poor**
 **Unacceptable**

	Alternative maintains locally appropriate seasonal variation in flows (quantity and timing) that will support an appropriate physical channel configuration and locally-appropriate species.
	Alternative includes modifications to the locally-appropriate flow regime (quantity and timing of flows). These variations have been assessed and would produce no significant impact on the physical channel stability or the locally-present species.
	Alternative includes significant modifications to the natural, locally-appropriate flow regime in terms of seasonal variation in timing and quantity of flow. This modification is likely to have an impact on the channel stability and/ or locally-present biota.
	Alternative includes significant modifications to the natural, locally-appropriate flow regime in terms of seasonal variation in timing and quantity of flow. This modification is likely to have a significant impact on the channel stability and/ or locally-present biota.



# Objective 7

## **COOPERATE WITH OTHER LOCAL AGENCIES TO ACHIEVE MUTUALLY-BENEFICIAL GOALS**

The District provides flood protection within Santa Clara County, yet local jurisdictions hold land-use authority. Any flood protection project has the potential to significantly influence surrounding land uses—positively or negatively. Conversely, surrounding land uses and jurisdictional plans can significantly influence the possibilities for providing flood protection. A project developed under a positive partnership with a city can unite a local community and provide many possible benefits to the region. These include development and use of parkland and open space; increased science and exploration opportunities for schools; increased real estate values attributable to greenbelt quality or encouraging visitors to the area to the benefit of local businesses. A poorly planned project may forfeit those potential benefits and even face opposition from the community. To maximize benefits to the community, the District and local jurisdictions should collaborate early in the process to identify common goals and visions.

This objective measures how effectively a potential project meets goals of both the District and its partner communities affected by the project. This can only be achieved through effective communication and collaboration between the District and the local jurisdiction(s). The criteria measure whether a potential project meet specific goals outlined through a project-specific partnership as well as whether it supports the long-standing goals of the municipality as established in its general plan.

Individual criteria are:

### **7.1. Mutual Local Goals (50)**

Ability to achieve the project-specific goals and objectives developed jointly by the District and local agencies.

### **7.2. Supports General Plan (50)**

Ability to support goals and policies as stated in general plan of partner agencies.

**Appendix B-7 provides additional notes and information on this topic.**






Objective 7: Cooperate With Other Local Agencies to Achieve Mutually Beneficial Goals

**C7.1**  
**Mutual Local**  
**Goals**

**Assesses:** Ability to achieve the project-specific goals and objectives developed jointly by the District and local agencies

**Rating Guidance**

 **Outstanding**
 **Very Good**
 **Adequate**
 **Fair**
 **Poor**
 **Unacceptable**

	All goals and objectives developed in the memorandum of consensus <sup>2</sup> (MOC) of all involved agencies are met.
	Some goals and objectives developed in the memorandum of consensus of all involved agencies are met.
	A memorandum of consensus is developed, but only district goals and objectives are met.
<b>X</b>	<p>Few if any objectives of any agency met.</p> <p>OR</p> <p>No memorandum of consensus was developed for the project.</p>

<sup>2</sup> A memorandum of consensus (or similar agreement) is developed in a Local Agency Inclusion Process – See Appendix B-7







Objective 7: Cooperate With Other Local Agencies to Achieve Mutually Beneficial Goals

**C7.2**  
Supports  
General Plan

**Assesses:** Ability to support goals and policies as stated in general plan of partner agencies

**Rating Guidance**

 **Outstanding**
 **Very Good**
 **Adequate**
 **Fair**
 **Poor**
 **Unacceptable**

	Supports all pertinent general plan elements.
	Supports some pertinent general plan elements.
	Does not support general plan elements. Some conflicts with general plan elements.
	Significant conflicts with major elements of the local agencies' general plan.



# Objective 8

## COMMUNITY BENEFITS BEYOND FLOOD PROTECTION

*“Increasingly, floodplains are seen as valuable resources by our society. They provide opportunities for flood protection, agricultural production, open space, valuable native habitat, ecosystem protection, recreation, economic development, and housing.”*  
–California Floodplain Management Task Force; Final Recommendations Report, 2002.

Multi-objective planning for flood protection projects—providing additional societal benefits beyond flood protection—is reflected in Board policies calling for an enhanced quality of life in Santa Clara County and additional open spaces, trails and parks along creeks.

The criteria that measure this objective represent the full range of community benefits beyond flood protection that might be integrated into a creek project. These include safety, recreation, education, aesthetics, open space, economic benefits, cultural benefits, efficient use of resources, and other community desires. Meeting these criteria will require extensive communication with the local community. Most of the criteria are subjective, and the community itself will likely provide the best guidance as to whether the criteria, and the objective as a whole, would be met by an alternative. The planning team should also anticipate *future* needs of the local community and allow for appropriate project elements to support these needs. Individual criteria are:

### 8.1. Community Safety (20)

Overall safety for appropriate access and recreation

### 8.2. Recreation (20)

Quality of recreation experience provided by alternative

### 8.3. Aesthetics (20)

Quality of aesthetic form provided by alternative

### 8.4. Open space (20)

Incorporation of open space into alternative design

### 8.5. Community Input (20)

Alternative reflects community-developed objectives/ideas

**Appendix B-8 provides additional notes and information on this topic.**







Objective 8: Community Benefits Beyond Flood Protection

**C8.1**  
Community  
Safety

**Assesses:** Overall safety for appropriate access and recreation

**Rating Guidance**

 **Outstanding**
 **Very Good**
 **Adequate**
 **Fair**
 **Poor**
 **Unacceptable**

	All safety issues identified by public safety officials during their review of the alternative are addressed.
	Most safety issues identified by public safety officials during their review of the alternative are addressed. Project team provides an explanation of features deemed to be inappropriate or infeasible.
	Few if any of the recommendations are incorporated into the proposed alternative.
	The alternative was not reviewed by public safety officials to evaluate safety concerns.






Objective 8: Community Benefits Beyond Flood Protection

**C8.2  
Recreation**

**Assesses:** Quality of recreation experience provided by alternative

**Rating Guidance**

 **Outstanding**    
  **Very Good**    
  **Adequate**    
  **Fair**    
  **Poor**    
 **X** **Unacceptable**

	Area provides unique, quality recreational opportunities or a variety of opportunities including active and passive recreation in an area that is otherwise lacking in similar recreational opportunities. Area is highly accessible to the public and provides related amenities. Facilities are incorporated into existing recreational facilities and the surrounding community.
	Some recreational facilities incorporated into alternative. Access may be limited.
	Few or no recreational facilities incorporated into alternative. Access may be limited and related amenities to support the recreational facilities may be inadequate (for example, inadequate parking, no public transportation, no restrooms).
<b>X</b>	Existing recreational activities are removed as a result of the alternative. Recreational opportunities could have been, but are not, incorporated into the alternative.



Objective 8: Community Benefits Beyond Flood Protection

**C8.3**  
**Aesthetics**

**Assesses:** Quality of aesthetic form provided by alternative

**Rating Guidance**

 **Outstanding**
 **Very Good**
 **Adequate**
 **Fair**
 **Poor**
 **Unacceptable**



This is a qualitative assessment. Some features to consider include:

- Harmonizes with the landscape
- Emulates / creates natural environment including sound (birds, water); meander; smell (natural earth, water)
- Unexpected large / small features
- Concrete may be colored or sculpted to look like natural rock
- Park-like, natural-like
- Art, informal art, locally appropriate art
- Amenities—benches
- Clever
- Follows “Coyote Watershed Aesthetic Guidelines” for project features, as applicable (SCVWD, Dec 2000)

**X**

- Hardscape significantly greater than greenscape
- Visual monotony
- Heavy use of non-aesthetically treated concrete







Objective 8: Community Benefits Beyond Flood Protection

**C8.4**  
Open Space

**Assesses:** Incorporation of open space into alternative design

**Rating Guidance**

 **Outstanding**
 **Very Good**
 **Adequate**
 **Fair**
 **Poor**
 **Unacceptable**

	<ul style="list-style-type: none"> <li>The alternative ensures continued long-term protection of existing protected open space.</li> <li>Alternative creates new open space.</li> <li>Alternative protects existing open space that is/will be subject to development in the near future, taking advantage of opportunities to provide open space in anticipation of future development pressures or anticipated local growth.</li> </ul>
	The alternative reserves existing open space within the project area.
	Existing open space would be degraded by the alternative.
	Significant amount of existing open space would be lost.






Objective 8: Community Benefits Beyond Flood Protection

**C8.5**  
Community  
Support

**Assesses:** Alternative reflects community-developed objectives/ideas

**Rating Guidance**

 **Outstanding**
 **Very Good**
 **Adequate**
 **Fair**
 **Poor**
 **Unacceptable**

	Relative to other alternatives, community indicates overwhelming support.
	Overall, community indicates acceptance of this alternative relative to the other alternatives.
	Community clearly indicates a lack of support for this alternative.
<b>X</b>	Community finds this alternative unacceptable.

In essence, this criteria provides a combined assessment of the previous criteria under this objective, by allowing the community to voice its opinion on which features are most important and whether an alternative has addressed them.



# Objective 9

## MINIMIZE LIFE-CYCLE COSTS

While fairly straightforward to estimate, life-cycle costs are challenging to optimize. Careful attention to this objective will support Board Policy of achieving a balance between the benefits and costs of reducing the potential for flood damages. This objective also supports the Policy that requires the Chief Executive Officer to protect the assets of the agency.

Sometimes design choices that appear to save dollars during initial construction result in long-term maintenance requirements that create a significant financial burden over the lifespan of a project. Conversely, while right-of-way is frequently the most costly component of a river corridor project, the benefits of providing sufficient room for a self-sustaining geomorphic and biotic system may well pay off in the long run. Often the tradeoffs between capital and maintenance costs are not obvious, but examining project costs as a long-term investment rather than a one-time cost is the appropriate approach.

This objective does not attempt to place value on non-economic components of a project. The District has not yet developed local expertise in this emerging field of economic analysis. Neither does this objective measure the benefit:cost ratio of a project, because to provide a true assessment, non-economic components should be incorporated.

This objective measures the Net Present Value of three components of life-cycle costs: capital costs, maintenance or operations costs; and opportunities to reduce either of those costs through grant or cost-sharing opportunities. The measurement is presented not as ratings, but as dollar values. However, the dollar values could be converted to ratings by comparing any single alternative to the others under consideration.

## CRITERIA

### 9.1 Capital Cost

Net Present Value of estimated capital cost

### 9.2 Maintenance Cost

Net Present Value of all maintenance costs over the life of the project

### 9.3 Grant or Cost-Sharing Opportunities

Net Present Value of grant or cost-sharing opportunities for project or project components

**Criteria are not weighted—costs are simply added together in net present value format (\$NPV).**

**Appendix B-9 provides additional notes and information on this topic.**



# Objective 10

## **IMPACTS ARE AVOIDED, MINIMIZED OR MITIGATED**

This rating objective was designed to assist in demonstrating and documenting the alternatives considered in terms of their environmental impacts. An increasingly important parameter in obtaining construction permits for any project in or near creeks is to demonstrate that the selected or preferred alternative is the “least environmentally damaging practicable” (LEDPA) alternative. The selection process between Conceptual and Practicable (or “Feasible”) alternatives helps to ensure that only the practicable alternatives are brought forward for analysis and would be rated through this process. Objective 10 allows a comparison related to the “least environmentally damaging” portion of the LEDPA requirement. The results of the ratings in objective 10 can be used to help to demonstrate a thoughtful analysis of getting to the least environmentally damaging project.

## **RATING CRITERIA**

### **10.1. Compliance With San Francisco Bay or Central Coast Basin Plan (50)**

Assesses potential effects of Alternative on water quality via regulatory standards (Basin Plan)

### **10.2. Identify the Least Environmentally Damaging Practicable Alternative (50)**

Determines the preliminary LEDPA and ensures it is carried forward









Objective 10: Impacts are Avoided, Minimized or Mitigated

**C10.1**  
Water Quality  
Effects

**Assesses:** Potential effects of each project alternative on water quality via regulatory standards (Basin Plan)

**Rating Guidance**

 Outstanding
  Very Good
  Adequate
  Fair
  Poor
  Unacceptable

	<ul style="list-style-type: none"> <li>Project alternative will enhance or improve one or more existing or potential beneficial uses designated by the Regional Water Quality control board (RWQCB), <b>and</b></li> <li>Project alternative will not impair or harm any beneficial uses designated by the RWQCB.</li> </ul>
	<ul style="list-style-type: none"> <li>Project Alternative will not adversely affect any of the existing or potential beneficial uses designated by the RWQCB.</li> </ul>
	<ul style="list-style-type: none"> <li>Project Alternative will have only minor adverse effects on existing or potential beneficial uses for the water body designated by the RWQCB, <b>and</b></li> <li>Minor effects on existing or potential beneficial uses can be minimized and/or feasibly mitigated</li> </ul>
	<ul style="list-style-type: none"> <li>Project Alternative will have potentially significant effects on no more than one existing or potential beneficial use designed by the RWQCB, <b>and</b></li> <li>Potential effects on existing or potential beneficial uses can be minimized to a non-significant level.</li> </ul>
	<ul style="list-style-type: none"> <li>Project Alternative will have potentially significant adverse effects on two or more existing or potential beneficial uses for the water body designated by the RWQCB, <b>and</b></li> <li>Mitigation for adverse effects to beneficial use(s) will be technically difficult, excessively expensive, or will only partially compensate for harm.</li> </ul>
	<ul style="list-style-type: none"> <li>Project Alternative will have potentially adverse effects on existing or potential beneficial uses for the water body designated by the RWQCB, <b>and</b></li> <li>Mitigation for the harm to beneficial use(s) is not feasible.</li> </ul>

**Water Quality Notes Regarding Basin Plan:**

Each conceptual project alternative must be assessed for water quality effects by considering effects on designated beneficial uses (BU). Both existing and potential beneficial uses must be assessed. The RWQCB designates existing and potential beneficial uses for each water body and these designations can be found in the applicable Basin Plan, depending on the location of the project:

San Francisco Bay Basin Plan, Chapter 2:

[www.waterboards.ca.gov/sanfranciscobay/basin\\_planning.shtml](http://www.waterboards.ca.gov/sanfranciscobay/basin_planning.shtml)

Central Coast Basin Plan, Chapter 2:

[http://www.waterboards.ca.gov/centralcoast/publications\\_forms/publications/basin\\_plan/index.shtml](http://www.waterboards.ca.gov/centralcoast/publications_forms/publications/basin_plan/index.shtml)

Compliance with the Basin Plan is currently the most important consideration for obtaining project approvals (i.e. Section 401 Water Quality Certification, Waste Discharge Requirements) from the RWQCB. The project alternative with the highest score for this objective is likely to be the LEDPA and must be carried forward into the planning phase.







Objective 10: Impacts are Avoided, Minimized or Mitigated

**C10.2  
LEDPA**

**Assesses:** Determines the preliminary LEDPA and ensures it is carried forward

**Rating Guidance**

 **Outstanding**
 **Very Good**
 **Adequate**
 **Fair**
 **Poor**
 **Unacceptable**

	<ul style="list-style-type: none"> <li>Project alternative <b>avoids</b> all adverse effects on environmental resources.</li> </ul>
	<ul style="list-style-type: none"> <li>Project Alternative <b>avoids and/or minimizes</b> all effects on environmental resources, <b>and</b></li> <li>Project Alternative (without mitigation) will not result in significant adverse environmental effects.</li> </ul>
	<ul style="list-style-type: none"> <li>Project Alternative will result in potentially significant adverse effects to environmental resources, <b>and</b></li> <li>Feasible <b>mitigation measures</b> will reduce the significance of adverse environmental effects to less than significant levels.</li> </ul>
	<ul style="list-style-type: none"> <li>Project Alternative will result in potentially significant adverse effects to environmental resources, <b>and</b></li> <li><b>Mitigation</b> for adverse effects to beneficial use(s) is infeasible or will be technically difficult or excessively expensive.</li> </ul>

**LEDPA Notes:**

The Project Alternative with the highest C10.2 score is the preliminary LEDPA. For any project that affects a special aquatic site\*, the RWQCB and USACE will issue Clean Water section 401 and 404 approvals only to the Project Alternative that is the LEDPA. It is acceptable to carry forward to the planning phase alternatives that are not the preliminary LEDPA (future design revisions may change which alternative is the LEDPA), but the preliminary LEDPA must be one of the project alternatives carried forward to the next phase.

\*Special aquatic sites include sanctuaries and refuges, wetlands, mud flats, vegetated shallows, coral reefs, and pool and riffle complexes (see 40 code of Federal Regulations Part 230.3r).



## APPENDIX E. NFP FRAMEWORK ANALYSIS



NFP Objectives	NFP Criteria
Objective 1. Homes, schools, businesses and transportation networks are protected from flooding and erosion	1.1 Safety
	1.2 Economic Protection
	1.3 Durability
	1.4 Resiliency
	1.5 Local Drainage
	1.6 Time to Implementation
Objective 2. Integrate Within the Context of the Watershed	2.1 Meets Local Watershed Goals
Objective 3. Support Ecologic Functions and Processes	3.1 Meets Local Habitat Goals
	3.2 Quality of Habitat
	3.3 Sustainability of Habitat
	3.4 Connectivity of Habitat
Objective 4. Integrate Physical Geomorphic Stream Functions and Processes	4.1 Floodplain
	4.2 Active Channel
	4.3 Stable Side Slopes
	4.4 Upstream/Downstream Transitions
Objective 5. Minimize Maintenance Requirements	5.1 Structural Features
	5.2 Natural Processes
	5.3 Urban Flows
	5.4 Access
Objective 6. Protect the Quality and Availability of Water	6.1 Water Availability
	6.2 Groundwater Quality
	6.3 Instream Water Quality
	6.4 Storm-Water Management
	6.5 Flow Regime
Objective 7. Cooperate with other Local Agencies to Achieve Mutually Beneficial Goals	7.1 Mutual Local Goals
	7.2 Supports General Plan
Objective 8. Maximize Community Benefits Beyond Flood Protection	8.1 Community Safety
	8.2 Recreation
	8.3 Aesthetics
	8.4 Open Space
	8.5 Community Support
Objective 9. Minimize Life-Cycle Costs	9.1 Capital Cost
	9.2 Maintenance Cost
	9.3 Grant or Cost-Sharing opportunities
Objective 10. Impacts are Avoided, Minimized or Mitigated	10.1 Compliance with San Francisco Bay or Central Coast Basin Plan
	10.2 Identify the Least Environmentally Damaging Practicable Alternative (LEDPA)

Main NFP Objectives Rating	
Relative Objective Weight	
Legend	Value
High	30
Medium	20
Low	10
Does not apply	0

NFP Criteria Rating		
Rating Guidance	Numerical Value	Qualitative Value
Outstanding	5	●
Very Good	4	◐
Adequate	3	◑
Fair	2	◒
Poor	1	○
Unacceptable	0	⊗



NFP Objectives	Objective Weight	Justification	NFP Criteria	Default Criteria Weight	Feasible Alternatives									
					A - E1	B - E2	C - E3	E - F1	F - F2	G - F3	I - F5	J - E5	K - H1	
Objective 1, Homes, schools, businesses and transportation networks are protected from flooding and erosion	30	During public meetings held in Spring and Fall 2019, attendees expressed that flood protection should be the priority goal for this project. The Valley Water Board members also agree that reducing the risk of flooding to the creek adjacent community should be the main priority of this project.	1.1 Safety	0.30	2	3	2	3	3	3	3	2	0	
			1.2 Economic Protection	0.30	3	3	3	3	3	3	3	0		
			1.3 Durability	0.10	3	2	3	2	2	3	3	1		
			1.4 Resiliency	0.10	3	3	3	3	4	3	3	0		
			1.5 Local Drainage	0.10	3	3	3	3	3	3	3	0		
			1.6 Time to Implementation	0.10	3	3	3	3	3	4	4	5		
			Summary Objective 1 Rating	2.8	2.9	2.8	2.9	3.0	2.9	3.0	2.9	0.6		
Final Objective 1 Rating				85	87	84	87	89	86	90	86	18		
Objective 2, Integrate Within the Context of the Watershed	10	While physical, ecological and social Coyote Creek watershed processes were considered during initial delopment of project alternatives, the project aims to contain flood waters by proposing structural solutions mainly away from the channel itself so as not to disturb the current floodplain. As a result, proposed flood mitigation alternatives for this project do not seek to degrade nor benefit the watershed as a whole	2.1 Meets Local Watershed Goals	1	3	4	3	3	4	3	3	3		
			Summary Objective 2 Rating	3.3	3.5	3.3	3.3	3.5	3.3	3.5	3.4	2.5		
			Final Objective 2 Rating	33	35	33	33	35	33	34.6	34	25		
Objective 3, Support Ecologic Functions and Processes	20	To the extent possible this project will look for opportunities to support locally and regionally appropriate habitat, as well as look for ways to interconnect local habitat with nearby habitat areas to have a resilient ecosystem into the future.	3.1 Meets Local Habitat Goals	0.25	2	3	2	2	3	2	3	2		
			3.2 Quality of Habitat	0.25	2	3	2	2	3	2	3	3	1	
			3.3 Sustainability of Habitat	0.25	3	3	3	3	3	3	3	3		
			3.4 Connectivity of Habitat	0.25	3	4	3	3	4	3	4	3		
			Summary Objective 3 Rating	2.8	2.9	2.8	2.8	2.9	2.8	2.9	2.9	2.3		
Final Objective 3 Rating				55	59	55	55	59	55	57	57	45		
Objective 4, Integrate Physical Geomorphic Stream Functions and Processes	10	Since most alternatives for this project include structural solutions located away from the active channel and active-channel floodplain without necessarily making any profound changes to the flood conveyance corridor, proposed mitigation alternatives do not look into assessing whether the channel has been properly designed to integrate geomorphic processes, and whether energy is appropriately dissipated.	4.1 Floodplain	0.35	2	2	2	2	3	2	3	2	4	
			4.2 Active Channel	0.30	2	2	2	2	2	2	2	2	2	
			4.3 Stable Side Slopes	0.20	4	5	4	4	5	4	5	5	2	
			4.4 Upstream/Downstream Transitions	0.15	3	3	3	4	4	4	3	4	2	
			Summary Objective 4 Rating	2.6	2.9	2.6	2.9	3.1	2.9	3.0	2.8	2.9		
Final Objective 4 Rating				26	29	26	29	31	29	30	28	29		
Objective 5, Minimize Maintenance Requirements	30	As indicated by the Valley Water Board as well as the public, it is extremely important to propose with this project, an achievable long-term operations and maintenance obligation level. This will be done by reducing maintenance requirements by design and by working collaboratively with field-experienced maintenance workers.	5.1 Structural Features	0.25	1	2	1	1	1	1	1	1	0.5	
			5.2 Natural Processes	0.25	2	3	2	2	3	2	3	3	0	
			5.3 Urban Flows	0.25	1	1	1	1	1	1	1	1	1	
			5.4 Access	0.25	3	3	3	3	3	3	3	3	0.5	
			Summary Objective 5 Rating	1.9	2.0	1.9	1.8	2.0	1.8	1.9	2.0	0.5		
Final Objective 5 Rating				56	61	56	55	59	55	57	59	15		
Objective 6, Protect the Quality and Availablility of Water	20	To the extent possible this project will look for opportunities to ensure clean, safe water in the creek which is a core Valley Water mission.	6.1 Water Availability	0.30	3	3	3	3	3	3	3	3	3	
			6.2 Groundwater Quality	0.25	2	2	2	2	2	2	2	2	2	
			6.3 Instream Water Quality	0.30	3	4	3	3	4	3	4	4	3	
			6.4 Storm-Water Management	0.10	2	2	2	2	2	2	2	2	1	
			6.5 Flow Regime	0.05	5	5	5	5	5	5	5	5	5	
			Summary Objective 6 Rating	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.7		
Final Objective 6 Rating				57	59	57	57	59	57	58	58	53		
Objective 7, Cooperate with other Local Agencies to Achieve Mutually Beneficial Goals	30	Experience in past flood protection projects has indicated that a flood risk reduction project can only be completed in a timely manner if there is early cooperation and collaboration with local jurisdictions to identify common goals and visions. This will ensure not only a more effective completion of the planning, design and construction phases of the project but also ensure the public that the government is working together for them.	7.1 Mutual Local Goals	0.5	3	3	3	3	4	3	4	0		
			7.2 Supports General Plan	0.5	2	3	2	3	3	3	3	3	1	
			Summary Objective 7 Rating	2.8	3.0	2.7	3.0	3.2	3.0	3.3	3.1	0.5		
Final Objective 7 Rating				82.5	89	81	90	96	89	99	92	15		
Objective 8, Maximize Community Benefits Beyond Flood Protection	20	To the extent possible this project will look for opportunities to integrate community benefits beyond flood protection into the project as communicated to the Project Team by the public during public meetings held in the Spring and Fall of 2019.	8.1 Community Safety	0.2	4	4	3	3	4	3	3	3	3	
			8.2 Recreation	0.2	2	3	2	3	2	3	3	3	1	
			8.3 Aesthetics	0.2	3	2	2	3	2	3	3	3	1	
			8.4 Open Space	0.2	3	4	3	3	4	3	4	4	3	
			8.5 Community Support	0.2	4	3	4	4	4	5	4	0		
			Summary Objective 8 Rating	2.9	3.1	2.8	2.9	3.1	2.8	3.3	3.2	1.0		
Final Objective 8 Rating				58	62	56	59	63	56	65	64	20		
Objective 9, Minimize Life-Cycle Costs	30	To select a cost effective and fiscally responsible project, the costs for the various project alternatives will be assessed, compared, and examined as long-term investments rather than one-time capital	9.1 Capital Cost		\$72,394,700	\$80,234,400	\$83,305,300	\$73,625,100	\$81,464,800	\$84,535,700	\$79,818,100	\$78,587,700	\$0	
			9.2 Maintenance Cost		\$1,200,000	\$1,225,000	\$1,200,000	\$1,200,000	\$1,225,000	\$1,200,000	\$1,225,000	\$1,225,000	\$665,200	
			9.3 Grant or Cost-Sharing opportunities											
Summary Objective 9 Rating														
Final Objective 9 Rating														
Objective 10, Impacts are Avoided, Minimized or Mitigated	30	Per Valley Water Board directive, this project is on an expedited schedule. The expedited schedule assumes that the flood risk reduction alternative ultimately selected does not result in significant detrimental impacts to the environment. As a result meeting this objective is of high importance.	10.1 Compliance with San Francisco Bay or Central Coast Basin Plan	0.5	3	4	3	3	4	3	4	4	4	
			10.2 Identify the Least Environmentally Damaging Practicable Alternative (LEDPA)	0.5	3	4	3	3	4	3	4	4	4	
			Summary Objective 10 Rating	3.4	4.0	3.4	3.4	4.0	3.4	3.9	3.9	4.0		
Final Objective 10 Rating				101	120	101	101	120	101	117	117	120		
Total Rating				553	599	549	564	610	560	608	595	540		



[illegible]



[illegible]



[illegible]



[illegible]



[illegible]



[illegible]



[illegible]



NFP Objectives	Objective Weight	Justification	NFP Criteria	Default Criteria Weight	Feasible Alternatives										
					A	B	C	D	E	F	G	H	I	J	K
Objective 8: Maximize Community Benefits Beyond Flood Protection	20	To the extent possible this project will look for opportunities to integrate community benefits beyond flood protection into the project as communicated to the Project Team by the public during public meetings held in the Spring and Fall of 2019.	8.1 Community Safety	0.2	3.5	3.8	3.3	3.4	3.2	3.5	3.0	3.1	3.3	3.6	0.0
			8.2 Recreation	0.2	2.1	2.5	1.7	2.4	2.1	2.5	1.7	2.4	2.5	1.0	
			8.3 Aesthetics	0.2	2.2	2.6	2.0	2.6	2.2	2.6	2.0	2.6	2.5	1.0	
			8.4 Open Space	0.2	3.2	3.6	3.2	3.6	3.2	3.6	3.2	3.6	3.5	3.0	
			8.5 Community Support	0.2	3.5	3.0	3.1	3.1	4.0	3.5	4.2	3.6	4.0	0.0	
Summary Objective 8 Rating				2.9	3.1	2.8	3.0	2.9	3.1	2.8	3.1	3.3	3.2	1.0	



[illegible]



## APPENDIX F. DETAILED CAPITAL AND MAINTENANCE COSTS



Estimated quantities utilized for planning level operations and maintenance costs

Reach	Nearby Facility/Area	Design Flow <sup>a</sup> (cfs)	Flood Mitigation Element	Bank Location	Project	Height <sup>b</sup> (ft)	Approx. Length (ft)	Width (ft)	Total Vegetation Management (ft <sup>2</sup> )	Total Vegetation Management (ac)
4	Charcot Ave. Bridge	9,500	Floodwall	West	CCFPP	4	575	25	14375	0.33
			Passive barrier	West	CCFPP	4	50	0	0	0.00
			Floodwall	West	CCFPP	4	460	25	11500	0.26
			Passive barrier	West	CCFPP	4	25	25	625	0.01
			Floodwall	West	CCFPP	4	465	25	11625	0.27
			Floodwall	East	CCFPP	4	550	25	13750	0.32
			Passive barrier	East	CCFPP	4	50	0	0	0.00
			Floodwall	East	CCFPP	4	400	25	10000	0.23
	Total									1.42
5	Mobile Home Parks and UPRR Tracks	9,500	Levee	West	CCFMMP	4	350	52	18200	0.42
	Notting Hill Dr. and Industrial Area D/S of Berryessa Rd.	9,500	Floodwall	West	CCFMMP	9	2000	25	50000	1.15
			Floodwall	West	CCFMMP	9	2500	25	62500	1.43
	Industrial Area U/S Berryessa Rd.	9,100	Floodwall	East	CCFMMP	2	350	25	8750	0.20
	Total									3.20
6	CSJ Mabury Service Yard	9,100	Floodwall	East	CCFPP	3	1,100	25	27500	0.63
	RV Storage Lot	9,100	Floodwall	West	CCFMMP	6	1,200	25	30000	0.69
	Highway 101	9,100	Floodwall	East	CCFPP	4	350	25	8750	0.20
	Jackson St.	9,100	Passive barrier	West	CCFPP	5	75	25	1875	0.04
	Watson Park	9,100	Floodwall	West	CCFPP	6	1,200	25	30000	0.69
			Berm		CCFPP	5	75	34	2550	0.06
			Floodwall		CCFPP	5.5	250	25	6250	0.14
	Kellogg Company	9,100	Floodwall	East	CCFPP	2	850	25	21250	0.49
	Parkside Terrace Apartments	8,400	Floodwall	East	CCFPP	5.5	750	25	18750	0.43
	Total									3.37
7	South 17 <sup>th</sup> St., north of San Antonio St.	8,400	Acquire/Elevate - 70 S 17th Street	West	CCFMMP	12	N/A			0.28
			Acquire/Elevate - 60 S 17th Street		CCFMMP	13	N/A			0.09
			Acquire/Elevate - 48-50 S 17th Street		CCFMMP	12	N/A			0.37
			Floodwall		CCFMMP	5.5	550	25	13750	0.32
	Arroyo Way	8,400	Acquire/Elevate - 120 Arroyo Way		CCFMMP	7	N/A			1.04
			Acquire/Elevate - 150 Arroyo Way		CCFMMP	8	N/A			0.42
			Acquire/Elevate - 166 Arroyo Way		CCFMMP	8	N/A			0.37
			Acquire/Elevate - 180 Arroyo Way		CCFMMP	9	N/A			0.62
	Brookwood Ave.	8,400	Acquire/Elevate - 311 Brookwood Avenue	East	CCFPP	8	N/A			0.27
			Acquire/Elevate - 315 Brookwood Avenue		CCFPP	8	N/A			0.32
			Acquire/Elevate - 321 Brookwood Avenue		CCFPP	7	N/A			0.5
			Floodwall		CCFPP	3	100	25	2500	0.06
	South 17 <sup>th</sup> St. south of San Antonio St.	8,400	Acquire/Elevate - 398 S 17th Street	West	CCFMMP	12	N/A			0.50
	South 16 <sup>th</sup> St. and William Street.	8,400	Floodwall		CCFMMP	9	700	25	17500	0.40
			Acquire/Elevate - 797 East William Street		CCFMMP	8	N/A			0.42
			Floodwall		CCFMMP	4	400	25	10000	0.23
	William St. Park and William St.	8,400	Vegetated berm	West	CCFPP	4	1,200	44	52800	1.21
			Passive barrier		CCFPP	3	150	25	3750	0.09
	Selma Olinder Park and Olinder Elementary School	8,400	Floodwall	East	CCFPP	5	950	25	23750	0.55
			Passive barrier		CCFPP	5	1,750	25	43750	1.00
	Total Vegetation Management (no homes)									3.85
8	Creekside Garden Apartments	8,300	Floodwall	West	CCFPP	6	350	25	8750	0.20
	Rocksprings and Bevin Brook Dr. homes	8,300	Floodwall		CCFPP	4.5	500	25	12500	0.29
			Berm		CCFPP	4.5	1500	34	51000	1.17
	Tully Rd. San José Water Company Groundwater Station	8,300	Floodwall	East	CCFPP	6.5	600	25	15000	0.34
Total									2.00	
Quantities for Vegetation Management Work	Estimated Total Acreage CCFMMP (ac)									4.84
	Estimated Total Mitigation Acreage CCFMMP (3:1, ac)									14.51
	Estimated Total Acreage CCFPP (ac)									9.59
	Estimated Total Mitigation Acreage CCFPP (3:1, ac)									28.76
	Coyote Creek Length for bank maintenance (CCFMMP)									350
	Coyote Creek Length for bank maintenance (CCFPP)									2775

Notes: a. 20-year storm recurrence interval. b. Flood risk reduction element design height.



Coyote Creek Flood Management Measures Project – Estimated long term operations and maintenance forecast

CIP project name:									
Coyote Creek, Montague Expressway to Tully Road (E3)									
Activity	Corresponding operations project name	Corresponding operations project number	Quantity	Unit of measure	Unit rate (per unit of measure)	Frequency, once every ____ year(s)	Annual cost (estimated)	Eligible for funding from SCW E1.3?	When was or will CIP be turned over to O&M?
									FY24
Vegetation management									
- Mitigation site maintenance (Y4-8)	Mgmt of Revegetation Projects	00761075	15	acre	\$ 30,000	1	\$ 435,300	Yes	
- Mitigation site maintenance (Y9+)	Mgmt of Revegetation Projects	00761075	15	acre	\$ 4,578	1	\$ 66,427	Yes	
- See note 5 below.	Vegetation Mangmnt for Access	00761078	5	acre	\$ 1,373	1	\$ 6,645	Yes	
- See note 6 below.	Stream Capacity Vegetation Con	26771067	3	acre	\$ 1,836	1	\$ 4,590	Yes	
Sediment removal	Watershed Sediment Removal	00761023	-	cy	\$ 110	0	\$ -	Yes	
Bank protection	Watershed Erosion Protection	62761027	350	lf	\$ 2.54	1	\$ 888	No	
Rodent abatement	Watershed Levee Maintenance	62761028	350	lf	\$ 0.55	1	\$ 193	No	
Debris removal	Watershed Debris Removal	62761026	350	lf	\$ 0.98	1	\$ 344	No	
Good neighbor maintenance	Watershed Good Neighbor Maint	00761022	350	lf	\$ 1.02	1	\$ 356	No	
Encampment cleanup	Encampment Cleanup Program	26771027	1	day	\$ 11,334	0.25	\$ 45,334	No	
Other maintenance							\$ -		
- [Other]							\$ -	No	
- [Other]							\$ -	No	
- [Other]							\$ -	No	
Creek inspections (non-USACE)	Wtrshd Facility Condition Assmnt	62761024	350	lf	\$ 1.52	1	\$ 533	No	
Creek inspections (USACE)	Corps Local Sponsor O&M	62761074	-	lf	\$ 1.52	0.5	\$ -	No	
Totals							\$ 251,854		



Coyote Creek Flood Protection Project – Estimated long term operations and maintenance forecast

CIP project name:									
Coyote Creek, Montague Expressway to Tully Road (E3)									
Activity	Corresponding operations project name	Corresponding operations project number	Quantity	Unit of measure	Unit rate (per unit of measure)	Frequency, once every ____ year(s)	Annual cost (estimated)	Eligible for funding from SCW E1.3?	When was or will CIP be turned over to O&M?
									FY24
Vegetation management									
- Mitigation site maintenance (Y4-8)	Mgmt of Revegetation Projects	00761075	29	acre	\$ 30,000	1	\$ 862,800	Yes	
- Mitigation site maintenance (Y9+)	Mgmt of Revegetation Projects	00761075	29	acre	\$ 4,578	1	\$ 131,663	Yes	
- See note 5 below.	Vegetation Mangmnt for Access	00761078	10	acre	\$ 1,373	1	\$ 13,167	Yes	
- See note 6 below.	Stream Capacity Vegetation Con	26771067	5	acre	\$ 1,836	1	\$ 9,180	Yes	
Sediment removal	Watershed Sediment Removal	00761023	-	cy	\$ 110	0	\$ -	Yes	
Bank protection	Watershed Erosion Protection	62761027	2,775	lf	\$ 2.54	1	\$ 7,041	No	
Rodent abatement	Watershed Levee Maintenance	62761028	2,775	lf	\$ 0.55	1	\$ 1,526	No	
Debris removal	Watershed Debris Removal	62761026	2,775	lf	\$ 0.98	1	\$ 2,727	No	
Good neighbor maintenance	Watershed Good Neighbor Maint	00761022	2,775	lf	\$ 1.02	1	\$ 2,820	No	
Encampment cleanup	Encampment Cleanup Program	26771027	1	day	\$ 11,334	0.25	\$ 45,334	No	
Other maintenance							\$ -		
- [Other]							\$ -	No	
- [Other]							\$ -	No	
- [Other]							\$ -	No	
Creek inspections (non-USACE)	Wtrshd Facility Condition Assmnt	62761024	2,775	lf	\$ 1.52	1	\$ 4,224	No	
Creek inspections (USACE)	Corps Local Sponsor O&M	62761074	-	lf	\$ 1.52	0.5	\$ -	No	
Totals							\$ 468,505		