Valley Water

# PLANNING STUDY REPORT

## Upper Penitencia Creek Flood Protection Project

***Project No. 26324001***

**September 2022**

# PLANNING STUDY REPORT

## UPPER PENITENCIA CREEK FLOOD PROTECTION PROJECT (26324001)

Coyote Creek Confluence to Dorel Drive


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# ABREVIATIONS & ACRONYMS

| | |
|---|---|
| ADA | Americans With Disabilities Act |
| BART | Bay Area Rapid Transit |
| BFE | Base Flood Elevation |
| BMP | Best Management Practices |
| CESA | California Endangered Species Act |
| CMP | Corrugated Metal Pipe |
| CNDDB | California Natural Diversity Database |
| CDFW | California Department of Fish and Wildlife |
| CEQA | California Environmental Quality Act |
| cfs | cubic feet per second |
| CIP | Capital Improvement Project |
| City | City of San Jose |
| County | County of Santa Clara |
| CSJ | City of San Jose |
| CWA | Clean Water Act |
| D/S | Downstream |
| EIR | Environmental Impact Report |
| EOP | Emergency Operations Plan |
| EPA | U.S. Environmental Protection Agency |
| ESA | Environmental Science Associates |
| FAHCE | Fisheries and Aquatic Habitat Collaborative Effort |
| FEMA | Federal Emergency Management Agency |
| FESA | Federal Endangered Species Act |
| FIRM | Flood Insurance Rate Map |
| FIS | Flood Insurance Study |
| fps | feet per second |
| ft | feet |
| HCP | Habitat Conservation Plan |
| HEC-RAS | Hydrologic Engineering Center – River Analysis System |
| HSLA | Hazardous Substance Liability Assessment |
| LWD | Large Woody Debris |

| | |
|---|---|
| NAVD | North American Vertical Datum |
| NCCP | Natural Community Conservation Plan |
| ND | Negative Declaration |
| NFIP | National Flood Insurance Program |
| NFP | Natural Flood Protection |
| NHI | National Heritage Institute |
| NMFS | National Marine Fisheries Service |
| NRCS | Natural Resources Conservation Services |
| O&M | Operations and Maintenance |
| OSHA | Occupational Safety and Health Act |
| PSR | Planning Study Report |
| QEMS | Quality and Environmental Management System |
| ROW | Right-of-Way |
| RWQCB | Regional Water Quality Control Board |
| SCC | Santa Clara County |
| SCVURPPP | Santa Clara Valley Urban Runoff Pollution Prevention Plan |
| SFEI | San Francisco Estuary Institute |
| SMP | Stream Maintenance Program |
| SVBX | BART/VTA Silicon Valley Extension |
| SWPPP | Stormwater Pollution Prevention Plan |
| SWRCB | State Water Resources Control Board |
| TCE | Temporary Construction Easement |
| U/S | Upstream |
| USACE | United States Army Corps of Engineers |
| USFWS | United States Fish and Wildlife Service |
| USGS | U.S. Geological Survey |
| UST | Underground Storage Tank |
| VHP | Santa Clara Valley Habitat Plan |
| VTA | Valley Transportation Authority |

# Executive Summary

## Introduction

The purpose of this report is to describe the planning process used to develop a recommended multi-objective solution for the Upper Penitencia Creek Flood Protection Project (Project). To that end, the setting and problems are described, objectives are defined, the alternatives are analyzed based on the project's alternative ranking methodology, public input is described, and the staff recommended alternative is identified, including its operation and maintenance needs and potential mitigation requirements.

The study reach is located within the City of San Jose and extends approximately 4.2 miles along Upper Penitencia Creek from the confluence with Coyote Creek in the west to Dorel Drive near the creek's outlet from Alum Rock Canyon in the east (see Figure ES-1). With the capacity to convey less than a 10-year flow event currently, Upper Penitencia Creek has flooded and damaged the community at least seven times since Valley Water began preparing flood reports in 1967. In 2017, the creek spilled its banks at several locations causing nuisance flooding although no damages were reported. Potential damages from a 100-year flood event are estimated at $455 million (in 2004 dollars, according to a U.S. Army Corps of Engineers [USACE] economic analysis). Over 8,000 residential, commercial, and industrial properties would be flooded in a 100-year flood event.

The Project is part of the Safe, Clean Water and Natural Flood Protection Program (SCW) approved by Santa Clara County voters in 2012 and updated in 2020. Based on the Valley Water Board of Directors' Ends Policies, a variety of alternatives that would satisfy the project objectives were assessed for feasibility and broad environmental impacts. To ensure all concerns were addressed, the recommended alternative was developed in coordination with the City of San Jose, Santa Clara County, resource agencies, stakeholders, and the public. The recommended project was selected because it best served the interests of the public and met the Valley Water Board of Directors' Ends Policies. To comply with the California Environmental Quality Act, an Environmental Impact Report will be prepared to address the recommended project's likely environmental impacts during the project's design phase.

The project described in this Planning Study will be funded by Local (SCW) funding without any federal funding. The Local Project will provide 100-year protection from the Coyote Creek confluence up to Capitol Avenue (Phases I & II of the Project) and will substantially reduce the 100-year floodplain, but a 100-year floodplain will remain due to spills between Capitol Avenue and Dorel Drive (Phase III of the Project). Although funding is not available for providing 100-year flood protection for that reach, the long-term plan is to provide 100-year protection to the entire length through a future project for the upper reaches (Capitol Avenue to Dorel Drive). This future project, Phase III, would seek federal funds and most likely require detention basins due to the constraint of not inducing flooding downstream in Coyote Creek.

## Project Objectives

As described in SCW, the primary goal of the Project (Local funding only) is to acquire all necessary rights-of-way and construct a 1% flood protection project from Coyote Creek confluence to King Road. Other project objectives include:

- Secure required property for the full project reach (to Dorel Drive), in anticipation of future federal funding that would allow for construction of the full project.
- Maintain and enhance water supply potential.
- Preserve and enhance existing aquatic and riparian habitat.
- Reduce sedimentation and maintenance requirements.
- Identify opportunities to integrate recreation improvements consistent with the City of San Jose and Santa Clara County Parks Master Plan.

The original local-funding-only project was to acquire all necessary rights-of-way and construct a 1% (100-year event) flood protection project from Coyote Creek confluence to King Road, which would have protected 450 parcels. In December 2019, the Valley Water Board directed staff to use the available local funding to complete the design and construction of the locally funded project as well as build the reaches of the preferred project that can be constructed with the available funding. This approach extends the local-funding-only project from King Road to Capitol Avenue and provides 1% flood protection for an additional 800 parcels. As a result, the new local-funding-only project is to construct flood improvements along Upper Penitencia Creek from the confluence of Coyote Creek to Capitol Avenue to increase the 1% flood protection provided with local available dollars to 1,250 parcels, including the new Berryessa BART station. Figure ES-2 shows the parcels that would be removed from the 1% floodplain and parcels that would remain.

The project objective regarding flood protection is to protect against the 1% flow event; not necessarily to remove parcels from the FEMA floodplain. Therefore, it is not required that parcels be removed from the FEMA Flood Insurance Study (FIS) mapping nor for the project to

be built to FEMA standards (specifically freeboard requirements). This distinction is important when considering levees/floodwalls for flood protection. A key issue with the public is to not have high levees/floodwalls between the creek and adjacent areas to not impede the creek view and access. Even so, many of the parcels that would be protected with this project may also be mapped out of the FEMA FIS floodplain as well.

## Project Alternatives

Due to the unique features and values of the Upper Penitencia Creek watershed, this planning study followed a unique pilot planning process. Through a partnership with the San Francisco Estuary Institute (SFEI) and utilizing SFEI's Flood Control 2.0 methodology, a landscape vision plan was developed for the watershed to balance all water resources objectives and develop a comprehensive high-level master plan for the watershed. While different from Valley Water's typical planning process, the Vision process was an effective way to vet various ideas and narrow down to a limited set of alternatives. Charrettes were conducted with the City of San Jose and Santa Clara County, other stakeholders, resource agencies, and internal Valley Water experts.

Concepts were developed during the landscape Vision process that helped meet all the various objectives. These concepts were combined in different ways and, in consideration of project funding and constraints, developed into conceptual alternatives. Since the conceptual alternatives were primarily different combinations of the same concepts, the main differences between alternatives was the level of flood protection the alternative would provide. The project team identified a single feasible alternative that met the project objectives. This alternative (Alternative A) and the No-Project alternative are fully described in Chapter 5. Alternative A and the No-Project alternatives were rated using Natural Flood Protection objectives and compared with each other.

## Public Outreach

During the Project's planning phase, the project team incorporated input from both internal and external stakeholders into the problem definition, objectives refinement, and development of the conceptual and feasible alternatives. The external outreach included members of the public living in close proximity to the creek, City of San Jose staff, Santa Clara County Parks staff, Eastside Union High School District staff, the Flea Market developer, and regulatory agencies. This public outreach is expected to continue throughout the design and construction phases of the Project.

## Staff-Recommended Alternative

After reviewing the feasible alternatives using Natural Flood Protection objectives, engagement with the community, and feedback received from citizens, City staff, and elected officials, Valley Water staff has identified Alternative A as the staff-recommended alternative. This alternative

best meets the project's objectives and the Board's Ends policies within the available funds. This alternative is composed of the following project elements:

- Coyote Creek confluence optimization
- Channel widening with geomorphic and riparian restoration along Reach 1
- King Road capacity expansion
- Utilization of the Mabury Bypass as the main flow conveyance in Reaches 2 & 3 (includes geomorphic and riparian restoration)
- Low levees and floodwalls as needed to provide design capacity
- Optimization of the flow split between the Mabury Bypass and the main channel
- Geomorphic and fish passage restoration under Highway 680
- Penitencia Creek trail enhancements and extension from King Road down to the Coyote Creek Confluence

## Estimated Project Cost, Schedule, and Implementation

The estimated capital cost for the Project (Local funding only) is $24 million (2019 dollars) to build it and $251,000 annually to maintain it; See Appendix C for cost estimate details.

On December 17th, 2019, the Valley Water Board was informed of the staff recommended alternative and authorized the project to move into the design phase. The following milestones are the next steps:

- Commence with the design phase in September of 2022;
- Finalize design phase and propose certification of EIR in 2025;
- Obtain resource agency permits in 2025
- Upon Board approval, construction may commence in 2025 and can be completed by 2028.

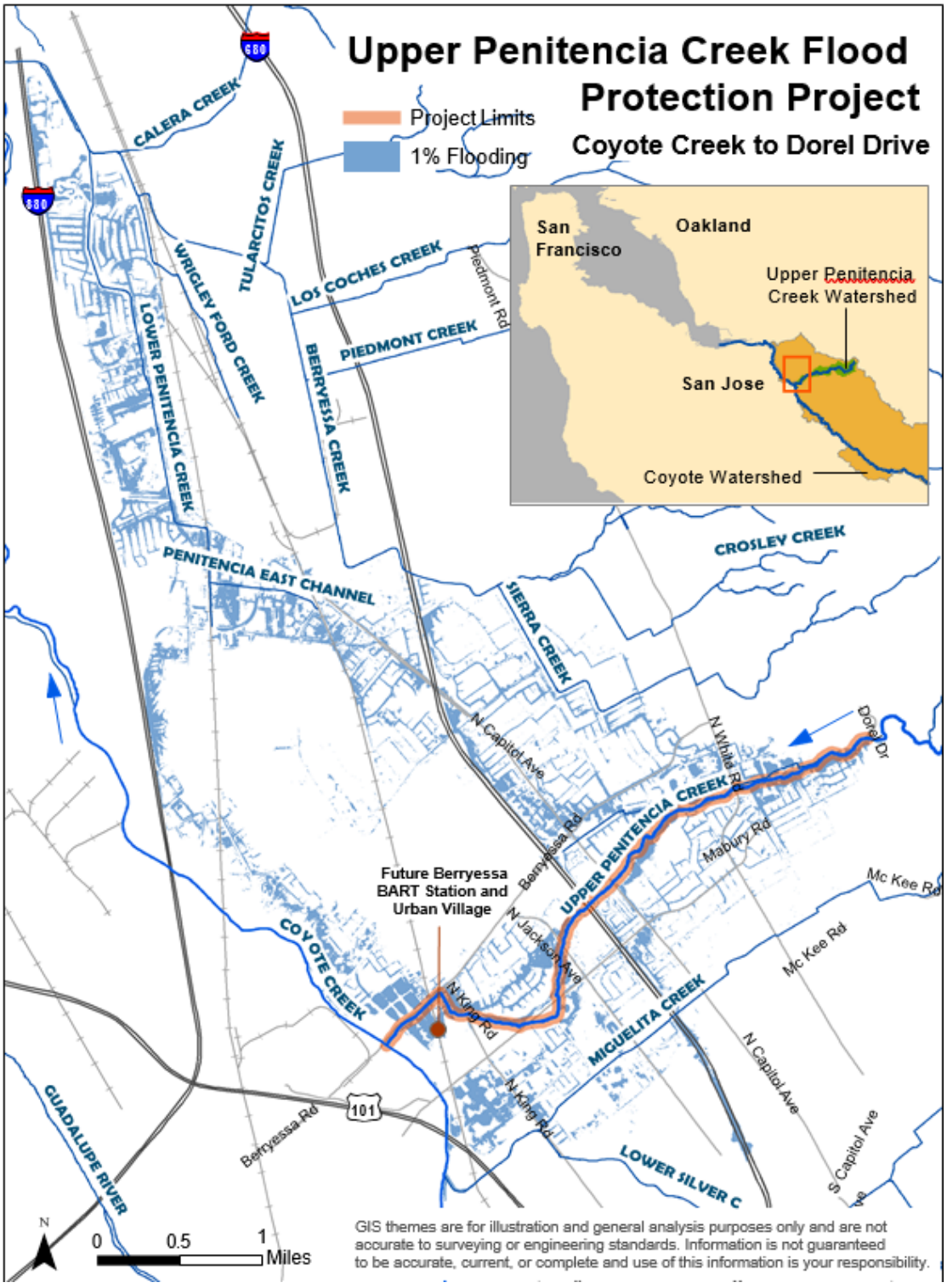



**Figure ES-1. Project Location/Flood Map**

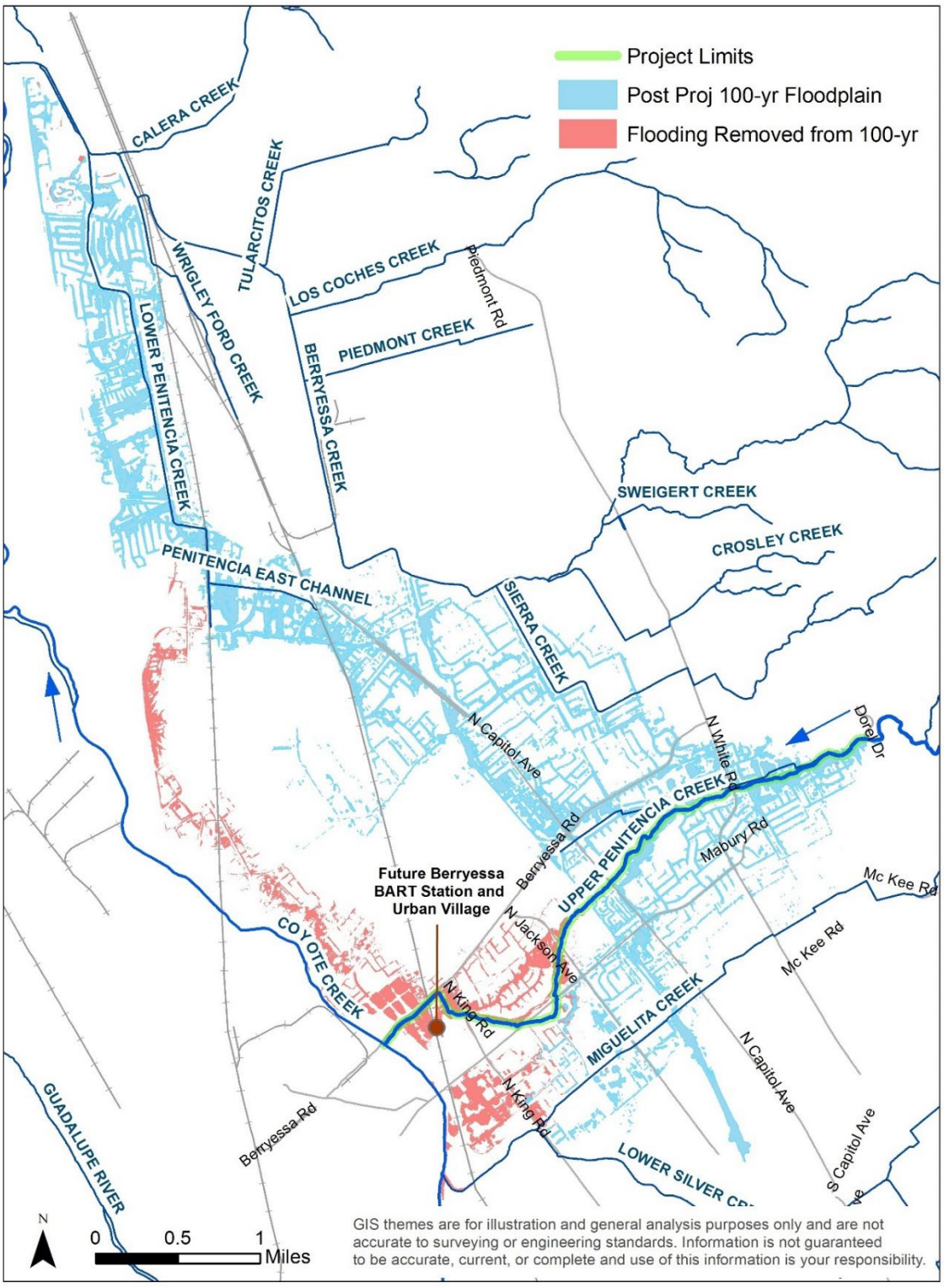



**Figure ES-2. 100-Year Flood Map: Post-Project vs. Existing Conditions (red would be removed from the 100-year floodplain with Phases I & II post-project conditions)**

# Chapter 1: Introduction/Background

## 1.1 Purpose and Organization of the Planning Study Report

The Planning Study Report (Report) for the Upper Penitencia Creek Flood Protection Project documents the project's problem definition, development and evaluation of the alternatives, and describes the staff-recommended project.

The Report has been organized as follows:

Chapter 1: Background (Including project goals and objectives)
Chapter 2: Watershed Description
Chapter 3: Problem Definition
Chapter 4: Project Outreach
Chapter 5: Formulation of Project Alternatives
Chapter 6: Staff-Recommended Project
Chapter 7: Maintenance Program
Chapter 8: Project Cost, Funding, and Schedule
Chapter 9: Conclusions and Recommendations

## 1.2 Project Origin

With the capacity to convey less than a 10-year flow event, Upper Penitencia Creek has flooded the community at least seven times since Valley Water began preparing flood reports in 1967. Since then, damaging flood events occurred in 1978, 1980, 1982, 1983, 1986, 1995, and 1998, impacting many homes, businesses, and surface streets. In 2017, the creek spilled its banks at several locations along the Mabury bend causing nuisance flooding although no damages were reported. Potential damages from a 100-year flood event are estimated at $455 million (in 2004 dollars, according to a USACE economic analysis[1]), with average annual damages estimated at $30.5 million for the full reach from the Coyote Creek confluence to Dorel Drive. Over 7,000 parcels of residential, commercial, and industrial properties are at risk of flooding from a 25-year flood and more than 8,000 parcels are at risk of flooding from a 100-year flood along Upper Penitencia Creek.

Therefore, as part of the Safe Clean Water (SCW) and Natural Flood Protection Program (projects funded by the voter-approved Measure B in November 2012, continued through Measure S in November 2020), Valley Water initiated the Upper Penitencia Creek Flood Protection Project (Project) to identify flood risk reduction, water supply, maintenance, recreational, and habitat restoration opportunities within the watershed.

## 1.3 Project Location

The Project is located in the City of San Jose and extends from the downstream end of Upper Penitencia Creek at the confluence with Coyote Creek up to Dorel Drive (close to Alum Rock

[1] United States Army Corps of Engineers. Upper Penitencia Creek Flood Damage Reduction Draft Feasbilility Report.

Park). The Project is approximately 4.2 miles long and this length has been subdivided into the following reaches for ease of reference:

Reach 1: Coyote Creek Confluence to King Road
Reach 2: King Road to Jackson Ave
Reach 3: Jackson Ave to Capitol Ave
Reach 4: Capitol Ave to Viceroy Way
Reach 5: Viceroy Way to Piedmont Road
Reach 6: Piedmont Road to Noble Ave
Reach 7: Noble Ave to Dorel Drive

## 1.4 **Valley Water Goals and Project Objectives**

The mission of the Santa Clara Valley Water District (Valley Water) is to provide Silicon Valley safe, clean water for a healthy life, environment, and economy.

Per the SCW Report, the primary goal of the Project (Local funding only) is to acquire all necessary rights-of-way and construct a 1 % flood protection project from Coyote Creek confluence to King Road. Other project objectives include:

- Secure required property for the full project reach (to Dorel Drive), in anticipation of future federal funding that would allow for construction of the full project.
- Preserve water supply potential.
- Preserve and enhance existing stream natural habitat and fisheries potential.
- Reduce sedimentation and maintenance requirements.
- Identify opportunities to integrate recreation improvements consistent with the City of San Jose and Santa Clara County Parks Master Plan.

Relevant Board Governance Policies and Natural Flood Protection

- Ends Policy E-1: Provide Silicon Valley safe, clean water for a healthy life, environment, and economy.
    - 1.1: An integrated, socially equitable, and balanced approach in managing a sustainable water supply, effective natural flood protection, and healthy watersheds is essential to the future of all communities served.
    - 1.2: Effective public engagement by Valley Water is achieved through transparent, open communication that informs and generates participation among all communities, including disadvantaged communities, communities of color, and communities with limited English proficiency, as well as other key stakeholders.
    - 1.3: Collaboration with government, academic, private, non-governmental, and non-profit organizations, as well as diverse and disadvantaged communities is integral to accomplishing the Valley Water mission.
    - 1.6: As standard practice, all work products shall be visually pleasing, sustainable, cost-effective, culturally appropriate, equitable across all communities, and reflect the characteristics of the surrounding urban setting and natural habitat using appropriate materials, colors, shapes, art works, vegetation, and surface treatments. This includes the naming of facilities in a manger that is respectful of all diverse communities.

- Ends Policy E-2: Provide a reliable, safe, and affordable water supply for current and future generations in all communities served.
    - 2.5: Manage water resources using an integrated, science-based approach.
- Ends Policy E-3: Natural flood protection is provided to reduce risk and improve health and safety for residents, businesses, and visitors, now and into the future.
    - 3.3: Increase the health and safety of residents countywide by reducing community flood risk.
- Ends Policy E-4: Provide water resources stewardship to protect and enhance ecosystem health.
    - 4.1: Use a science-based, inclusive approach to protect Santa Clara County's watersheds and aquatic ecosystems for current and future generations.
    - 4.2: Sustain ecosystem health while managing local water resources for flood protection and water supply.
    - 4.5: Engage the community to promote watershed stewardship by providing meaningful engagement in Valley Water programs for all people regardless of race, color, gender identity, disability status, national origin, tribe, culture, income, immigration status, or English language proficiency.

The project team will incorporate Board-approved Natural Flood Protection (NFP) objectives throughout the Project's development and implementation. The following table summarizes the NFP objectives:

**Table 1-1: Project NFP Objectives[2]**

| No. | NFP OBJECTIVE |
|---|---|
| 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 the 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 capital 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 Valley Water and the partner communities 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. |

[2] Duckler, S., PE; SCVWD (2014 Rev.). *Guidance on Alternative Evaluation and Selection for Natural Flood Protection Projects.*

The original local-funding-only project was to acquire all necessary rights-of-way and construct a 1% (100-year event) flood protection project from Coyote Creek confluence to King Road (Phase I of the Project), which would have protected 450 parcels. In December 2019, the Valley Water Board of Directors directed staff to use the available local funding to complete the design and construction of the locally funded project as well as build the reaches of the preferred project that can be constructed with the available funding. This approach extends the local-funding-only project from King Road to Capitol Avenue (Phase II of the Project) and provides 1% flood protection for an additional 800 parcels. As a result, the new local-funding-only project is to construct flood improvements along Upper Penitencia Creek from the confluence of Coyote Creek to Capitol Avenue (Phases I & II) to increase the 1% flood protection provided with local available dollars to 1,250 parcels, including the new Berryessa BART station.

The project objective regarding flood protection is to protect against the 1% flow event; not necessarily to remove parcels from the FEMA floodplain. Therefore, it is not required that parcels be removed from the FEMA Flood Insurance Study (FIS) mapping nor for the project to be built to FEMA standards (specifically freeboard requirements). This distinction is important when considering levees/floodwalls for flood protection. A key issue with the public is to not have high levees/floodwalls between the creek and adjacent areas to not impede the creek view and access. Even so, many of the parcels that would be protected with this project may map out of the FEMA FIS floodplain as well.

## 1.5 **Previous Project, Studies, and Actions**

The following section briefly describes past and present studies, project, and programs that are relevant to the Project.

Watershed Environmental Impact Report/Environmental Impact Statement (EIR/EIS) – 1990

In August 1990, the Natural Resources Conservation Services (NRCS) in cooperation with the Guadalupe-Coyote Resource Conservation District and Valley Water, prepared a Final Upper Penitencia Creek Watershed Plan and Environmental Impact Report/Environmental Impact Statement (EIR/EIS). In the final Watershed Plan, a no-project alternative and five alternatives were presented. In various combinations, the alternatives included floodwalls, levees, floodplain modification, bypass channels, raising roadways, floodproofing, and vegetation removal. The recommended alternative to provide flood protection for Upper Penitencia Creek included all of these elements.

In 1991, the NRCS terminated their involvement due to insufficient agricultural benefits. Following the departure of the NRCS, Valley Water requested the U.S. Army Corps of Engineers (USACE) to investigate whether there was a continued federal interest in participating. USACE subsequently completed a Reconnaissance Report in 1995 that determined the benefit to cost ratio was sufficient to move forward with a project.

U.S. Army Corps of Engineers Feasibility Study – 1998 to 2015

In 1998 Valley Water, as the Local Sponsor, signed a Feasibility Cost Sharing Agreement (FCSA) with USACE. Both agencies committed to perform a feasibility study of the Upper Penitencia Creek Flood Protection Project to determine if there is a federal interest in providing flood risk management improvements along Upper Penitencia Creek.

In January 2001, USACE approved an application by Valley Water for a Section 104 General Credit for Flood Protection on Reach 1 – Coyote Confluence to King Rd. Based on the NRCS recommended plan, Valley Water retained consultants to design Reach 1 of the Project and prepare a supplemental environmental impact report. However, in 2002, due to Valley Water cash flow constraints, it was decided that Reach 1 should be constructed in tandem with the remaining elements of the overall USACE project. The Reach 1 design was halted at the 60% level as the result of concerns about future funding for flood projects within the Coyote Fund and the environmental concerns about the bypass design.

In 2003, based on Valley Water's cash flow model and USACE project cost estimate, there would not be enough funds available to construct the Upper Penitencia Creek Flood Protection Project for more than a decade. However, staff recommended that USACE should still complete the feasibility study and Environmental Impact Report (EIR). By completing these studies, it would provide project stakeholders such as the City of San Jose, the Santa Clara Valley Transportation Authority, and private developers with information to determine whether Valley Water's approved project alternative would have any future impact on their projects.

Amendments to the FCSA were signed off on in 2005 and 2009 in order to increase the original total study cost from $2,990,000 to $7,516,000 (in 2009) due to significantly more work required than originally estimated.

In 2013, the FCSA was amended once again to increase the total study cost from $7,516,000 to $9,800,000 due to significantly more work required than previously estimated and project delays caused by inadequate federal funding.

In 2013, USACE completed the preliminary analyses of the Feasibility Study. USACE formulated alternatives to reduce potential economic damages due to flooding, reduce risk to public health and safety due to flooding, and improve habitat conditions consistent with flood management needs. These alternatives were screened using the following measures: effectiveness in reducing damages, economic feasibility, implementation feasibility, and potential environmental impacts. The preferred alternative included channel widening, floodwalls, and levees.

On April 1, 2014, USACE held a public meeting to share the results of the Feasibility Study. At that meeting, community members expressed concerns over vegetation removal, habitat impacts, and visual changes.

In November and December 2015, USACE held a re-scoping charette and a field meeting with the resource agencies to explore the viability of a multi-purpose project. Following this meeting, USACE decided that the multi-objective project which is appropriate for this creek could not be funded under the existing single-purpose authorization. Therefore, the Project was not included in USACE's 2017 workplan. Valley Water decided to proceed with planning on its own with local funding only. As described in the SCW, the local-only project would "acquire all necessary rights-of-way and construct a 1 % flood protection project from Coyote Creek confluence to King Road."

Upper Penitencia Creek Phase I Hazardous Material Investigation – Phase I Report – 1999

In 1999, CH2M finalized a Phase I Hazardous Material Investigation for Upper Penitencia Creek to evaluate and identify parcels which have or may have been impacted by hazardous substances. Ninety-three properties were investigated, and most were found to be generally free of environmental concern. Twenty-nine of the properties required additional sampling and/or inquires in order to make an adequate assessment. A Phase II assessment was recommended to identify specific areas where either remediation will be required prior to construction or where special instructions will be required for contractors working at the locations.

Coyote Creek Watershed Integrated Pilot Assessment - 2003

In 2003, the Santa Clara Valley Urban Runoff Pollution Prevention Program (SCVURPPP) conducted a pilot assessment of the stream ecosystems functions in the Coyote Creek Watershed, including the Upper Penitencia Creek sub-watershed. The goal of the assessment was to coordinate and improve local and regional watershed monitoring and assessment programs. The study assessed existing hydrologic processes and channel dynamics, aquatic habitat, riparian habitat, and landscape-level connectivity, the capacity of the study area to support aquatic wildlife and select water quality parameters. Potential management actions and monitoring activities were prioritized based on which would have the greatest positive impact on cold and warmwater fish and macroinvertebrate communities.

Upper Penitencia Creek Hydrology Report – 2001 and 2004

In 2001, USACE developed a hydrologic model for Upper Penitencia Creek and a report to summarize the results. The purpose was to develop hydrology information for the creek to be used in the development of floodplains and the sizing of proposed channel improvements for the USACE Feasibility Study for Upper Penitencia Creek. In 2004, USACE updated the report with additional stream and rainfall gage data. This update reduced most of the design storm event discharges by 10%-15%.

An Urban Geomorphic Assessment of the Berryessa and Upper Penitencia Creek Watersheds in San Jose, California - 2009

In 2009, Colorado State University conducted a watershed study to investigate vastly different channel morphologic response to urbanization and valley subsidence. This included the urbanized portion of Berryessa Creek, which exhibits system-wide channel instability, and Upper Penitencia Creek, which has remained stable despite similar urban build out trends. The study found that hydrologic and river engineering infrastructure changes to Berryessa Creek have adversely affected channel stability system wide. However, for Upper Penitencia Creek, valley subsidence and local channel straightening have resulted in reach-scale channel instability.

Santa Clara County Safe, Clean Water and Natural Flood Protection Program

In November 2012, Santa Clara County voters approved the 15-year Safe, Clean Water and Natural Flood Protection Program (SCW), which provides an additional $41.9 million in funding for the Project. SCW allowed for two potential outcomes, with and without Federal Project participation. The preferred project, with federal and local funding, would provide flood protection to all the homes, business, and public buildings in the 100-year floodplain, although not all structures would necessarily be able to be removed from the FEMA floodplain. The 2nd option, with local funding only, would provide funding to acquire all the necessary rights-of-way and to construct a 100-year flood protection project from Coyote Creek confluence to King Road, which would still allow for spills to occur between King Road and Dorel Dr.

Upper Penitencia Creek Historical Ecology Assessment - 2012

In 2012, SFEI produced the Upper Penitencia Creek Historical Ecology Assessment. This report presented maps and descriptions of the geomorphology and various habitat types found historically in the Upper Penitencia Creek watershed. Information from this assessment can be found in chapter 2.8 Biological Resources.

BART/VTA Study – July 2013

In 2013, Schaaf & Wheeler finished a hydraulic floodplain study of the Berryessa, Lower Penitencia, and Upper Penitencia watersheds for the Bay Area Rapid Transit (BART)/Santa Clara Valley Transportation Agency (VTA) Silicon Valley Berryessa Extension (SVBX). SVBX is a 16-mile extension of the existing BART system into Silicon Valley from Alameda County and includes the new Berryessa Station located along Upper Penitencia Creek downstream of King Road. Schaaf & Wheeler's study included Federal Emergency Management Agency (FEMA) flood hazard maps to be included with the SVBX Conditional Letter of Map Revision (CLOMR). The City of San Jose decided not to proceed with the CLOMR.

FEMA Flood Insurance Study – February 2014

FEMA published updated Flood Insurance Studies (FIS) for Santa Clara County to identify current flood hazards. Original FIS were published in the early 1980s, with it updated in 2009

and 2014. Although after reviewing the updates, it appears that flooding around the Mabury Road area was incorrectly removed from the flood map.

Coyote Creek Hydrology Study - 2015

In 2015, Valley Water finalized a hydrology study for the Coyote Creek watershed, which included the Upper Penitencia Creek sub-watershed. The purpose was to develop a design hydrologic model that reflects Coyote Creek's entire watershed. A calibrated HEC-HMS hydrologic model was developed to calculate the 100-year and 10-year storm event flows for all the creeks in the watershed, including Upper Penitencia Creek.

Upper Penitencia Creek Stressor/Source Identification Project - 2016

In 2016, SCVURPPP conducted a Stressor Source Identification Project on Upper Penitencia Creek per Municipal Regional Stormwater NPDES Permit requirements to identify and isolate potential stressors and/or sources associated with observed potential water quality impacts. This stressor project determined sources of stress on biological communities in the Upper Penitencia Creek, whether natural (e.g., lack of stream flow) or anthropogenic (e.g., nutrients or temperature), were not associated with discharges from the municipal separate storm sewer system. Rather, if reduced biological conditions in the creek are partially caused by anthropogenic inputs, they are likely associated with diversions from the percolation ponds to the channel, which are intended to sustain water flows for groundwater percolation to satisfy downstream well users/water rights.

Landscape Vision Process with the San Francisco Estuary Institute (SFEI) - 2016

On June 6, 2016, Valley Water entered into a contract with SFEI to work on a Landscape Visionary Plan for the Project. This included working with the project team to come up with a science expert panel that would come up with a multi-objective solution to the Project. This multi-objective solution is more in line with the integrated water resources master plan Valley Water is developing – One Water.

On March 13, 2017, Valley Water in conjunction with SFEI conducted a workshop which included Valley Water personal, Project partners, and the science expert panel.

On July 6, 2017, Valley Water entered into an agreement for SFEI to complete a full Vision Report describing the workshop, results and conclusions. In March 2018, Valley Water amended the agreement with SFEI to include additional work in support of the Landscape Visionary Plan in order to better meet Valley Water's and partner's needs. The Vision Report was finalized in January 2019.

Berryessa/Upper Penitencia Creeks FEMA CTP Study - 2018

Valley Water entered into a Cooperating Technical Partners (CTP) agreement with FEMA in 1999. In 2016 FEMA awarded Valley Water $500,000 through the CTP program to perform

hydraulic analyses of the Berryessa, Lower Penitencia, and Upper Penitencia watersheds to produce flood hazard maps of the watersheds. The work was contracted out to Wood Rodgers and Schaaf & Wheeler and submitted to FEMA by 2018. In 2019, FEMA informed Valley Water that the CTP study results would be used to modify the FEMA floodplain maps as part of a Physical Map Revision (PMR) effort initiated by FEMA. Valley Water addressed FEMA's comments and submitted to FEMA in late 2021. The map changes, which reflect recently completed flood protection projects on Lower Penitencia and Berryessa Creeks, are likely to become effective by 2023 sometime (estimated time allows for FEMA's response (6 months), one additional round of comments (12 months, 6 for each agency), and FEMA's appeals process (6 months)- and is subject to change). The PMR will reflect the existing conditions of Upper Penitencia Creek.

Valley Water's Stream Maintenance Program

Valley Water's Stream Maintenance Program (SMP) comprises a programmatic Environmental Impact Report and permits from seven regulatory agencies allowing for Valley Water to conduct routine stream maintenance on creeks over which it has responsibility. The current SMP (SMP-2) is authorized through 2023 and Valley Water is pursuing an updated SMP (SMP-3) for a subsequent ten-year period. It is anticipated routine maintenance for the Upper Penitencia Creek Flood Protection Project would be undertaken as part of SMP-3. This program will provide long-term guidance to Valley Water to effectively implement routine stream maintenance along Upper Penitencia Creek in a cost-effective and environmentally sensitive manner.

Santa Clara Valley Habitat Plan (VHP)

The Santa Clara Valley Habitat Plan (VHP) details the conditions and measures required to obtain regulatory permit authorization for impacts to certain protected species and habitats through the approval of a Habitat Conservation Plan (HCP) and a Natural Community Conservation Plan (NCCP). The HCP and NCCP are endangered species permits issued to allow local development and maintenance activities to occur within the permit area. Conditions detailed in the VHP require that impacts to species and their habitats must be mitigated by incorporating avoidance and minimization measures into projects and activities and/or paying development impact fees imposed to cover the costs of VHP implementation.

The Upper Penitencia Creek flood protection project from Coyote Creek to Dorel Drive is identified as a covered activity under the VHP (reference). Valley Water will apply all conditions as described in Chapter 6 of the VHP when implementing flood protection projects, including review and approval by the Wildlife Agencies.

## 1.6 **Major Property Owners**

The majority of the land within the riparian corridor of Upper Penitencia Creek is public land owned by the City of San Jose, Santa Clara County, and Valley Water. A Tri-Party Agreement

(see Appendix E) between these public landowners allows the use of the land along the Upper Penitencia Creek to be used for flood management, water conservation, open space, and recreational purposes (see Section 2.10). The majority of the land is natural open space (see Figure 1-1 below).

A major private property owner is the Flea Market owner along Reach 1. The property owner is in the process of working with the City of San Jose to build an urban village at the existing flea market. Valley Water is working on receiving a dedication of approximately 17 acres adjacent to Upper Penitencia Creek and Coyote Creek from the property owner which will enable the Reach 1 Project elements to be constructed along the existing Flea Market (from the Coyote Creek confluence up to the BART tracks crossing).

The VTA recently opened the new Berryessa BART station along Reach 1. To mitigate for the construction related impacts, the VTA restored and widened Upper Penitencia Creek along the BART station. This included the creation of 1 acre or riparian habitat, 1.06 acres of floodplain wetland habitat, and approximately 982 linear feet of stream channel.[3] The Valley Water flood protection project would include similar improvements just upstream and downstream of the VTA site. VTA also has a light rail station at Capitol Avenue located just south of the creek in Reach 4.

Independence High School, part of the Eastside Union High School District (ESUHSD), is located south of the main channel upstream of Educational Park Drive in Reach 2. The Mabury Diversion, Mabury pond, and diversion pipe leading to the Overfelt Ponds are located here. The ESUHSD offices are located just southeast of the creek at Capitol Avenue in Reach 4.

The Berryessa Union School District (BUSD) has two schools located just north of the creek in Reach 5, Summerdale Elementary School and Piedmont Middle School, and Toyon Elementary School located just south of the creek in Reach 6. Just downstream of Jackson Avenue, BUSD has an approximate 10-acre plot of land located just north of the Mabury Bypass in Reach 2. The plot consists of open space plus the Berryessa Community Gardens.

[3] H.T. Harvey &Associates, & Balance Hydrologics (2017). *Upper Penitencia Creek Improvement Project Year 4 (2016) Monitoring Report (Project 3518-03).*

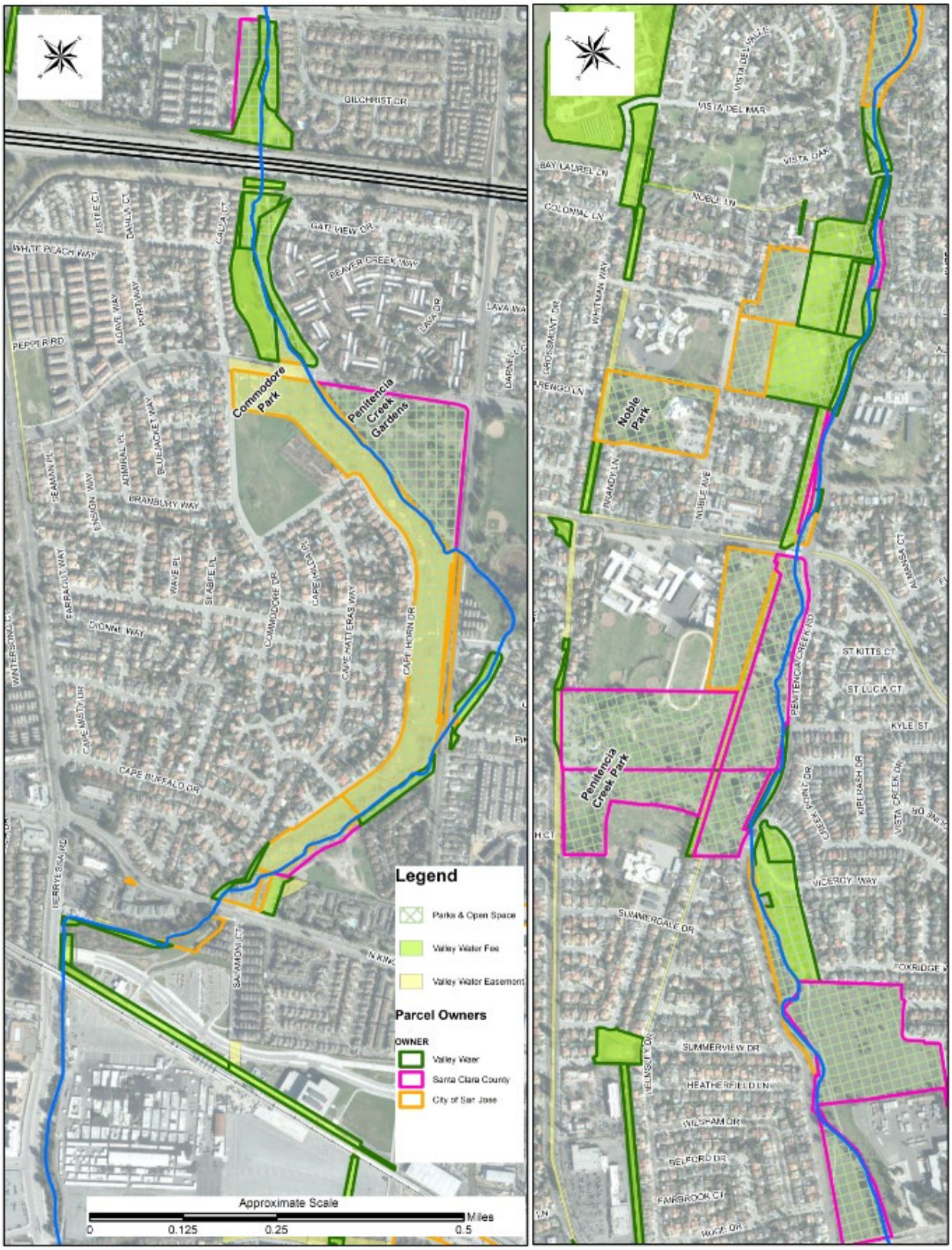



**Figure 1-1. Public Open Space along the Riparian Corridor**

# Chapter 2: Watershed and Creek Description

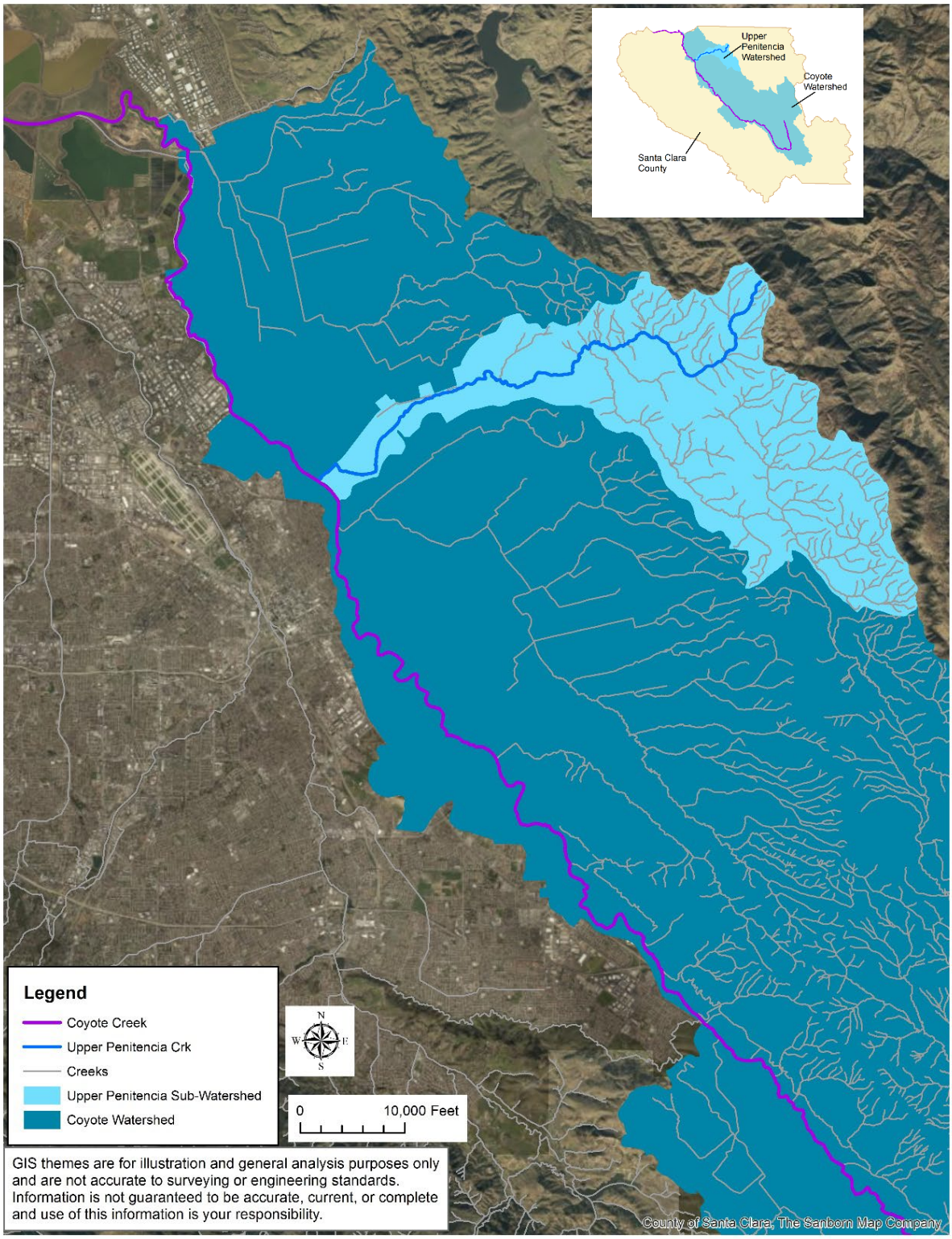



**Figure 2-1. Watershed Boundaries**

## 2.1 **Watershed Description**

As shown in Figure 2-1, the Upper Penitencia Creek watershed lies within the northeast portion of Santa Clara County and drains an area of approximately 24 square miles within the larger Coyote Creek watershed. Upper Penitencia Creek joins Coyote Creek ten miles upstream of South San Francisco Bay, near downtown San Jose. The creek flows generally westward approximately 11 miles from its headwaters at Poverty Ridge in the Diablo Range to the Coyote Creek confluence. 10% of the total drainage area is above the Cherry Flat reservoir. Two miles downstream of the reservoir is the confluence with Arroyo Aguague, the principal tributary to Upper Penitencia Creek comprising approximately 54% of the Upper Penitencia Creek watershed. Land use within the watershed is mostly open space in the hills, with only 12 % of the total area urbanized, primarily in the alluvial plain on the valley floor within City of San Jose jurisdiction.[4]

The Upper Penitencia Creek watershed is bounded by the Berryessa Creek watershed to the north and the Lower Silver Creek watershed to the south. The watershed receives an average annual rainfall ranging from 26 inches at its headwaters to 14 inches near Coyote Creek.

Prior to European and American settlement of Santa Clara Valley, the valley floor portion of Upper Penitencia Creek was an aggrading seasonal wash flowing on an alluvial fan. The alluvial fan originated at the canyon mouth at the eastern edge of the valley. The mountainous upstream area, representing roughly 90% of the creek's watershed, generates large amounts of sediment that is episodically transported to the alluvial fan by storm flows. In this area, the creek flows through canyons and receives large amounts of runoff from the steep hillsides. After exiting the canyon mouth, Upper Penitencia Creek flows over a thick deposit of coarse alluvium which results in considerable loss of streamflow to groundwater. Because the creek is located on the apex of an alluvial fan, local runoff in the area downstream of the creek historically followed the topography and naturally flowed away from the creek. Thus, the creek naturally received minimal surface flows after exiting the canyon. It also has no tributary stream that discharges into the creek within the Santa Clara Valley. The downstream decrease in channel slope promoted deposition of course bedload transported by the creek, building the alluvial fan. The creek typically had insufficient flow to breach the natural levees of Coyote Creek and the downstream terminus of the creek was a large sausal (willow grove and freshwater marsh) which seasonally connected to what is now Lower Penitencia Creek, and no channel connection to Coyote Creek existed. The creek had abundant gravel bars and the braided channels of the creek shifted within the broad and shallow overall channel and overtopped the banks during high water flows, further diminishing the flows carried by the creek.

[4] Buchan, L. A.J., & P.J. Randall, EOA, Inc. (2003). *Assessment of Stream Ecosystem Functions for the Coyote Creek Watershed.* Prepared for the Santa Clara Valley Urban Runoff Pollution Prevention Program.

The hydrology, geomorphology, and habitat conditions of the creek have significantly changed since the arrival of Europeans and Americans. The most substantial change was the construction in the mid-1800s of a permanent channel connecting Upper Penitencia Creek to Coyote Creek (see Figure 2-2). This connection helped to drain the sausal (willow swamp) at the natural downstream terminus of Upper Penitencia Creek. Subsequently, agricultural and urban development removed almost all of the wetland complex, eliminating large areas of riparian and aquatic habitat. Additional changes included the construction of streets, storm drains, bridges and grade control structures which confined the creek to a relatively narrow corridor.

Cherry Flat Reservoir and Alum Rock Park

The upper reach of Upper Penitencia Creek is impounded by a small dam, which forms Cherry Flat Reservoir. Cherry Flat Reservoir, owned and operated by the City of San Jose, is upstream from Alum Rock Park and the confluence with Arroyo Aguague at an elevation of 1,700 feet. The land adjacent to the reservoir is privately owned. The dam was constructed in 1936 as a means of solving the constant problem of reoccurring floods and drought in Alum Rock Park. The reservoir has a storage capacity of 500 acre-feet, a surface area of 25 acres, and is impounded by a 60-foot high earthen dam.[5]

In the late 1970's, Alum Rock Park switched to the municipal water supply and the City of San Jose has since managed the reservoir for base-flow augmentation during drought years. Several ranchers above the park, however, derive their water from stream flows. Flows are not released from the dam during the winter months unless early or high rains are predicted, and storage capacity needs to be increased. Two pipes at the base of the dam release water to the creek. The City of San Jose is regulated under a California Department of Fish and Game 1600 permit to maintain a "wet/active" channel below the dam. Most years, the flows from natural springs on which the dam was built, supply adequate flows to maintain a "wet" streambed, and no releases are made from the dam. Despite the maintenance of steady streamflow through Alum Rock Park, streamflow is often very low between the park and Noble Avenue.[6]

The City of San Jose is required to release waters from Cherry Flat Reservoir in quantities that maintain riparian habitat downstream to Alum Rock Park. Although Arroyo Aguague provides much of the summer baseflow that runs through Upper Penitencia Creek through Alum Rock Park. A future study can be conducted to determine whether a release program can be implemented to address both wet and dry years beneficial for downstream resources. Proper management of the timing and magnitude of water releases can have a beneficial impact on aquatic habitat conditions through the low flow summer months.

[5] Buchan, L. A.J., & P.J. Randall, EOA, Inc. (2003). *Assessment of Stream Ecosystem Functions for the Coyote Creek Watershed.* Prepared for the Santa Clara Valley Urban Runoff Pollution Prevention Program.
[6] Biotic Resources Group (2001). *Alum Rock Park Riparian Management Plan*. Prepared for the City of San Jose Department of Public Works – Parks and Recreation Facilities Division.

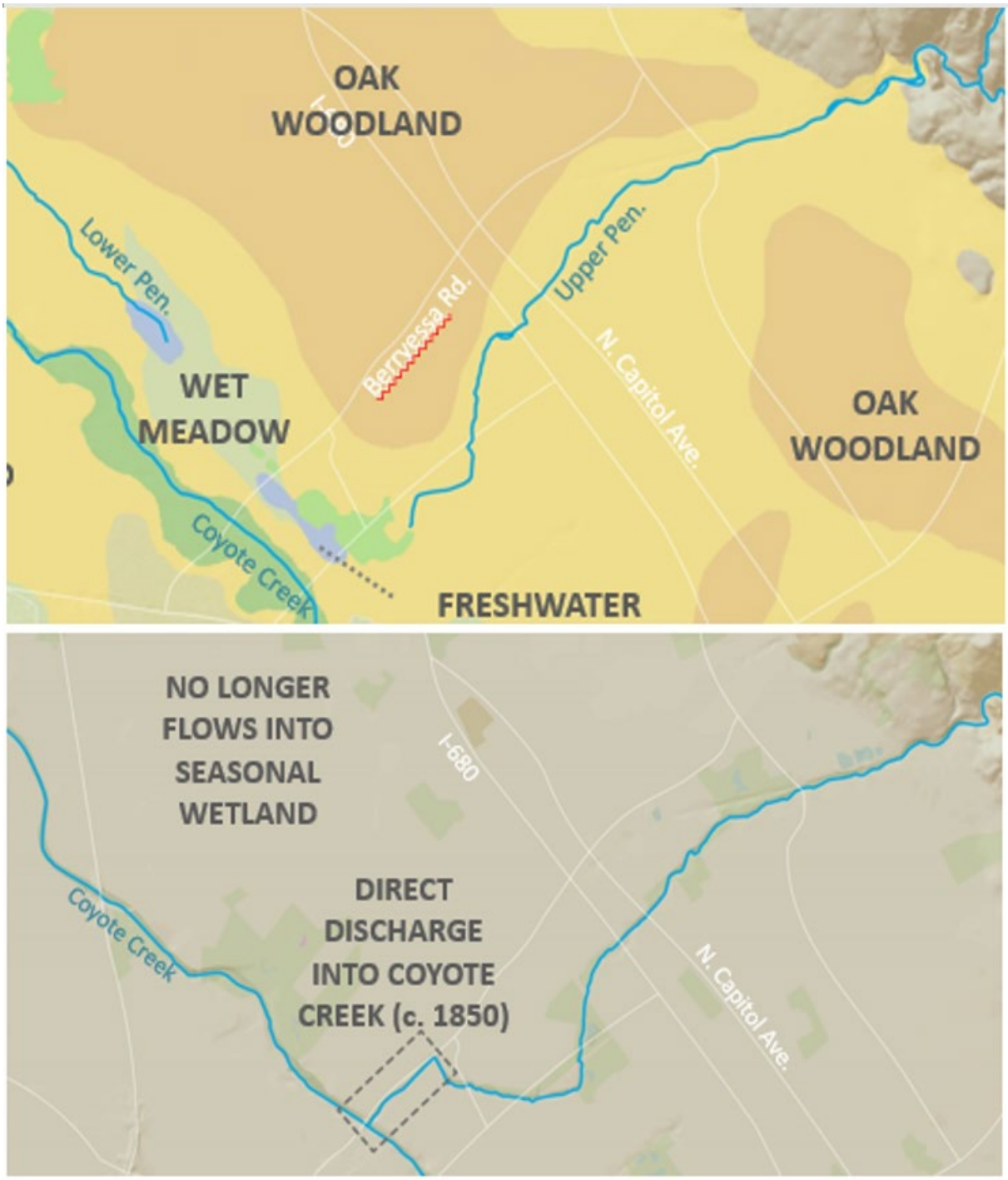



**Figure 2-2. Historical (upper) and current (lower) Upper Penitencia Creek connection to Coyote Creek[7]**

[7] San Francisco Estuary Institute (2019). *Resilient Landscape Vision for Upper Penitencia Creek*. Prepared for the SCVWD.

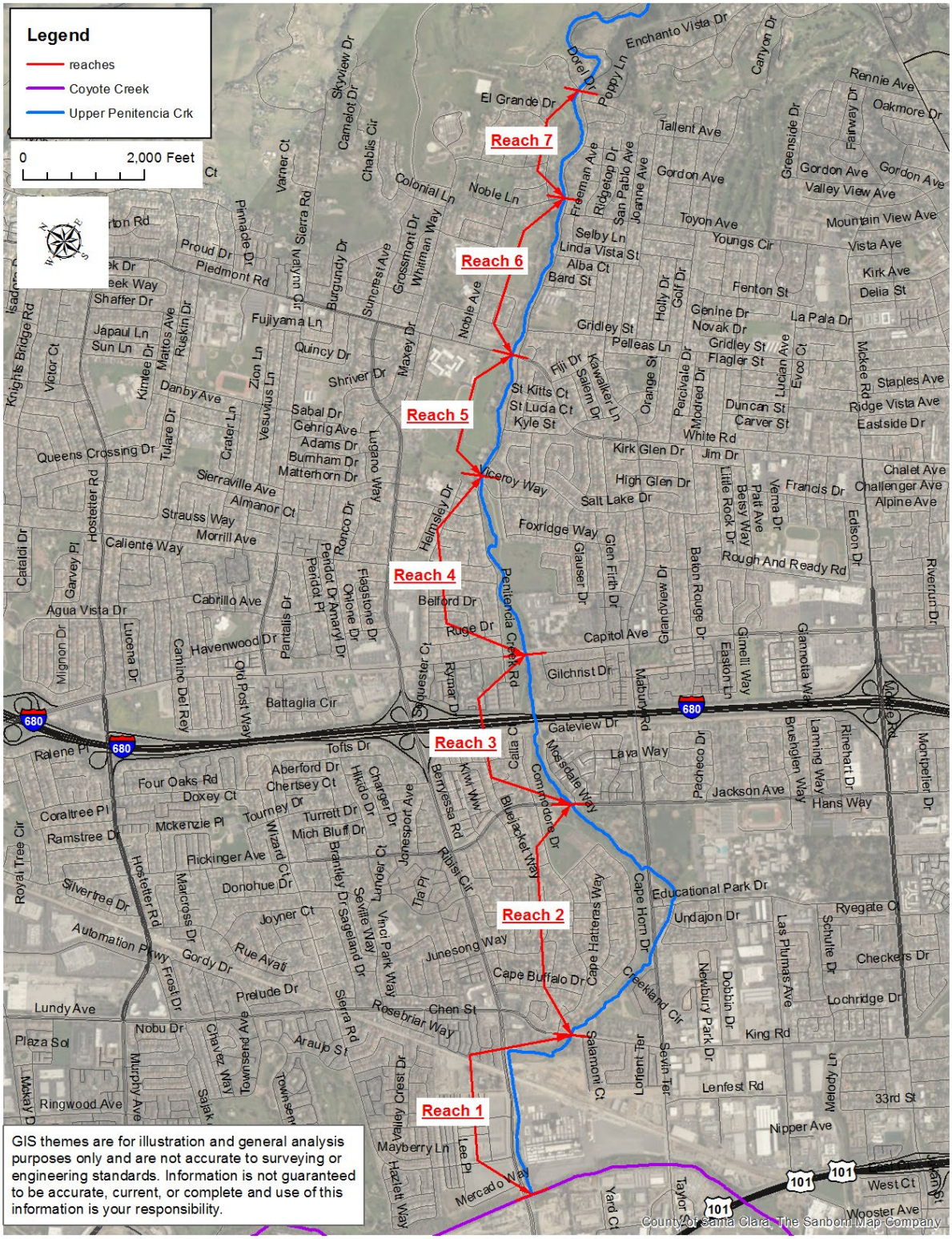



**Figure 2-3. Reach Boundaries**

## 2.2 **Creek Description**

Upper Penitencia Creek flows generally westward through a mix of open space, commercial, and residential land uses before entering Coyote Creek. The project area consists of the lower, urban portion of the watershed. It is bordered by Dorel Drive on the East; the confluence with Coyote Creek on the west; Berryessa Road on the north; and Mabury Road on the south (Figure 2-3). Upper Penitencia Creek within the project area has been divided into seven reaches (Reach 1 through Reach 7) based on their similar hydraulic characteristics. Reach 1 is the downstream reach from the Coyote Creek confluence to King Road. Reach 7 is the upstream reach, extending from Noble Avenue to upstream of Dorel Drive. Table 2-1 list the reaches with their limits and lengths.

**Table 2-1: Upper Penitencia Creek Project Reaches**

| Reach | Downstream Station | Upstream Station | Length (ft) | Limits |
|---|---|---|---|---|
| 1 | 88 | 3600 | 3512 | From the Coyote Creek Confluence to King Road |
| 2 | 3600 | 8909 | 5309 | King Road to Jackson Ave |
| 2a | 62 | 5237 | 5175 | Mabury Bypass along Reach 2 |
| 3 | 8909 | 11614 | 2705 | Jackson Ave to Capitol Ave |
| 4 | 11614 | 14700 | 3086 | Capitol Ave to Viceroy Way |
| 5 | 14700 | 17005 | 2305 | Viceroy Way to Piedmont Road |
| 6 | 17005 | 19871 | 2867 | Piedmont Road to Noble Ave |
| 7 | 19871 | 21829 | 1958 | Noble Ave to Dorel Drive |

Note: All reaches and measurements reference the downstream face of bridge.

Table 2-2 list the 20 crossings along the project reach. It should be noted that the dimensions are approximate and many of them have significant sediment deposition which lower their opening depths and capacities. Further details on each reach are described below.

**Table 2-2: Bridges/Culverts within Project Reach**

| Reach | Crossing | Station (ft) | Approximate Opening Dimensions (ft) | | | Bridge/Culvert |
|---|---|---|---|---|---|---|
| | | | Length | Width | Depth | |
| 1 | Coyote Maintenance Rd. | 1+20 | 66 | 6 | 4.5 | 6 ft CMP Culvert - 1.5 ft sediment |
| 1 | Flea Market Driveway d/s | 10+00 | 60 | 38 | 9.0 | Bridge |
| 1 | Flea Market Driveway u/s | 13+25 | 64 | 18.5 | 9.0 | Box Culvert |
| 1 | BART Station Driveway | 22+70 | 100 | 207.1 | 7.0 | Bridge (1 pier) |
| 1 | King Road | 36+25 | 45 | 20.9 | 5.3 | Box Culvert |
| 2 | King Rd Pedestrian Path | 36+55 | 12 | 23.0 | 7.0 | Bridge (Pedestrian) |

| | | | | | | |
|---|---|---|---|---|---|---|
| 2 | Mabury Road (westerly) | 57+15 | 259 | 23.5 | 3.0 | Double Box Culvert |
| 2 | Educational Park Drive | 64+40 | 83 | 26.2 | 5.0 | Bridge |
| 2 | Mabury Road (easterly) | 72+50 | 95 | 25.8 | 5.0 | Bridge |
| 2 | Jackson Avenue | 90+00 | 185 | 23.6 | 8.2 | Semi- Circular CMP Culvert (2 ft sediment) |
| 3 | Jackson Bypass | 95+00 | 141 | 134.7 | 9.3 | 4-Box Culvert |
| 3 | Highway 680 | 106+00 | 200 | 110.8 | 7.5 | Bridge |
| 3 | Capitol Avenue | 116+70 | 113 | 109.3 | 7.0 | Bridge |
| 4 | Penitencia Creek Trail | 124+85 | 15 | 45 | 12 | Bridge (Pedestrian) |
| 4 | Penitencia Creek Road | 148+50 | 300 | 24.5 | 6.3 | Box culvert |
| 5 | Penitencia Park Trail | 160+90 | 20 | 24.1 | 6.7 | Box Culvert (Pedestrian/Closed) |
| 5 | Piedmont Road | 170+80 | 148 | 111.8 | 10.8 | Bridge |
| 6 | Pedestrian/Abandoned | 187+10 | 15 | 40 | 8 | Bridge |
| 6 | Noble Avenue | 198+85 | 28 | 41.5 | 4.8 | Double Box Culvert |
| 7 | Dorel Drive | 218+50 | 47 | 29 | 7.7 | Bridge |
| 7 | Dorel Private Driveway | 219+50 | 46 | 38.0 | 6.0 | Bridge (1 pier) |

### **2.2.1** Reach 1: Coyote Creek Confluence to King Road, Sta. 0+00 to 35+50

Reach 1 is a segment of creek that was constructed in the early 1850s when a ditch was dug from the then downstream terminus of Upper Penitencia Creek straight to Coyote Creek, forming an unnatural 110-degree turn downstream of King Road (see figure 2-4). The lower portion of Reach 1 (from the BART tracks to the confluence) forms a series of pools and riffles within a confined, 60- to 90-foot wide, densely vegetated channel that is perpendicular to Coyote Creek at the confluence (see Figure 2-5). This lower portion of the reach is bounded to the north by Berryessa Road and to the south by the paved development of the San Jose Flea Market property. Immediately upstream of the confluence, Upper Penitencia Creek flows under a paved roadway through a 6-foot corrugated metal pipe (CMP) culvert. The CMP typically has sediment deposition of approximately 1.5-foot depth. The roadway is an undercrossing from the San Jose Flea Market to the property north of Berryessa Road which once served as parking for the flea market. During high flows, the culvert becomes overwhelmed and the creek flows over the roadway into Coyote Creek.

To mitigate construction-related impacts on riparian habitat and federal and state jurisdictional wetlands and waters from the SVBX project, the VTA implemented a habitat mitigation project on Upper Penitencia Creek at the 110-degree bend, southwest of the intersection of Berryessa Road and King Road, and adjacent to the new Berryessa BART station (see Figures 2-4 and 2-6). The mitigation design consisted of the creation of 1.0 acre of riparian habitat, 1.06 acres of

floodplain wetland habitat, and approximately 1,000 linear feet of stream channel, widening the channel at the bend. Mitigation site construction was completed in October 2012, and native riparian and wetland plants were installed in January 2013.[8]

The Reach 1 right of way varies with Valley Water only owning a small portion along the VTA mitigation site. The VTA and City of San Jose own the other portions along the upper reach while the Flea Market developer owns the land in the lower portion of the reach. Valley Water is currently working with the developer to receive a dedication of approximately 17 acres of riparian corridor land located along Upper Penitencia Creek and Coyote Creek at the site.


**Figure 2-4. Reach 1: Coyote Creek Confluence to King Rd**

[8] H.T. Harvey & Associates, & Balance Hydrologics (2017). *Upper Penitencia Creek Improvement Project Year 4 (2016) Monitoring Report (Project 3518-03).*


**Figure 2-5. Reach 1 Flea Market entrance crossing (approx. Sta. 10+00), looking D/S.**


**Figure 2-6. Reach 1 BART/VTA mitigation site (approx. Sta. 25+00).**

### **2.2.2** Reach 2: King Road to Jackson Avenue, Sta. 35+50 to 90+50

As can be seen in Figure 2-7, Upper Penitencia Creek flows under Mabury Road at two locations: the westerly/downstream crossing (Sta. 57+50) and the easterly/upstream crossing (Sta. 74+50). The King Road bridge and the two Mabury Road bridges are prone to sediment deposition and are an issue with the City of San Jose. The majority of the riparian corridor is owned by the City of San Jose with a Valley Water flood protection easement throughout the Mabury Bypass.

The Mabury Road stream gage and stream diversion to the Mabury Pond is approximately located 100-feet downstream of the east Mabury Road bridge (Sta. 73+00). The Mabury Diversion is mainly used to divert waters to the Overfelt Gardens Ponds for recreational purposes as well as groundwater recharge. This reach is within the confined zone which means percolation only impacts the shallow aquifer and has little value for the deep aquifer.

In most of reach 2 and a portion of reach 3, There is a wide swath of natural land (150- to 300-ft wide) adjacent to the creek on the northside that is informally referred to as the Mabury Bypass and is referred to as the Mabury Bypass (or Reach 2a) in this document. Even though the Mabury Bypass was not intentionally built as a bypass, it works as one by carrying higher flows spilling into it from the main channel. Just upstream of Jackson Avenue (in Reach 3), flow can bifurcate under the Jackson Avenue bridge during high flow events bringing overflow from the main channel. Separating the main channel from the Mabury Bypass is a farm berm built in the late 1800s that was not meant for flood protection purposes. In the past, this berm has blown out in Reach 2 and a lateral weir structure was built just U/S to protect the blow out area and incidentally carry flows to the Mabury Bypass. Bypassed flows return to the main channel approximately 400 feet upstream of King Road.

The lower portion of the reach, from King Road up to the westerly Mabury Rd Crossing, is a small natural channel with a width of 40 feet and depth of 6 feet, approximately. It is bounded by the Mabury Bypass on the north and the Penitencia Creek trail on the south. Residential properties and a San Jose Water Company property lay just south of the trail.

The mid portion of the reach, between the two Mabury Rd crossings, has farm levees that were built before the urbanization of the area and are not in good condition for flood control purposes. This portion of the creek is also prone to sediment deposition issues, further reducing the capacity of the already low-capacity channel. The channel between the Mabury crossings is more of an engineered trapezoidal channel approximately 37 feet wide by 8 feet deep, as shown in Figure 2-8. Portions of the reach have sacked concrete rip rap for erosion protection.

The upper portion of the reach, from the easterly Mabury Rd crossing up to Jackson Avenue, also has farm levees bounding the creek. The levees are not in good condition with the north side failing at one location during a 2017 storm event (the breach was repaired in 2018). The creek is an aggrading shallow, natural channel with sediment deposition issues, many trees, and

not a lot of underbrush (see figure 2-9). The width varies from 30 to 45 feet, but the depth is only about 5 feet through much of the section.


**Figure 2-7. Reach 2: King Rd to Jackson Ave**


**Figure 2-8. Reach 2 Mabury meander D/S of Educational Park Drive (approx. Sta. 63+00), looking upstream.**


**Figure 2-9. Reach 2 D/S of Jackson Avenue crossing (approx. Sta. 90+00)**

### **2.2.3** Reach 3: Jackson Avenue to Capitol Avenue, Sta. 90+50 to 119+00

Reach 3 extends from the Jackson Avenue to Capitol Avenue, crossing under Interstate 680 at mid-reach. The segment of creek in the vicinity of Interstate-680 (I-680) has a relatively low gradient and is an aggrading (sediment accumulating) reach (see Figure 2-13). This results in the formation of a "critical riffle" at the I-680 Bridge, possibly impeding fish passage during low flows. Sediment removal has been done in the past to clear out fish passage blockages. To the north of the creek, an approximately 150-foot-wide swath of public-owned property extends the length of Reach 3, providing potential opportunities for channel widening and expansion of the floodplain. The majority of the reach is owned by Valley Water, with just a portion downstream of Capitol Avenue owned by the County of Santa Clara. The Penitencia Creek trail travels the length of the reach and passes under I-680 on the southside of the creek.

Upper Penitencia Creek flows under Jackson Avenue through an arched CMP culvert during most flow conditions. High flows may overtop the north bank of the creek just upstream of the culvert and flow through the Jackson Avenue bridge undercrossing (Figure 2-11) into the Mabury Bypass within Reach 2.

Between Jackson Avenue and I-680 lies the approximate boundary of the groundwater recharge zone (as shown in figure 2-10), where land east of this boundary is within the unconfined zone and land west of the boundary is within the confined zone. Infiltrated water can reach the water supply aquifer in the unconfined zone whereas in the confined zone the infiltrated water cannot reach the aquifer due to a protective clay layer.


**Figure 2-10. Reach 3 – Jackson Ave to Capitol Ave**

**Figure 2-11. Reach 3 Jackson Ave Mabury Bypass Culverts (Looking D/S)**

**Figure 2-12. Reach 3 looking upstream at the I-680 bridge (approx. Sta. 105+00).**

**Figure 2-13. Reach 3; 500 feet upstream of I-680 (approx. Sta. 113+00), looking upstream.**

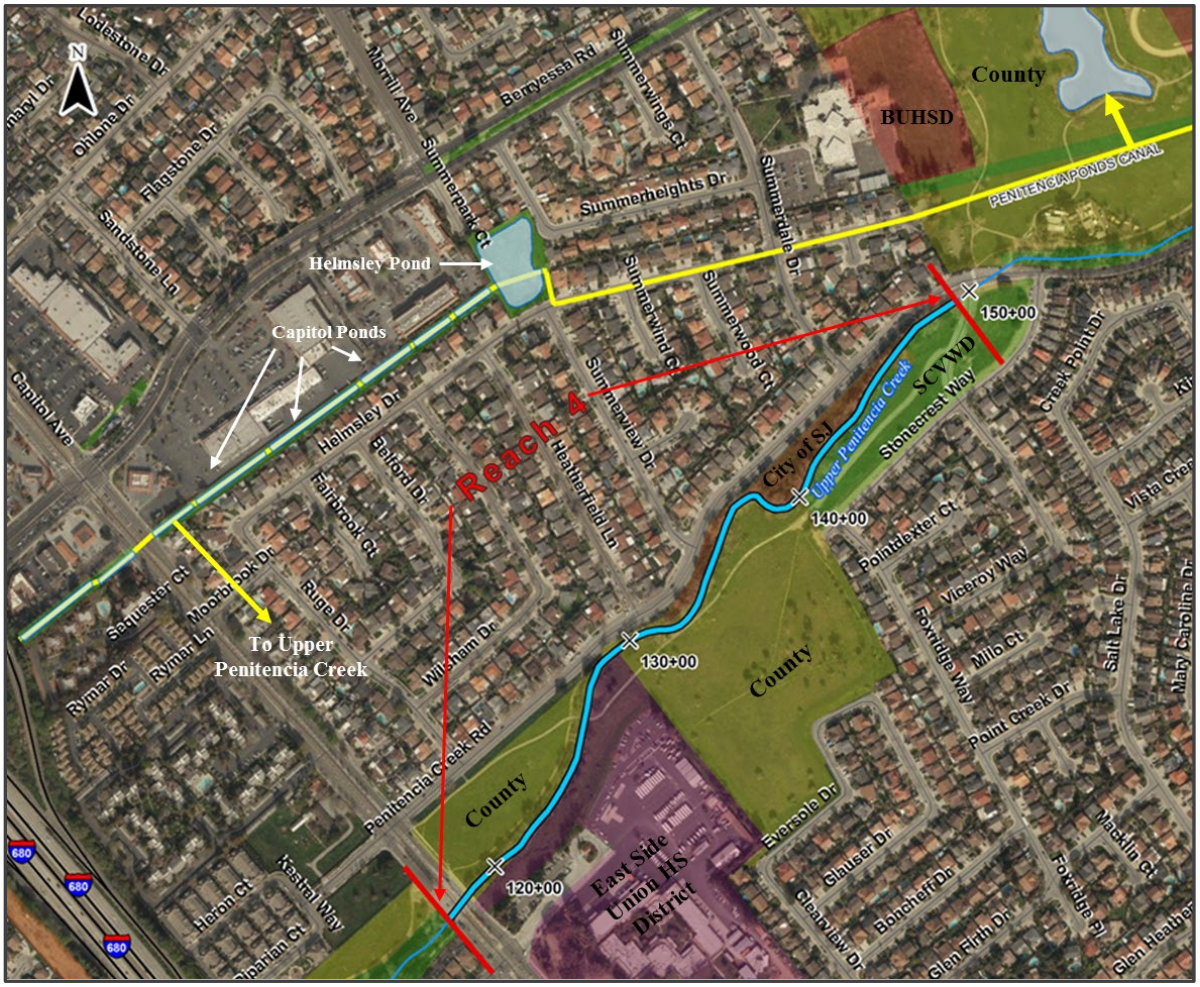



**Figure 2-14. Reach 4: Capitol Ave to Penitencia Creek Rd**

**2.2.4** Reach 4: Capitol Avenue to Penitencia Creek Road (near Viceroy Way), Sta. 119+00 to 149+50

As shown in Figure 2-14, Reach 4 extends from the Capitol Avenue bridge upstream to the Penitencia Creek Road crossing. Open space lands owned by Valley Water, County of Santa Clara (as part of the Penitencia Creek Park chain), and the East Side Union High School District are adjacent to Upper Penitencia Creek along the entire length of this reach. Penitencia Creek trail runs adjacent to the riparian corridor and crosses the creek via a pedestrian bridge located approximately 800-feet upstream of Capitol Avenue. Figure 2-15 is a view of the large County property, looking downstream from station 140+00. This area has the potential to be used as both a recreational and flood protection facility.

The Penitencia Ponds Canal, which delivers imported water from the South Bay Aqueduct to various ponds throughout the system, runs underground from Piedmont Road to the Helmsley Groundwater Recharge Pond, north of Reach 4. This water then overflows into the Capitol Ponds as shown in Figure 2-14. A turnout pipe from the Capitol Ponds may release imported water to Upper Penitencia Creek but is rarely used.

The creek through Reach 4 is a natural meandering channel with the width varying 40 to 70 feet and the depth 6 to 10 feet. The creek banks are vegetated with native trees such as sycamores and oaks. There are also native trees scattered through some of the open spaces. In addition to the pedestrian bridge mentioned above, there is a 300-foot-long culvert that goes under Penitencia Creek Road and Viceroy Way at the U/S end of the reach. Valley Water has an agreement with the City of San Jose that allows for the removal of Viceroy Way (2-lane road on Valley Water property) to provide for flood protection (See Appendix E).

**Figure 2-15. Reach 4, looking downstream towards large County property and trail (Creek is on the right side)**

**2.2.5** Reach 5: Sta. Upper Penitencia Creek Road (near Viceroy Way) to Piedmont Road, 149+50 to 172+50

Reach 5, as shown in Figure 2-16, extends from the Penitencia Creek Road culvert at Viceroy Way to Piedmont Road and is located between Penitencia Creek Road to the south and the Penitencia Creek County Park to the north. Several structures, including the Wildlife Center of Silicon Valley and Penitencia Creek trail, are located directly adjacent to the creek within the park property. The Penitencia Ponds Canal runs underground through the park and may release imported water into the Penitencia Creek Park Pond for recreational purposes as needed. A small pedestrian crossing (constricting box culvert) is located approximately 1,000 feet downstream of Piedmont Road at Sta. 165+00.

The creek is a natural channel throughout the reach with the depth varying from 7 to 9 feet. Figure 2-17 is what the channel typically looks like. The majority of the reach is 40 to 60 feet wide, but it does constrict to 25 feet at the pedestrian crossing culvert. The majority of the reach is on County land with a small stretch upstream of the Penitencia Creek Road culvert on Valley Water land. The County Park has the potential of being used for both recreational and flood protection purposes.


**Figure 2-16. Reach 5: Penitencia Creek Road to Piedmont Road**


**Figure 2-17. Reach 5 at Piedmont Road, looking D/S**

### 2.2.6 Reach 6: Piedmont Road to Noble Avenue, Sta. 172+50 to 200+50

As shown in Figure 2-18, Reach 6 extends from Piedmont Road to Noble Avenue and is located adjacent to Robert Gross Groundwater Percolation Ponds (Bob Gross Ponds) and the Piedmont Ponds. Penitencia Creek Road and trail run adjacent to the reach on the southside. Most of Reach 6 is on either Valley Water fee or easement. A small strip of land adjacent to Penitencia Creek Road upstream of the Piedmont Road crossing is owned by the Berryessa Union School District.

The Noble Diversion structure, located approximately 300-feet upstream of the Noble Avenue bridge and Reach 6 boundary, was installed to allow flows from Upper Penitencia Creek to be diverted to the Bob Gross Ponds via the Penitencia Ponds Canal. The diversion screen and associated fish ladder are silted in and no longer functional. The Penitencia Ponds Canal is an open vegetated swale from the Noble Diversion structure down into Pond 1c, which is a sediment settling basin. However, since the Noble Diversion is no longer functional, the canal and Pond 1c are not currently being used for groundwater recharge purposes.

The Bob Gross Ponds currently receive imported water from the State Water Project via the South Bay Aqueduct, which is released directly into Pond 1. Once Pond 1 is filled, it overflows into Pond 1c, and then successively into Ponds 2 and 3. If Pond 3 fills to capacity, it may overflow directly into Upper Penitencia Creek at Sta. 184+50. Pond overflow water is unscreened and may introduce warmer, nutrient rich surface water into the creek. South Bay Aqueduct water can also be released directly into Upper Penitencia Creek further upstream adjacent to Pond 1c (approx. Sta. 198+00).

Imported water from Pond 3 may also overflow into the Piedmont Percolation Ponds, which run parallel to Upper Penitencia Creek from Pond 3 to Piedmont Road. At the downstream-most pond (Piedmont Pond 4), imported water may either overflow into Upper Penitencia Creek or continue on in the Penitencia Ponds Canal which flows into an underground pipe immediately east of Piedmont Road.

The creek is a natural channel through this reach with a small, unused bridge crossing located approximately 1,200 feet downstream of Noble Avenue at approximate Sta. 188+00. Channel widths vary between 40 to 100 feet with narrow segments upstream of the Piedmont Road crossing and downstream of the Noble Avenue crossing. The depths vary mostly 6 to 10 feet, but there is a low point along Penitencia Creek Road just downstream of the Noble Avenue crossing, that is less than 5 feet. See figure 2-19 for a representative photo.


**Figure 2-18. Reach 6 Piedmont Rd to Noble Ave**


**Figure 2-19. Reach 6, 1,800 feet U/S of Piedmont Road (approx. Sta. 191+00), looking D/S.**

### **2.2.7** Reach 7: Noble Avenue to Dorel Drive, Sta. 200+50 to 220+00

Figure 2-20 shows Reach 7 which extends from Noble Avenue to Dorel Drive, the upstream boundary of the project area. It is essentially the beginning of the urbanized portion of Upper Penitencia Creek where the stream exits the steep canyons of Alum Rock Park. The Noble Diversion structure, located approximately 300-feet upstream of the Noble Avenue bridge, was installed to allow flows from Upper Penitencia Creek to be diverted to the Robert Gross Percolation Ponds via the Penitencia Ponds Canal. Valley Water has a water right permit from 1946 which allows up to 3,500 acre-feet to be diverted for water supply purposes. The diversion screen and associated fish ladder are silted in and no longer functional. The City of San Jose recently (2017) completed the Penitencia Creek trail on the north side of Penitencia Creek Road, adjacent to the creek, which extends from Noble Avenue to Dorel Drive.

The creek is a natural channel throughout most of the reach, with the Noble concrete structure being the only man-made portion (see Figure 2-21). Most of the reach is on Valley Water or City of San Jose property with part of the upper reach owned by the San Jose Water Company. The channel varies from 40 to 100 feet wide and 6 to 12 feet deep. See Figure 2-22 for a typical photo.

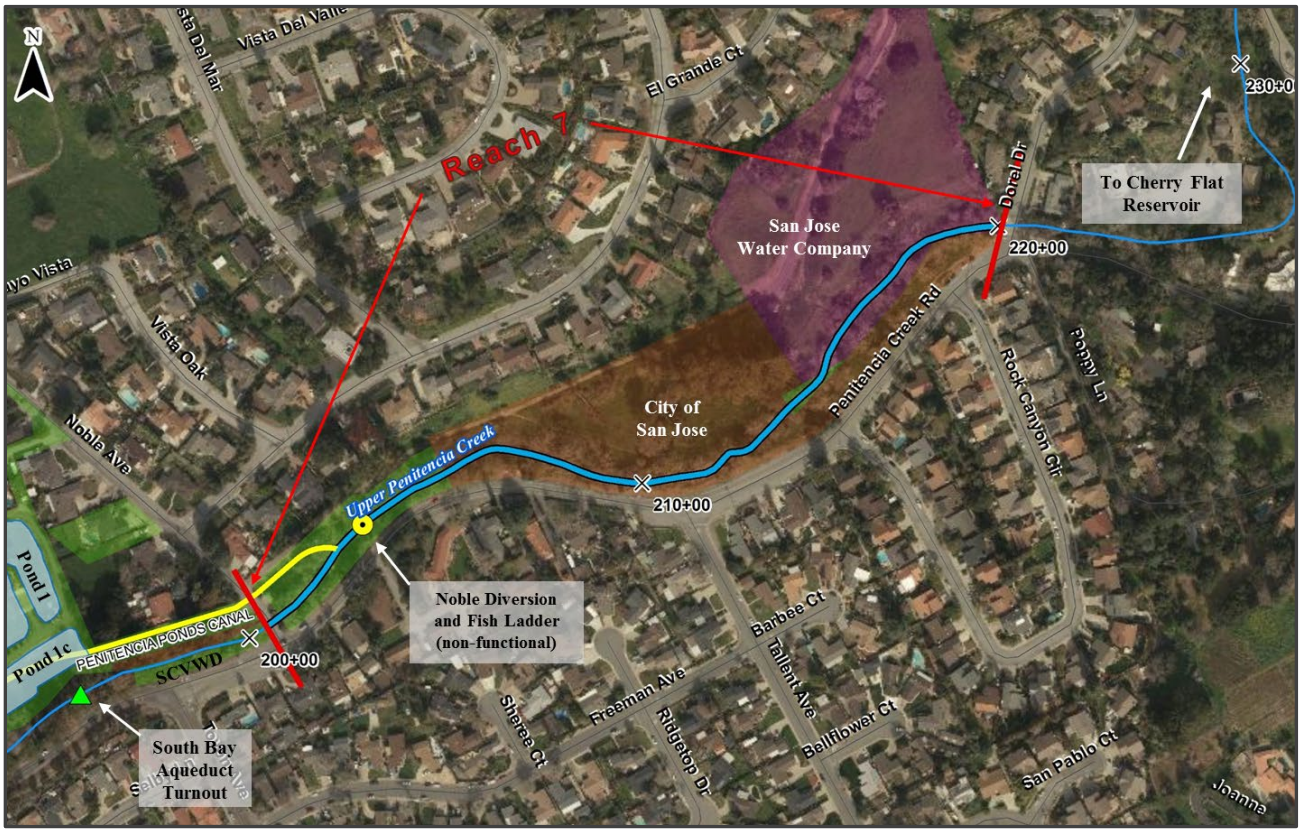



**Figure 2-20. Reach 7: Noble Ave to Dorel Dr**


**Figure 2-21. Reach 7 at Noble Diversion, looking downstream (Sta 204+25).**

**Figure 2-22. Reach 7, Looking D/S from Dorel Drive.**

## 2.3 **Hydrology**

The recurrence interval of a storm is not indicative of the amount of time that will lapse between an event, but rather a probabilistic chance of the event occurring within any given year. For an example, a 100-yr storm event is not limited to once every 100 years. A storm event of this magnitude may occur in consecutive years, or even more than once within the same year. FEMA has used this event as the standard boundary for determining areas in which homeowners must purchase flood insurance under the National Flood Insurance Program. The 100-year flood is defined as a flood that has a 1% probability of occurrence in any given year.

The NRCS first performed a hydrology study in 1990 as part of the planning for the Upper Penitencia Creek flood protection project. Since then, the hydrology has been updated several times. In 2001, USACE completed a hydrology study for the Upper Penitencia Creek project. They updated that study in 2004 with additional stream gage and rainfall data. In 2015 Valley Water updated the hydrology study for the whole Coyote watershed with a HEC-HMS model. This model developed 10- and 100-year hydrographs for the Upper Penitencia watershed.[9] The hydrology data for Upper Penitencia Creek is presented in Table 2-3 with the catch points mapped in Figure 2-23.

**Table 2-3. Upper Penitencia Creek Hydrology Data**

| **Location** | **Catch Point** | **Basin Area (sq. mi.)** | **100 YR (cfs)** | **10 YR (cfs)** |
|---|---|---|---|---|
| Arroyo Aguague U/S Upper Penitencia | 1 | 13.1 | 2,800 | 1,100 |
| Upper Pen U/S Arroyo Aguague | 2 | 6.1 | 750 | 200 |
| Upper Pen D/S Arroyo Aguague | 3 | 19.2 | 3,500 | 1,300 |
| Upper Pen @ Dorel Dr. | 4 | 21.9 | 3,750 | 1,400 |
| Upper Pen @ Piedmont Rd. | 5 | 22.5 | 3,800 | 1,450 |
| Upper Pen @ I-680 | 6 | 22.6 | 3,800 | 1,450 |
| Upper Pen U/S Coyote | 7 | 23.8 | 3,970 | 1,475 |

In order to conduct a hydraulic analysis on a full range of flood scenarios, the data from the hydrology study was used to calculate hydrographs for a full range of storm events: 2.33-, 5-, 10-, 25-, 50-, 100-, 200-, and 500-year. The following table provides the full range of peak flows through the project reach:

**Table 2-4. Upper Penitencia Creek Design Peak Flows**

| Location | Reach | Station | 43% (2.3 year) | 20% (5 year) | 10% (10 year) | 4% (25 year) | 2% (50 year) | 1% (100 year) | 0.5% (200 year) | 0.02% (500 year) |
|---|---|---|---|---|---|---|---|---|---|---|
| Dorel Dr. | 7 | 209+25 | 370 | 860 | 1,410 | 2,250 | 2,960 | 3,760 | 4,520 | 5,620 |
| Piedmont Rd. | 5 | 172+25 | 380 | 890 | 1,440 | 2,290 | 3,000 | 3,800 | 4,560 | 5,650 |
| I-680 | 3 | 112+00 | 390 | 890 | 1,440 | 2,290 | 3,000 | 3,790 | 4,550 | 5,630 |

[9] Xu, J., PE; Santa Clara Valley Water District (2015). *Coyote Creek Hydrology Study.*

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| U/S Coyote | 1 | 0+90 | 390 | 900 | 1,470 | 2,360 | 3,120 | 3,970 | 4,780 | 5,960 |

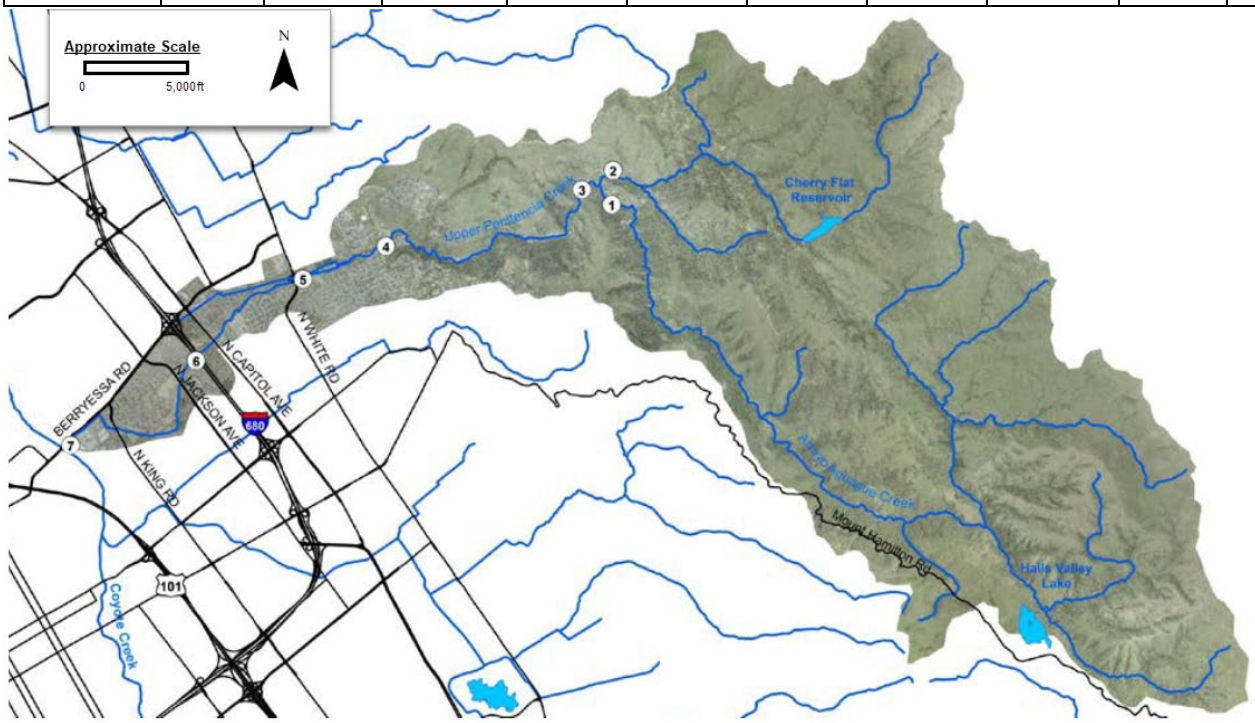



**Figure 2-23. Upper Penitencia Creek Hydrology Catch Points**

## 2.4 **Water Supply and Groundwater**

*Groundwater Basin Description*

The Santa Clara Subbasin is a groundwater aquifer which covers a surface area of 297 square miles and forms a northwest-trending, elongated valley bounded by the Santa Cruz Mountains to the west and the Diablo Range to the east. The Santa Clara Subbasin is further divided into two management areas: the Santa Clara Plain in northern Santa Clara County and the Coyote Valley from south of the Coyote Narrows. The project area is located within the Santa Clara Plain management area of the Santa Clara Subbasin. Approximately half of Upper Penitencia Creek within the project area, from Dorel Drive to about I-680, flows in the unconfined zone of the Santa Clara Plain management area, where the soils and geology are conducive to percolation, allowing for groundwater recharge via in-channel percolation and off-channel ponds. The portion of the creek from about I-680 to the Coyote Creek confluence is in the confined zone where percolation reaches the shallow aquifer but, in most part, does not make an impact on the deep aquifer. This is due to the thick, clay aquitard making this area of the Santa Clara Plain a confined aquifer. The percolation of surface water in the Santa Clara Plain recharge area replenishes unconfined groundwater within the recharge area and contributes to the recharge of the aquifer in the confined area of the Santa Clara Plain through subsurface flow. It serves as an

extensive conveyance network, allowing water to move from the recharge area to individual groundwater wells.

Valley Water's managed recharge program uses both runoff captured in local reservoirs and imported water delivered by the raw water conveyance system to recharge the basin. The Penitencia Recharge System is a small system predominately served by imported water from the State Water Project, although local water from the Upper Penitencia Creek watershed also contributes to in-stream recharge in Upper Penitencia Creek and the Overfelt and Mabury ponds. The other facilities in the system, which exclusively recharge State Water Project water, include the Dr. Robert W. Gross, Piedmont, Helmsley, and Capitol ponds. Recharge operations have been conducted in this system since 1934; the system recharges the Santa Clara Plain with a capacity of about 7,000 acre-ft (AF) per year (see Table 2-5).[10]

**Table 2-5. Penitencia Recharge System Capacity**

| Facility | Annual Recharge Capacity (AF)* |
|---|---|
| In-Stream Recharge (Creeks) | |
| Upper Penitencia Creek | 2,200 |
| Off-Stream Recharge (Ponds) | |
| Penitencia (Gross) Ponds, Piedmont, City Park Pond, Helmsley, Mabury, County Park Pond, Capitol, Overfelt. | 4,600 |
| **Recharge System Total** | **6,800** |

* The annual recharge capacity shown assumes water is available all year and that ponds are in normal operational condition.

There are approximately 22 wells within 0.5 miles of the Upper Penitencia Creek project reach. These wells are used to measure depth to first groundwater and groundwater quality. Groundwater monitoring wells at the site are screened in the deeper aquifer materials, and the groundwater levels in these wells reflect the pressure of groundwater in the lower aquifer zone rather than the shallow unconfined aquifer. Groundwater in the Santa Clara Plain is typically of very good quality, with infrequent detections of parameters (e.g., metals, major ions, and nutrients) above health-based Maximum Contaminant Levels. Although some organic chemicals are detected in the Santa Clara Plain, detections are infrequent and are typically low concentrations.

## 2.5 **Geology**

The geology of the project vicinity was described as follows in the 1985 Upper Penitencia Creek Floodplain Management Study conducted by NRCS:

[10] Santa Clara Valley Water District (2021). *Groundwater Management Plan*.

Soils in the foothills above Dorel Avenue consist of residual soils weathered from rock and include the moderately well-drained clay loam soils of the Altamont-Azule association and the well-drained loam soils of the Los Gatos-Gaviota-Vallecitos association. Three groups of soils occur on the urbanized areas below Dorel Avenue. The Yolo loam and Garretson gravelly loam are well drained soils on alluvial plains and fans. These soils occupy about 5,200 acres with the Garretson restricted to stream benches along channels. The soils have slopes of 0% to 5%. The Cropley clay and Yolo silty clay loam are well-drained soils on alluvial plains on the edges of alluvial fans. These soils have slopes of 0% to 2% and occur on about 2,600 acres. The third group of soils lies in a north-south band east of Coyote Creek. It is comprised of Campbell silty clay and silty clay loam which are somewhat poorly drained soils on low valley bottoms and alluvial plains. They occupy about 2,300 acres and their slopes are 0% to 2%.

The bedrock in the hills of the upper watershed consists primarily of sandstones, shales, conglomerates, and limestones of the Berryessa, Monterey, and Briones formations. These are mostly folded metamorphosed units of Cretaceous and Tertiary age. Some rocks of the Franciscan complex occur in the eastern half of the upper watershed. Numerous old and new landslide deposits are found in the hills and along the creek.[11]

The Hayward and Calaveras faults are major potentially active earthquake faults that cross the Penitencia Creek Watershed. Other potentially active faults are the Berryessa, Crosley, Quimby, Clayton, and Arroyo Aguague faults. Many landslides have occurred on the hills along the Calaveras faults. These hills have a high to very high susceptibility for landslides and very high erosion potential. Thus, these hillsides as well as the terrain east of the Calaveras fault are sources for large influx of sediments to the creek during the wet winter months. To the west of the hills lies a broad, gently sloping alluvial plane.

## 2.6 **Biological Resources**

*Vegetation Types*

In the early 1800s, the upper reaches of the project area supported an abundance of California sycamore trees, which can be indicative of intermittent hydrology, changing to an oak-dominated canopy near Reach 2 (Mabury Road), then to willow groves and freshwater marsh adjacent to Coyote Creek (see Figure 2-24). Hydrologic connectivity between Upper Penitencia Creek and what is now Lower Penitencia Creek, and ultimately Coyote Creek, occurred only infrequently during very wet years. These historical habitats supported wildlife (both aquatic and terrestrial) connectivity from the upper reaches, down through the marsh lands and Lower Penitencia Creek, and eventually to south San Francisco Bay.

[11] National Resources Conservation Services (1985).

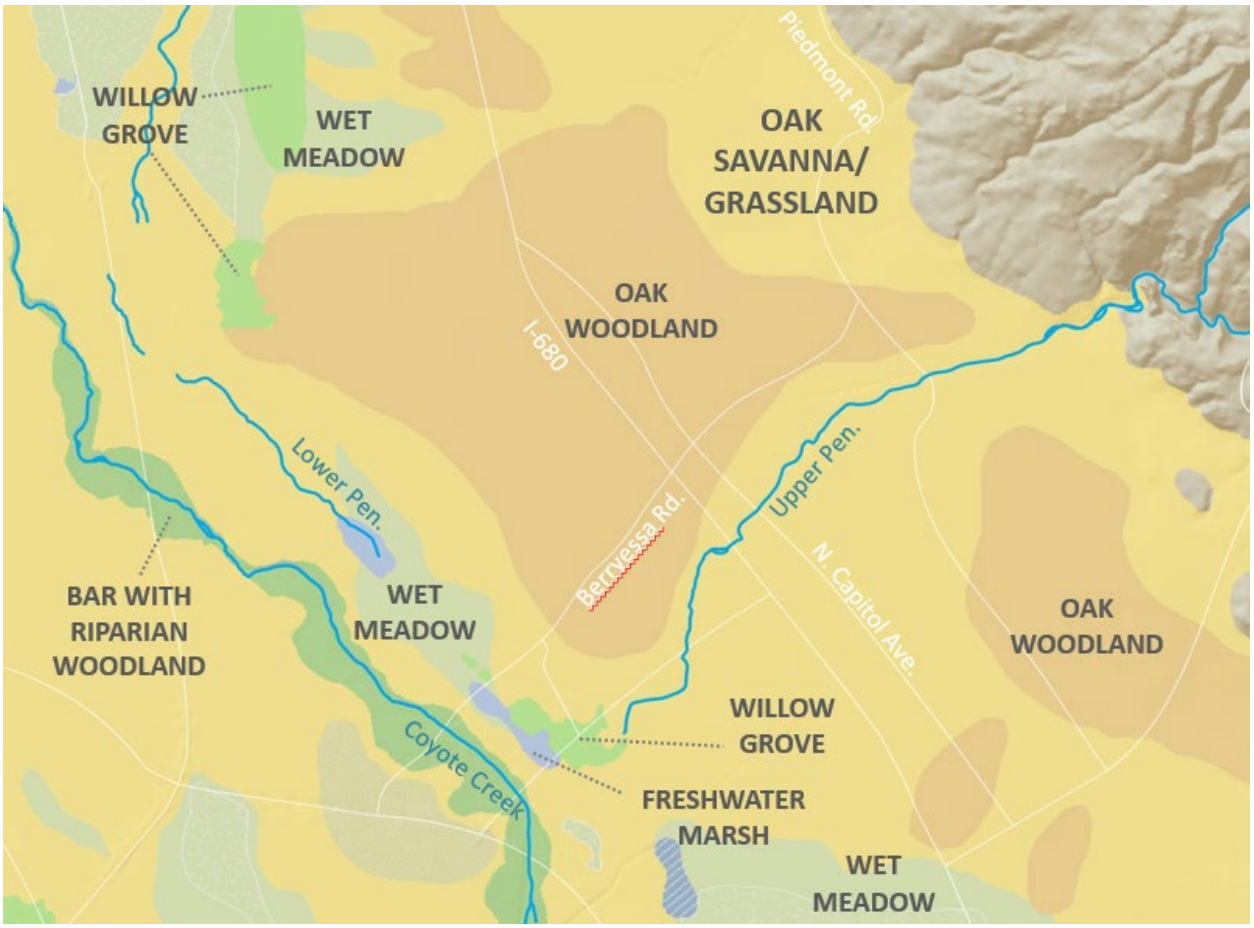



**Figure 2-24: Historical Habitats in the Project area (SFEI 2012)**

Today, the riparian corridor of Upper Penitencia Creek is one of the highest quality remaining habitat areas in the Santa Clara Valley. Most of the riparian vegetation along Upper Penitencia Creek is predominately cottonwood- and/or red willow-dominated riparian forest, with box elder, coast live oak, and western sycamore as other commonly occurring native trees, and walnut and eucalyptus as common nonnative trees.[12] These water-dependent trees are likely sustained by the relatively high groundwater table in many of the reaches and the release of imported water which augments dry season flows. Beginning in Reach 2, coast live oak, blue elderberry, toyon, and other more xeric trees and shrubs are common in the riparian corridor and along the riparian/upland boundary. These habitats have high value, particularly in semi-arid regions such as Santa Clara County, due to their limited extent, presence of water, and diverse food/prey and habitat structure resources, and, as a result are used by an abundant and diverse assemblage of wildlife species. Riparian vegetation also filters sediment and other pollutants from runoff before it enters the creek, reduces water temperatures by shading the creek channel, provides food sources for the aquatic food web, and enhances recreational experiences by shading trails and improving aesthetics. Riparian forest is a priority for protection and restoration in California due

[12] San Francisco Estuary Institute (2010). *Historical Vegetation and Drainage Patterns of Western Santa Clara Valley.*

to its importance in enhancing fish habitat in the adjacent stream. At the state level, riparian plant communities are considered a sensitive natural community because of habitat loss and their value to a diverse community of plant and wildlife species.

In Reaches 4–7, portions of the riparian corridor are dominated by western sycamore. Western sycamore trees and sycamore alluvial woodland, one of its associated vegetation types, are increasingly rare in California due to changes in the flow and geomorphic patterns necessary for its successful establishment, widespread hybridization with nonnative London plane tree, and pathogens such as sycamore anthracnose.[13] Although western sycamore is not listed as Endangered, Threatened, or Rare by either California Department of Fish and Wildlife (CDFW) or the U.S. Fish and Wildlife Service (USFWS), non-hybridized sycamore trees have substantial biological value and sycamore alluvial woodland is considered a sensitive natural community by CDFW (2018) and is a restoration priority for the Santa Clara Valley Habitat Agency (ICF International 2012). Preservation of the sycamore trees growing along the creek will be necessary to maintain the viability of this important habitat type and avoid significant mitigation at substantial costs.

Relatively small patches of ruderal grassland and unvegetated area are present along the creek (e.g., in Reaches 2, 3, and 5) and many of the Project areas are unvegetated or consist of ruderal grassland or ornamental plantings/parkland. These areas have relatively low biological resource value and offer opportunities for riparian and/or oak woodland habitat creation and enhancement.

Nonnative invasive eucalyptus trees are commonly found in the riparian corridor of Upper Penitencia Creek. In particular, there are large stands of eucalyptus in Reach 6. Eucalyptus can spread rapidly and densely, displace native vegetation, increase fire and hazard tree risks, and offer lower quality habitat for wildlife compared with native trees. Valley Water's Vegetation Field Operations treats nonnative invasive herbs, shrubs, and small trees on Valley Water property as mitigation for the SMP but does not remove large trees such as established eucalyptus. Outside of Valley Water property additional nonnative invasive species, such as tree-of-heaven, giant reed, weeping willow, fan palm, and black locust, are common.

### ***Wildlife and Special Status Species***[14]

The vegetation types along Upper Penitencia Creek create a nearly unbroken riparian corridor between the Diablo Range and Coyote Creek, which provides food, water, migration and dispersal corridors, and nesting and cover habitat for numerous wildlife species (Grenfell 1988; VHP 2012) and is unusual for such an urbanized area. There are relatively few barriers (such as I-680) and degraded areas that fragment the riparian corridor and may impede wildlife movement, although some reaches of the creek are very narrow (less than 100 feet wide). In

[13] San Francisco Estuary Institute & H.T. Harvey & Associates (2017). *Sycamore Alluvial Woodland – Habitat Mapping and Regeneration Study.* Prepared for the California Department of Fish and Wildlife Local Assistance Grant Program.
[14] ICF International (2012). Valley Habitat Plan. Available at: https://scv-habitatagency.org/178/Santa-Clara-Valley-Habitat-Plan

addition, despite changes in dry season hydrology and surrounding land use, Upper Penitencia Creek retains the hydrologic and geomorphologic conditions necessary to support many native riparian tree species. This is due to the relatively undammed and undeveloped watershed upstream of the valley floor and relatively high coarse sediment supply.

Habitat in the Upper Penitencia Creek watershed could support several special-status species, as shown in Table 2.6 (note: the table is not a complete list), that are protected under federal and/or state laws. Many of these species are covered under the Santa Clara Valley Habitat Plan (VHP), but the presence of suitable habitat in the Project area and their life-history timing will still have important ramifications and what and when Project activities may occur.

**Table 2-6. Special Status Species with Potential to Occur in the Project Vicinity**

| Common Name | Scientific Name | Status | VHP Covered Species |
|---|---|---|---|
| Central California Coast steelhead trout | *Onchorhynchus mykiss* | FT | |
| Pacific lamprey | *Entosphenus tridentatus* | SSC | |
| California red-legged frog | *Rana draytonii* | FT, SSC | ✓ |
| Foothill yellow-legged frog | *Rana boylii* | Candidate ST, SSC | ✓ |
| California tiger salamander | *Ambystoma californiense* | FT, ST, SSC | ✓ |
| Western pond turtle | *Actinemys* (=*Emys*) *marmorata* | SSC | ✓ |
| Tricolored blackbird | *Agelaius tricolor* | Candidate SE, SSC | ✓ |
| Fragrant fritillary | *Fritillaria lilacea* | CRPR:1B | ✓ |
| Hall's bush mallow | *Malacothamnus hallii* | CRPR:1B | |

Special Status Animals
SE State listed as Endangered
ST State listed as Threatened
FE Federally listed as Endangered
FT Federally listed as Threatened
SSC CDFW Species of Special Concern
California Rare Plant Rank 1B: Rare throughout range, meets the definition of Rare or Endangered under CEQA guidelines

**Steelhead trout** in Coyote Creek and Upper Penitencia Creek belong to the Central California Coast Distinct Population Segment (CCC steelhead), which was listed as Threatened under the federal Endangered Species Act (FESA) in 1997. The National Marine Fisheries Service (NMFS) lists the improvement of steelhead freshwater habitat quantity and quality as recovery actions for CCC steelhead (NMFS 2016). Upper Penitencia Creek, including within the project area, is listed by NMFS as Critical Habitat for CCC steelhead. Maintaining or improving the ability of steelhead to migrate through the Project reaches will be an important consideration in the design and maintenance of reach-specific actions.

**California red-legged frog** is listed as Threatened under FESA and as a Species of Special Concern by the CDFW and is known to occur within the upper watershed of Upper Penitencia

Creek. USFWS-designated Critical Habitat for the species occurs approximately 0.25 miles east of the project area. The California Natural Diversity Database (CNDDB) cites multiple occurrences of California red-legged frog in the Upper Penitencia Creek watershed within Alum Rock Park approximately two miles upstream of the project area.

**Foothill yellow-legged frog** utilize aquatic habitat often found in oak woodlands for thermoregulation, foraging, and avoidance of predators. Foothill yellow-legged frog is listed as a Species of Special Concern by the CDFW and is a Candidate for listing as Threatened under the California Endangered Species Act (CESA). Foothill yellow-legged frog is reported in the CNDDB to occur within the adjacent Arroyo Hondo/Alameda Creek watershed.

**California tiger salamander** use the grassy understory of open woodlands for terrestrial aestivation or refuge and aquatic sites for breeding and use riparian forest and scrub land cover as movement habitat. California tiger salamander is listed as Threatened under both FESA and CESA and as a Species of Special Concern by the CDFW. There have been multiple CNDDB occurrences of the California tiger salamander along the upper watersheds of both Upper Penitencia Creek (above Cherry Flat Reservoir) and Arroyo Aguague and these areas have been designated Critical Habitat of this salamander by the USFWS.

**Western pond turtle** utilizes aquatic habitat for thermoregulation, foraging, and avoidance of predators. The turtle is also known to overwinter in leaf litter or soil at upland sites and uses sparsely vegetated upland sites for nesting. Western pond turtle is listed as a Species of Special Concern by the CDFW, and although the CNDDB does not list any Western Pond turtle occurrences within the Upper Penitencia Creek watershed, in-stream, pond, and upland habitat within the project area and upper watershed could support this species.

**Tricolored blackbird** is listed as a Species of Special Concern by the CDFW and is a Candidate for listing as Endangered under CESA. Tricolored blackbird could use this land cover type as breeding and year-round habitat and require pre-construction surveys to comply with the conditions outlined in the VHP.

**Fragrant fritillary** and **Hall's bush mallow** are two of the special-status plants with potential to occur in the Project vicinity. They are typically found in open, hilly grasslands or chaparral, and are both considered to be rare, threatened, or endangered in CA and elsewhere and, as such, are subject to protections under the California Environmental Quality Act (CEQA). These species are unlikely to occur in the Project reaches but are examples of plant species that may need to be surveyed for prior to construction activities and avoided or otherwise protected if present.

## 2.7 **Cultural Resources**

It is believed that Native Americans inhabited the Project area prior to Spanish colonization. The Project will require ground disturbing activities (e.g., excavation) to improve flood capacity or enhance stream function and a plan should be developed to consider tribal burial grounds and

cultural artifacts that may be found. Due to the creek side location involving excavation of natural land, it is highly possible that cultural resources will be found.

California Assembly Bill No. 52 requires tribal cultural resources must be considered under CEQA. The bill imposes requirements for tribal consultation regarding projects that may affect a tribal cultural resource and lists recommended mitigation measures. For projects that are located within an archaeologically sensitive area (e.g., where there is a concentration of archaeological sites in the project vicinity) and involves ground disturbing activities, a cultural resource survey report should be completed by a qualified archaeologist as designated by the Society of Professional Archaeologists in order to evaluate the potential for any cultural resources to occur at the project site. Valley Water should obtain a list of the California Native American tribes within the project vicinity. Tribes which are traditionally and culturally affiliated with the geographic area of the proposed project should be notified within 14 days of commencing environmental review for a project. The tribes have 30 days to send a written request for consultation on a project. If a particular tribe requests consultation in writing, Valley Water's lead tribal representative shall begin the consultation process within 30 days of the request. The purpose of the consultation is to identify tribal cultural resources, potential significant impacts, and acceptable mitigation measures. If historical or pre-historic resources are found or if there is a high potential to encounter these resources, approaches would be developed to avoid or minimize those potential impacts.

As the Project transitions from planning to design, the project team will conduct a preliminary cultural resource study to search any records and gather information on the tribes and their history in the project area. There is a high potential of discovering archaeological artifacts during construction. This could restrict or stop construction in affected areas causing significant delays and increase costs. A detailed cultural resources plan will be developed to help minimize cultural resource impacts.

## 2.8 **Hazardous Materials**

In 1999, CH2M finalized a Phase I Hazardous Material Investigation for Upper Penitencia Creek to evaluate and identify parcels along the project reach which have or may been impacted by hazardous substances. Ninety-three properties were investigated with the majority of them being labeled generally free from environmental concern. Twenty-nine of the properties required additional sampling and/or inquires in order to make an adequate assessment. A Phase II assessment was recommended to identify specific areas where either remediation will be required prior to construction or where special instructions will be required for contractors working at the locations.

In 2009, a Limited Phase I Hazardous Substance Liability Assessment (HSLA) was conducted by Northgate Environmental Management, Inc. for one site in the project area. This assessment was limited to 830 North Capitol Avenue and the surrounding creek area (approximately 3

acres). This property is owned by the Berryessa Union High School District and their offices are located adjacent to the assessment area. The assessment did not indicate the presence of Recognized Environmental Conditions but did indicate that residual pesticides may be present in shallow soils due to historical use as orchards and agricultural purposes.

The developer of the Flea Market along Reach 1 has conducted their own Environmental Site Assessment, originally in 2005 and then updated in 2018. Valley Water would update this assessment before finalizing any dedication of land from the landowner to Valley Water. Since the 1999 assessment recommended a Phase II assessment and the 2009 assessment was limited to only one site, Valley Water may wish to evaluate soil quality prior to performing any grading or subsurface excavation work.

## 2.9 **Local Drainage**

The storm drain system leading to Upper Penitencia Creek is rather small even though it is a highly urbanized area. Most of the drainage system in the surrounding area leads away from the creek, to Berryessa Creek to the north and Miguelita Creek to the South. Figure 2-25 shows the limited storm drain system flowing into Upper Penitencia Creek (Note: The "Surface" blue line is Upper Penitencia Creek). The owner of the sub-surface drainage system is the City of San Jose, and they are responsible for the operation and maintenance of the system including outfalls. Pipes with diameters greater than 24 inches are explicitly modeled in the FEMA's urban hydrology (using InfoWorks software) CTP study.

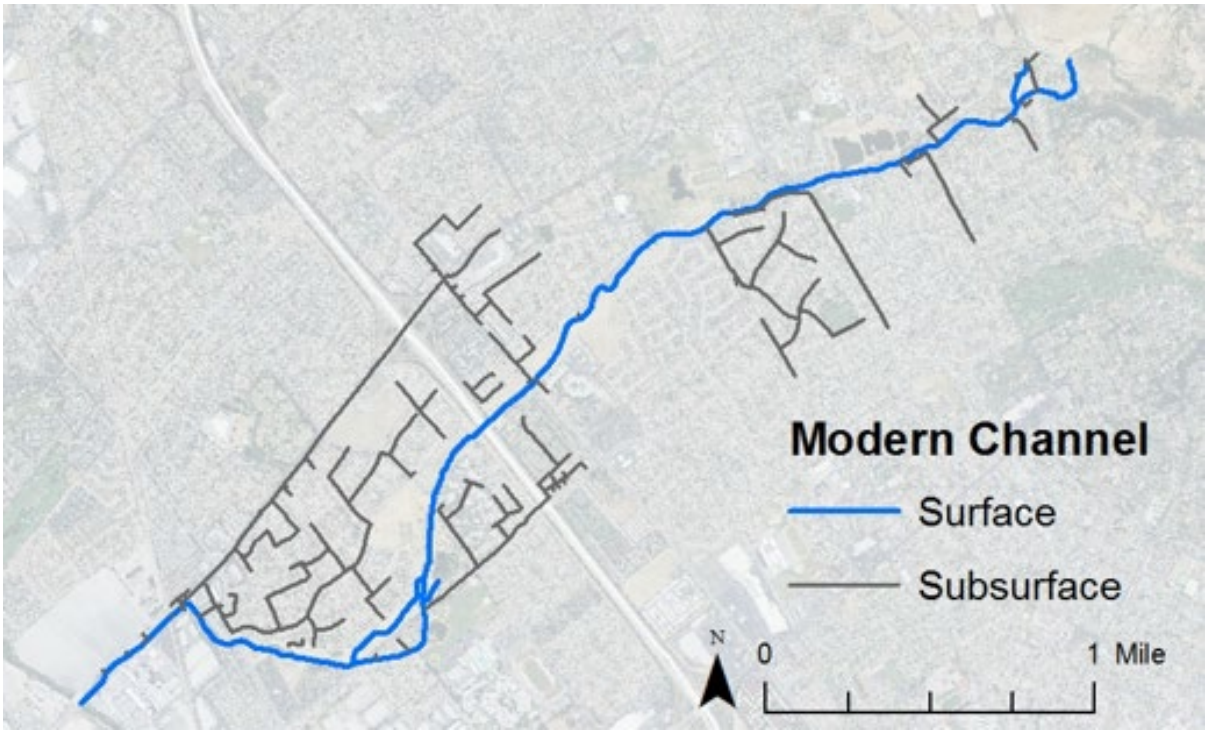



**Figure 2-25: Upper Penitencia Watershed Storm Drain System**

## 2.10 **Public/Community Settings**

Tri-Party Agreement (See Appendix E for the full agreement)

The County of Santa Clara prepared a master plan for Penitencia Creek Park, from Alum Rock Park to Coyote Creek, dated July 18, 1977, which contemplated the joint use of County, Valley Water, and City of San Jose-owned lands on and adjacent to the creek.

In July 1981, City, Valley Water, and County entered into a 25-year joint use agreement for the lands of the Upper Penitencia Creek Park chain, which generally defined the roles of each agency in developing the park chain. In 2008, the County, Valley Water, and City executed a joint use agreement (Tri-Party Agreement) for the joint use of lands along Upper Penitencia Creek, from Alum Rock Park to Coyote Creek, for flood management, water conservation, open space, and recreational purposes. The agreement was based on the 1981 agreement and extended the cooperation between agencies for a twenty-five (25) year period. The Tri-Party Agreement specifies the following responsibilities along Upper Penitencia Creek for each jurisdiction:

- County, City, and Valley Water agree to cooperate in providing such exchanges or conveyances of real property or easements as will permit the joint use of public-owned lands for parks, recreation, open space, flood management, and water conservation.
- Each jurisdiction shall submit proposed recreational improvement plans on County-, City-, or Valley Water owned land to the property owner for review and approval.
- The County and City agree to cooperate in the use of County-owned land for flood protection purposes. Valley Water agrees to cooperate in the use of Valley Water owned land along for recreational purposes.
- Valley Water shall maintain the natural and constructed channel between the tops of banks of the creek and the recharge facilities for flood control and water conservation purposes in accordance with the applicable property interests.
- Valley Water shall be guided by the plans and principles of the 1977 Master Plan in constructing aesthetically pleasing flood control improvements on Valley Water property and minimizing disturbance of the natural stream.

Parks and Trails

There are a number of parks located immediately adjacent to Upper Penitencia Creek. In addition, there is the Penitencia Creek Trail which runs along the creek through the majority of the project area (through reaches 2-7). The trail and parks information are listed in Table 2-7 below plus Figure 2-26 maps out the areas along the creek. The Penitencia Creek County Park is a natural park that includes a small county pond for aesthetic purposes. Commodore Park is a small community playground for children that is owned by the City of San Jose. The Berryessa Community Gardens is owned by the Berryessa Union School District and offers the residents of San Jose an opportunity to cultivate and harvest their own organic vegetables. Penitencia Creek Park, located along reach 5, is owned by the County of Santa Clara but managed by the City of

San Jose. It is a large natural park that includes a pond and the Berryessa Community Center. It is a multi-purpose center used for such things as classes, after school programs, and senior programs. Noble Park is located just north of the Bob Gross ponds near Reach 6, it is not directly adjacent to the creek, and it is right next to the Noble Public Library. Alum Rock is located just upstream of the project area and is one of California's oldest municipal parks. It is used for many activities such as hiking, picnicking, jogging, and bicycling.

**Table 2-7. Recreational Resources in Project Vicinity**

| Reach | Owner | Name | Area (acres) | Length (miles) |
|---|---|---|---|---|
| 2 | Santa Clara County | Penitencia Creek county park | 15 | -- |
| 2 | City of San Jose | Commodore Park | 3.2 | -- |
| 2 | Berryessa union school district | Berryessa community gardens | 9.9 | |
| 5 | Santa Clara County (Managed by City) | Penitencia Creek Park | 38 | -- |
| 6 | City of San Jose | Noble Park | 8.4 | -- |
| Upstream of Project Area | City of San Jose | Alum Rock Park | 740 | -- |
| 2-7 | City of San Jose | Penitencia Creek Trail | -- | 3 |

Schools

There are five schools in close proximity to the Project area. In addition, the East Side Union High School District offices are located along Upper Penitencia Creek in Reach 4. Table 2-8 list the schools and which school district they belong to. Plus, Figure 2-26 maps out the schools along the creek.

**Table 2-8. Schools along Project Area**

| Reach | School District | Name |
|---|---|---|
| 2 | East Side Union High School District | Independence High School |
| 4 | Berryessa Union School District | Summerdale Elementary School |
| 5 | Berryessa Union School District | Piedmont Middle School |
| 6 | Berryessa Union School District | Toyon Elementary School |
| 6 | Berryessa Union School District | Noble Elementary School |

Transportation

There are two main transportation facilities located along the project area, the Berryessa BART/VTA station and the VTA Light Rail Station. The Berryessa BART/VTA station located along Reach 1 is part of the 10-mile Berryessa Extension, the first phase of the 16-mile BART Silicon Valley Extension of the BART system. The station opened to the public in 2020 and

extends the BART line from Fremont down to north San Jose. There is a VTA Light Rail Station at the Capitol Avenue crossing over Upper Penitencia Creek in Reach 4.


**Figure 2-26: Schools, Parks, and Open Spaces along Creek Corridor**

# Chapter 3: Problem Definition

The threat of significant flooding is the primary problem identified in the study area. Areas within the City of San Jose and the City of Milpitas have the potential to be subjected to widespread flooding from Upper Penitencia Creek. Other problems include sediment deposition along the lower reaches, water quality concerns in the lower reaches, geomorphic stability issues, and lack of rights-of-way along the creek which results in minimal maintenance.

## 3.1 Creek Flooding

With the capacity to convey less than a 10-year flow event, recurrent flooding along Upper Penitencia Creek presents a long-term hazard to public safety, property values, and economic stability in the cities of San Jose and Milpitas. Since Valley Water started preparing flood reports in 1967, damaging flood events occurred in 1978, 1980, 1982, 1983, 1986, 1995, and 1998, impacting many homes, businesses, and streets. There may have been other flood events throughout the years that did not have significant impacts, such as in 2017 when the creek spilled its banks in several locations but did not cause any damages. Hydraulic models of Upper Penitencia Creek have shown that flooding would begin to occur at a ten-year flood level and identified approximately eight thousand parcels that would likely be subject to flooding in a 1% event. Also, farm levees built in the early 1900s in the lower reaches of the creek are in poor condition and could potentially exacerbate flooding during high flow events. Potential damages from a 100-year flood event are estimated at $455 million (in 2004 dollars, according to a USACE economic analysis).

### 3.1.1 Economic Damages

The following information on economic damages is from the USACE Feasibility Study and the analysis was done in 2003. This is the best information available in regard to the potential costs of damages due to flooding along Upper Penitencia Creek. The project team plans to conduct an updated analysis on economic damages due to flooding in order to come up with cost vs. benefits ratios.

The without-project equivalent annual damage reflects the damage value associated with the without-project condition over the period of analysis and under existing and future hydrology, hydraulic, and economic conditions in the study area. Essentially, equivalent annual damages are flood damages that could be expected in each year of the analysis period that have been converted to a single present worth value and then amortized over the 50 years analysis period. Table 3-1 displays the computed equivalent annual damage results by damage category. Equivalent annual damage for the Upper Penitencia Creek, assuming existing conditions, is about $30.54 million per year, of which 90% is damages to residential and industrial structures.

Figure 3-1 shows the expected damage associated with single flooding events. The expected damage for 5-, 20-, and 100-year events are about $4.8, $269, and $450 million, respectively.

**Table 3-1**
**Without-Project Equivalent Annual Damages**

| Damage Category | Equivalent Annual Damage* |
|---|---|
| Commercial Structures | $ 1,670,000 |
| Industrial Structures | $ 16,620,000 |
| Residential Structures | $ 10,484,000 |
| Public Structures | $ 74,000 |
| Automobile Damages | $ 1,012,000 |
| Emergency Costs | $ 423,000 |
| Travel Delays | $ 254,000 |
| **Total** | **$ 30,537,000** |

** October 2003 Price Level, 5.625% Discount Rate*

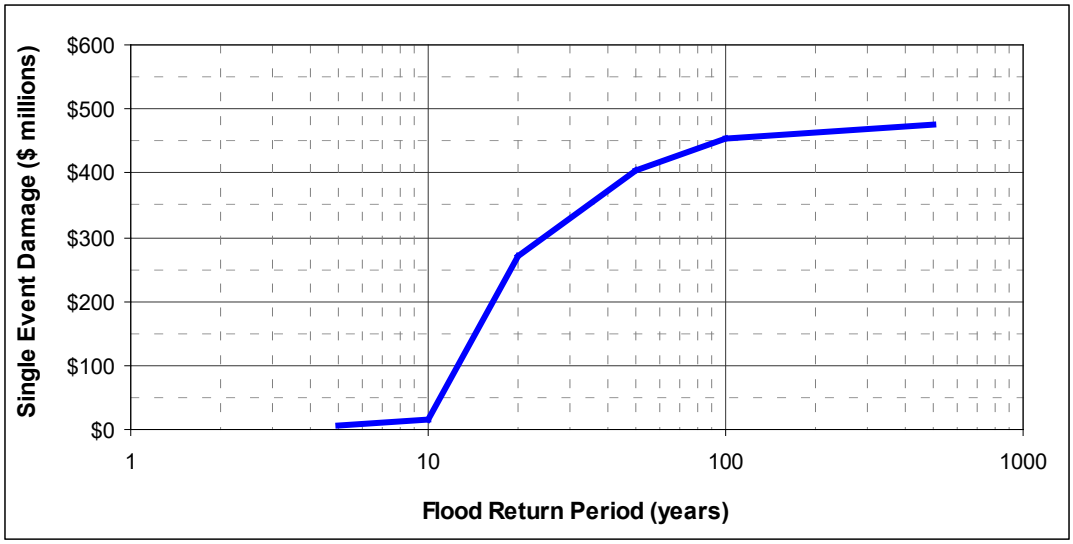



**Figure 3-1: Damage Curve for Flood Events**

### **3.1.2** History of Flooding

With the capacity to convey less than a 10-year flow event, Upper Penitencia Creek has flooded the community many times since Valley Water started documenting them in the 1950s. Damaging flood events occurred in 1955, 1958, 1967, 1978, 1980, 1982, 1983, 1986, 1995, and 1998; impacting many homes, businesses, and surface streets. In 2017, the creek spilled its banks in several locations along the Mabury bend although no damages were reported.[15] See Figure 3-2.

[15] Santa Clara Valley Water District (1952 – 2017). *Report on Flooding and Flood Related Damages in Santa Clara County.* https://aqua.valleywater.org/work-resources/flood-reports


**Figure 3-2: Historical Flooding Along Upper Penitencia Creek**

*December/January 1955/1956 Storm*

The "Christmas Storm Flood" lasted from December 1955 to January 1956. Much of the land in the Upper Penitencia Creek watershed was still agricultural so the damages were limited to farmland. Ponding of creek waters was primarily caused by inability of existing drainage facilities to handle the runoff and inundated approximately 400 acres resulting in considerable damage to fruit trees, especially apricot.

*1958*

The largest recorded flood was in 1958, at 3,730 cfs, although there is no information on the extent of flooding.

*January 1967 Storm*

The storm caused flows to overtop the existing channel in approximately eight locations. The Noble Avenue crossing became partially blocked and was overtopped by six inches of water. The private bridge downstream of Piedmont Road was overtopped causing flooding adjacent to the creek. Capitol Avenue was overtopped by a foot of water and a series of breakouts occurred along the Mabury meander causing significant flooding. Some of this overflow co-mingled with

flooding from a breakout at the King Road crossing resulting in severe inundation of the area located at the southerly corner of Berryessa and King Roads. There were a few more breakouts downstream of King Road.

*March 31 to April 13, 1982, Storm (January 1 to April 30, 1982)*

Reaches 5 - 7

There was overbanking on the south side of the creek from upstream of Noble Avenue on Penitencia Creek Road to downstream of Piedmont near Cayman Way. Toyon elementary school was evacuated on March 31st, with water reaching a maximum of about two feet deep in the streets adjacent to the creek channel. Further flooding occurred on the south side of the creek at Stonecrest Way and Viceroy Way. Water reached a maximum depth of about 2 feet in these streets as well.

Reaches 3 & 4

Just upstream of Heatherfield Lane, flood waters up to about 2 feet deep, flowed down Penitencia Creek Road to North Capitol Avenue. Downstream of I-680, there was overbanking and erosion on the north levee causing about two feet of water to flow northerly across North Jackson Avenue towards Commodore Drive and Cape Colony Drive then around Cape Horn Drive to Cape Diamond Drive. One farming area reported some damage.

Reaches 1 & 2

Downstream of North Jackson Avenue overbanking occurred in three locations along with erosion of the adjacent levees. 1) Water flowed toward Mabury Road and North Jackson Avenue on the east and toward North King Road and Mabury Road on the west. The flow in the creek divides just upstream of Mabury Road. 2) Along the main channel of the Mabury Bend there was overbanking and erosion of the levee at three locations. The west levee overbanked and eroded for approximately 25 feet downstream of the East Mabury Road crossing. Two other overbanking locations were between the east Mabury Road crossing and Educational Park Drive on the east bank for approximately 8 feet and 25 feet. Water was reported up to three feet deep in low spots on Educational Park Drive. While some water flowed down Pine Hollow Circle, most of the water flowed down Educational Park Drive to Independence High School and then southwest along Pine Hollow Circle. 3) One other overbanking and erosion of the levee occurred downstream of the confluence of the main channel with the Mabury Bypass. Water also flowed down Mabury Road, north King Road, Dobbin Drive, Lensfest Road to the railroad spurs, Nicora Avenue and Las Plumas Avenue. Water was up to about three feet deep at the WPRR tracks. It was further reported that one business of Lensfest Road had up to two feet of water within the buildings. Debris build up at the box culverts contributed to the channel overbanking.

The water ponding at the Flea Market was primarily local storm drainage and damage to a number of the businesses was reported.

*January 1983 Storm*

Upper Penitencia Creek in East San Jose experienced a peak flow at Piedmont Road on January 26 of about 1,400 cfs. This corresponds to a 15-year flood frequency. Overbanking occurred downstream of King Road, contributing to the local storm drainage ponding in the Flea Market and in the industrial area east and west of the Western Pacific Railroad and north of Mabury Road. It was reported that Mt. Green Nursery experienced flooding up to 18 inches deep. See Figure 3-4.

*February 1983 Storm - February 28th to March 4th*

Upper Penitencia overbanked in two locations during this storm, upstream and downstream of King Road. Minor flooding of fields, streets and parking areas occurred. Figure 3-3 shows how close King Road got to flooding in 1982.

*February 1986 Storm*

In the February 12-20, 1986 storm, overbanking occurred at several locations. Upstream on the south side of North King Road, upstream of Toyon Avenue, down to Piedmont Road. A peak flow of 1,080 cfs was recorded at the U.S.G.S station on Upper Penitencia Creek on February 17, corresponding to a seven-year flood frequency. There was also overbanking at Educational Park Drive and 200 feet downstream of Jackson Avenue on the north side of the creek. These overflows resulted in some ponding and the shallow flooding of one residence.

*January 9-10 1995 Storm*

The storm peaked at about 1,280 cfs which corresponds to approximately a 10-year event. The creek flooded in three locations: just downstream of the Noble Avenue crossing on the south side flooding Penitencia Creek Road near the Toyon Ave intersection, towards the north at the Pedestrian crossing near Heatherfield Lane flooding Penitencia Creek Road down to Capitol Avenue, and both sides of the creek overbanked at the King Road crossing. Flooding occurred upstream and downstream of the crossing on both the north and south sides.

*February 2-9, 1998 Storm*

From Valley Water's *Report on Flooding and Flood Related Damages in Santa Clara County February 2–9, 1998*: Upper Penitencia Creek overbanked at several locations between King Road and Jackson Avenue flooding the park along Cape Horn Drive and several hundred feet along King Road. The creek also overbanked along Penitencia Creek Road flooding the streets around Toyon Elementary School and strewing woody debris.

January and February 2017 Storms (SCVWD, Flooding Report January and February, Nov 2017)

There were two significant storms during 2017, the first was January 6th through the 9th and the second, the President's Day flood, was from February 20th through the 21st. Figure 3-6 shows how close it got to flooding at the Mabury Road Crossing.

Runoff from Upper Penitencia creek was minor, but a severely limited channel brought nuisance flooding along the creek. Upper Penitencia Creek experienced a few minor spills during the storm event. Spills were mainly experienced along the Mabury Bypass, bounded along the east and west by Jackson Avenue and King Road respectively. Overtopping occurred along both the left and right banks, immediately downstream of the Jackson Avenue culvert.

Spills over the left bank resulted in sheet flow draining into the County Park Pond. There was also a downed tree along the left bank, obstructing the trail through the park and not the creek itself. Greater amounts of spill took place further downstream over two concrete lateral weirs situated along the right bank, activating the Mabury bypass. The city of San Jose sandbagged areas along Mabury Road to prevent street flooding (See Figure 3-5). Despite these measures, some ponding occurred at a low spot along Mabury Road. Minor flooding may have occurred along Cape Horn Drive (residential street north of the Mabury bypass). Ponding was not seen at this location, but there was some debris, indicating that the lip of the street curb may have been overtopped.


**Figure 3-3: king road Jan 1983**

**Figure 3-4: Flea market – January 1983**

**Figure 3-5: Mabury Bypass January 2017 – sandbags to prevent flooding of Mabury Rd**

**figure 3-6: January 2017-Mabury Road crossing (West)**

### **3.1.3** FEMA Flood Insurance Study

On May 18, 2009, FEMA issued Flood Insurance Rate Maps (FIRMs) in digital format that were continuous along city boundaries. These new maps use an aerial photo as a base map and the effective FIRM panels were digitized and aligned with the topography. In 2014 some of the maps within the study area were updated. The 100-year FEMA floodplain is shown in Figure 3-7. In February of 2014, FEMA published updated Flood Insurance Studies for Santa Clara County to identify current flood hazards. The updates along Upper Penitencia Creek were based on modeling efforts by Schaaf & Wheeler that were used for the BART/VTA Extension project. There are some questions in regard to the accuracy around the Mabury bend since the updated maps show no flooding in that area where it is expected to flood due to limited capacity along that reach.

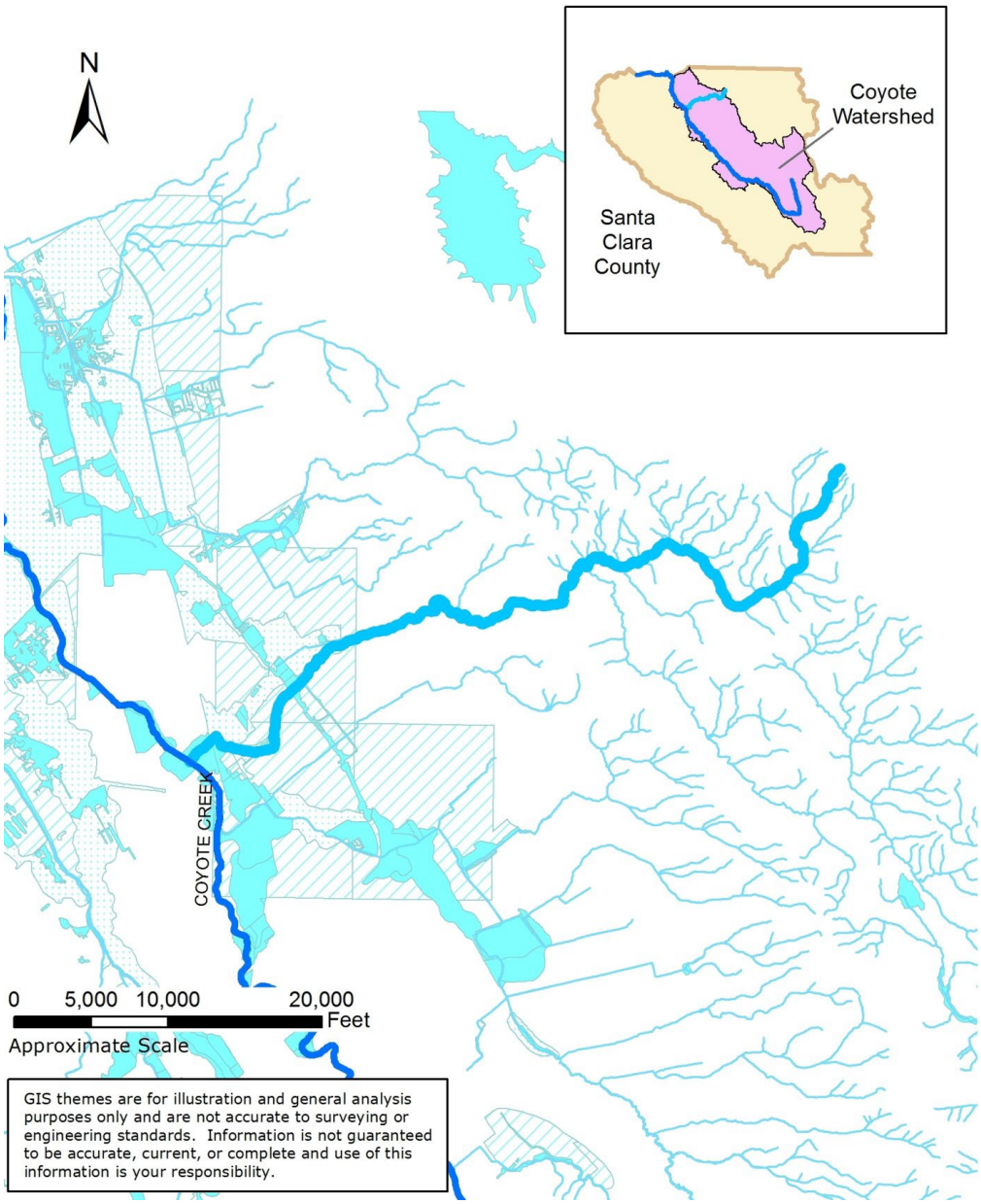



**Figure 3-7. 2009 FIRM for Upper Penitencia Creek Vicinity**

### **3.1.4** Existing Flood Risk

Through the development of a two-dimensional model for Upper Penitencia Creek, inundation maps for a 100-year event, as well as other recurrence intervals (e.g., 5,10, 25, 50 years) have been delineated. For more information on how the model was developed in detail, please see Appendix F: Hydraulic Analysis.

Based on the Project HEC-RAS modeling, as well as the historical flooding record, none of the reaches have 100-year capacity. The estimated channel capacities and corresponding flooding events, by reach, are shown in Table 3-2. The current channel capacity ranges from as low as

500 cfs (2- to 5-year event) in the reaches downstream of Jackson Avenue to as high as 1,700 cfs (10- to 25-year event) from Jackson Avenue to Capitol Avenue (Reach 3). The reaches upstream of Capitol Avenue mostly have a capacity between 1,000 and 1,500 cfs (5- to 10-year event), with the except of a stretch of Reach 6 just downstream of Noble Avenue.

**Table 3-2. Creek Capacities**

| Reach | Reach Description | Channel Capacity (cfs) | Approximate storm event |
|---|---|---|---|
| 1 | Coyote Confluence to King Rd. | 500 | 2 to 5 Year |
| 2 | King Rd to Jackson Ave. | 500 | 2 to 5 Year |
| 2a | Mabury Bypass | 900 | 5 to 10 year |
| 3 | Jackson Ave. to Capitol Ave. | 1700 | 10 to 25 Year |
| 4 | Capitol Ave. to Penitencia Creek Rd. Culvert | 1000 | 5 to 10 Year |
| 5 | Penitencia Creek Road Culvert to Piedmont | 1200 | 10 Year |
| 6 | Piedmont Avenue to Noble Avenue | 700 | 5 Year |
| 7 | Noble Avenue to Dorel Drive | 1500 | 10 Year |

Hydraulic models, as well as historical flood events, have shown Upper Penitencia is characteristic of a typical alluvial fan. As water exits the mouth of the Mount Diablo canyon, flows spread laterally through the valley floor. Upper Penitencia Creek's floodplain is highly urbanized and consists of residential homes and commercial units. Floodwaters travel northerly as far as Milpitas, affecting a sizeable number of residents outside of the City of San Jose. The Project HEC-RAS modeling efforts have shown roughly 8,000 parcels within the boundaries of the 100-year floodplain. The inundated area included 26 schools, 3 fire stations, and 1 rehabilitation center. Major transportation corridors at risk include highway I-680, VTA light rail, and the Berryessa BART extension. The following description is based on the Project HEC-RAS modeling results:

Breakout Locations

The first breakouts from the creek (reaches of lowest capacity) occur over between King Road and Jackson Avenue, into the Mabury bypass area. At these locations, flow from the creek is diverted into the Mabury Bypass channel (Note: The Mabury Bypass was not engineered to be a bypass, although it naturally acts as one). The meander through Mabury Road acts as an ephemeral reach of the creek, only conveying flow during heavy precipitation storms. The creek has adopted the bypass channel as its primary course, effectively abandoning the meander through Mabury Road. Flow is diverted into the bypass via a concrete weir situated along the right bank. A blow out of a portion of a berm upstream of this weir has effectively created two splits, diverting relatively smaller flows immediately into the bypass channel. During the President's Day weekend storm of 2017, flow escaped the bypass area and flooded two adjacent

streets. At the first location, a small amount of ponding had occurred at a low point along Mabury Road. The City of San Jose had deployed sandbags to shore up this area as shown in Figure 3-5. At the second location, flow had escaped onto Cape Horn Drive, a residential street which borders the bypass channel to the north. A fair amount of debris had littered the street shortly after the storm.

During higher flows in the upper reaches, based on modeling, it is anticipated flood flows would initially overtop the creek banks upstream from Piedmont Road. When flood level discharges reach Piedmont Road, significant flood flows would overtop the north bank. Flooding to the north would extend 6 to 7 miles across the City of San Jose to Berryessa Creek in the City of Milpitas. As the flood wave continues downstream from the Viceroy Way and Upper Penitencia Creek Road intersection, lesser amounts would overtop the South Bank and drain into Coyote Creek upstream of the Coyote Creek and Upper Penitencia Creek confluence. The majority of the south flooding flows would not extend beyond McKee Road, although some would flow down Highway 680 up to Alum Rock Avenue. Although Highway 680 acts like a blockage of flow in some areas, causing the flooding to pond and spread out more, the creek itself would not flood at the Highway 680 crossing. More frequent floods (500 cfs and less) would remain in channel. There would also be overflow into mostly residential areas along Reach 2, and a widespread overflow into commercial and business areas From King Road to Coyote Creek (along Reach 1). Figure 3-8 shows the flooding extents for a series of events based on the Project hydraulic modeling: 10-, 25-, 50-, and 100-year.

As can be seen in Figure 3-9, for the 100-year event, most of the depths would be below 1 foot. This would be the lower depth higher velocity sheet flow flowing through the floodplain, mostly traveling through the streets and roadways. In a few ponding areas, some depths would get extremely high, ranging from 5 to 18 feet. A couple of these areas are along Highway 680 at Alum Rock Avenue and just west of Lower Penitencia Creek upstream of its confluence with Berryessa Creek. More common would be ponding areas ranging from 1 to 3 feet in depth throughout the floodplain.

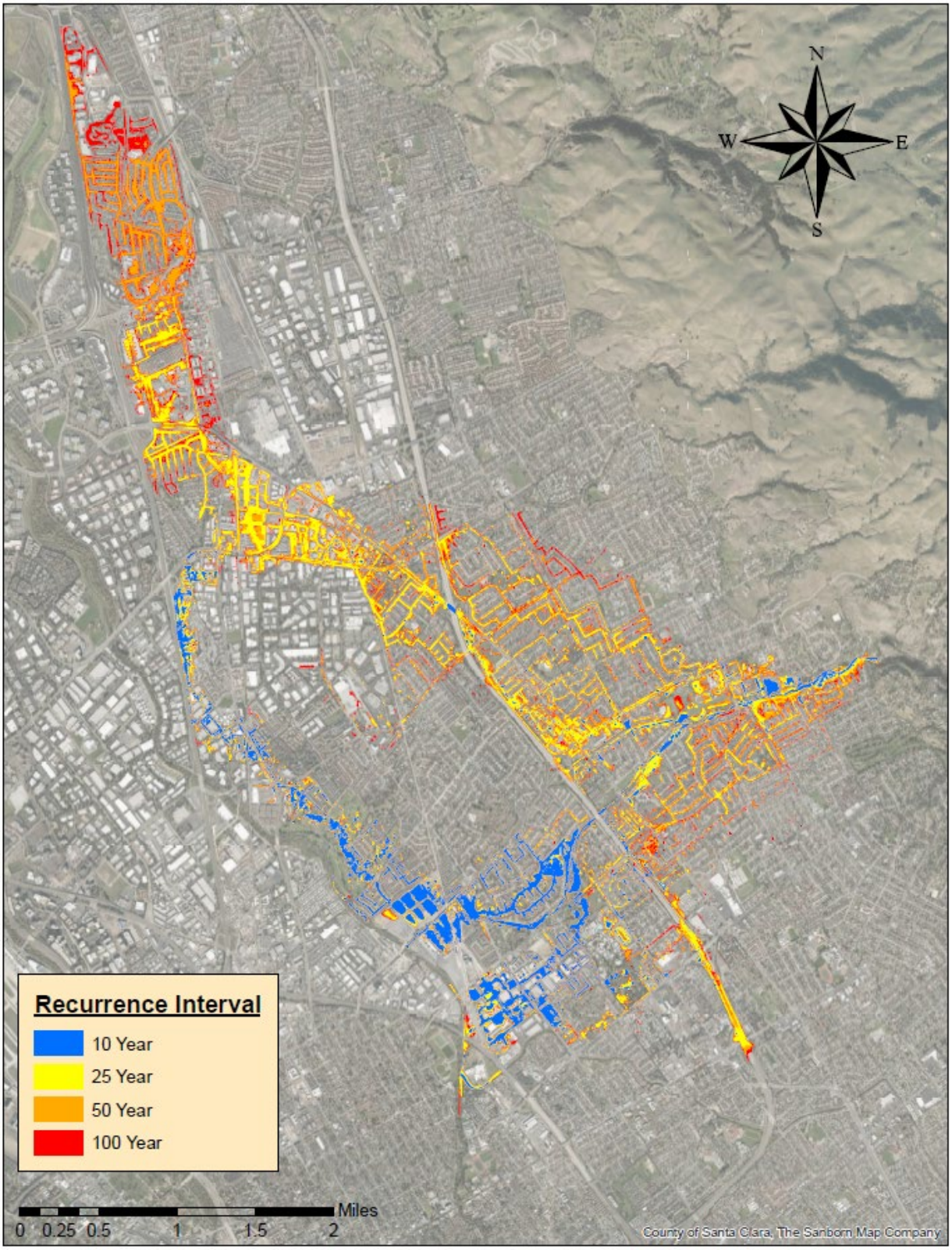



**Figure 3-8. Flood Map (Project HEC-RAS modeling): Extents of 10-, 25, 50-, & 100-Year Flow Events**

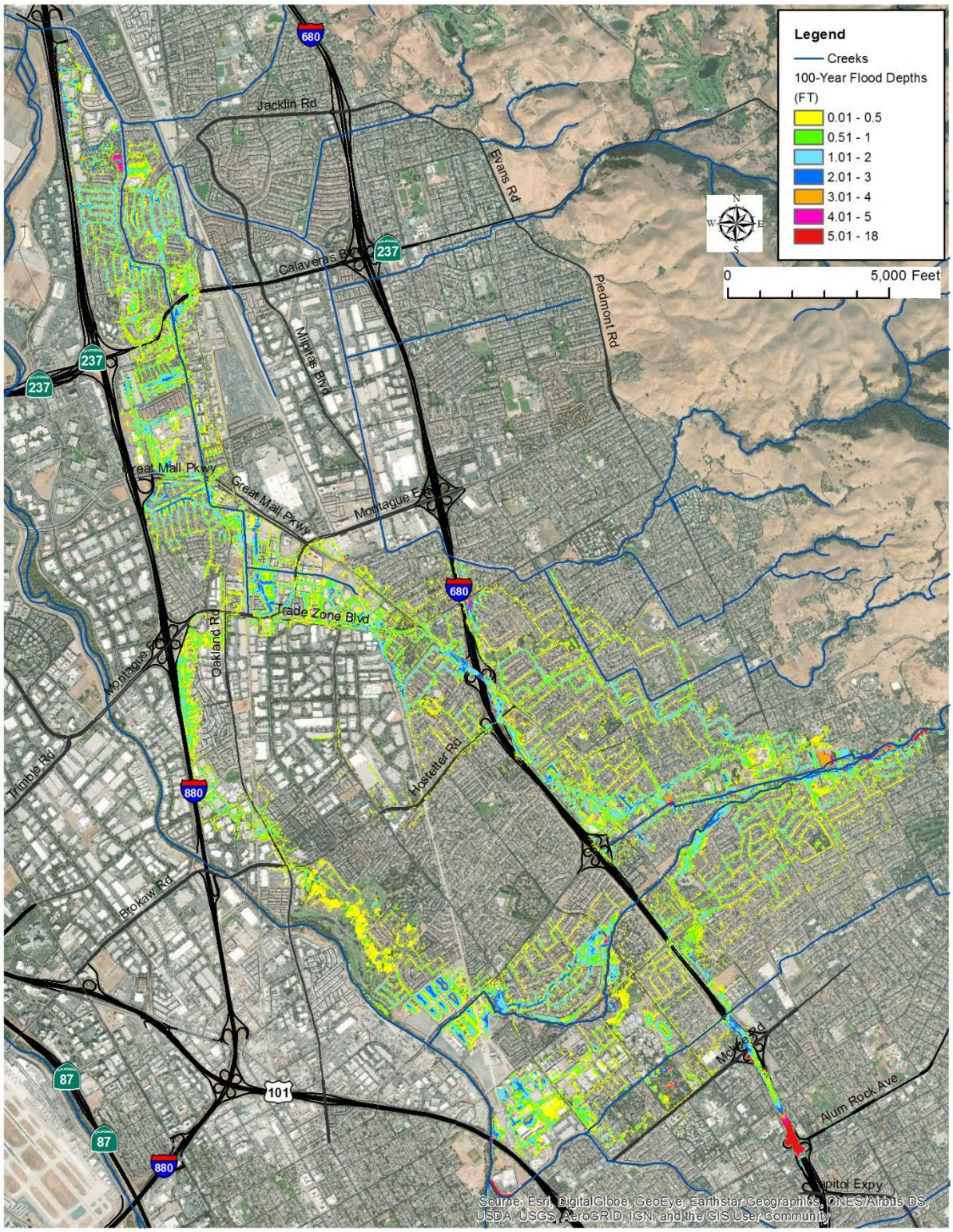



**Figure 3-9. 100-Year Storm Event (Project HEC-RAS modeling): Flooding Depths**

## 3.2 **Water Quality**

Water quality issues that can be detrimental to native ecosystems and aquatic/terrestrial wildlife include elevated water temperatures, high pathogen concentrations, excessive fine sediment, and pesticides/herbicides. Water quality issues related to any construction of flood control facilities along Upper Penitencia Creek will fall under the jurisdiction of the San Francisco Bay Regional Water Quality Control Board (Regional Board, Region 2), which is responsible for protecting water resources from pollution and nuisance that may occur as a result of waste discharges.

Creeks in urban areas can suffer from degraded water quality due to stormwater runoff, trash, pesticides, and fertilizers. Most of the floodplain around Upper Penitencia Creek slopes away from the creek, therefore the majority of stormwater runoff flows away from the creek and there are not many stormwater conduits that drain into the creek. This has helped minimize pollution compared to other urban creeks in the County. There is some impact to the water quality due to fertilizers used in the upper reaches above Alum Rock Park.

In more recent years, water quality impairment due to unhoused encampments has become more of an issue. Encampments are associated with accumulation of litter and trash in the creek as well human waste. Upper Penitencia Creek has not been impacted by encampments as much as some other creeks in the County, such as Coyote Creek and Guadalupe River, and most encampment impacts are limited to the lower reaches.

## 3.3 **Maintenance**

Over the years, Valley Water has done minimal maintenance along Upper Penitencia Creek due to the fact that Valley Water has limited right-of-way throughout the project area. Valley Water will only conduct maintenance where it has fee or easement and to maintain improvements to how it was constructed. Valley Water has two water supply diversion structures along Upper Penitencia Creek, the Noble Diversion and the Mabury Diversion. Due to sediment deposition issues, the Mabury Diversion structure has to be cleared of sediment and other debris on a regular basis for it to work properly. The majority of the maintenance activity has been herbicide application and weed abatement but there has also been tree/bush trimming where needed (mainly I-680 to King Road). It is important to note that Reach 1 has a significant issue with non-native vegetation overgrowth, but Valley Water does not have right-of-way along the reach. Another maintenance activity on Upper Penitencia Creek has been sediment removal at the Mabury Road Crossings along reach 2. This is no longer carried out due to the determination that the sediment within the crossings is at an equilibrium condition and would not exacerbate potential flooding.

## 3.4 **Geomorphology**

Erosion was observed to be a concern on certain reaches of Upper Penitencia Creek although sediment deposition appears to be more of a problem. Significant sedimentation has occurred in the downstream portion of the creek, from I-680 down to the confluence with Coyote Creek. It is estimated that the invert of the creek has been raised by sediment deposition by up to 3 feet in some areas. The most significant deposition problem is at the confluence with Coyote Creek where Upper Penitencia creek enters Coyote Creek at over a 90-degree angle.

The Mabury Meander in Reach 2 is a bend in Upper Penitencia Creek (from the north Mabury crossing to the south Mabury crossing) that has been modified and partially channelized as a result of urbanization. NMFS has expressed concern over fish-stranding risks associated with bifurcated or multi-channel designs. If flows are bypassed around the Mabury meander, either the existing Upper Penitencia Creek channel or the bypass would likely dry up after high flows pass, creating a risk that fish will be stranded in a shrinking pool of water with no means of escape; therefore, any bypass design must minimize such risks. (Gary Stern, NMFS, personal communication)

Although the Mabury meander is natural and it has high value, it appears as though the creek currently wants to abandon the meander and use the Mabury bypass as its main path. There have been breaches along the berm separating the main channel and the Mabury bypass allowing flows into the bypass. Sediment deposition has raised the invert of the main channel two to three feet causing even low flows to break into the bypass.


**Figure 3-10: Mabury Meander upstream of Educational Park Drive (looking U/S)**

## 3.5 **Problem Definition Summary**

The key problems identified in the existing conditions assessment are:

- Potential flooding damages.
- Maintain and improve geomorphic stability to maintain conveyance and reduce maintenance activities.
- Maintain and improve continuity and quality of the aquatic habitat and floodplain habitat within the creek corridor.
- Maintain water supply potential.
- Mabury Meander has significant issues:
    - Lowest capacity in project area – historical flooding
    - Significant sediment deposition
    - Trees dying and falling
    - Failing Farm levees
    - Main channel and bypass connection does not function properly

# Chapter 4: Project Outreach

Below is information on the major outreach efforts conducted for the project. In addition to those efforts, other forms of beneficial outreach conducted by the project team include emails, online meetings, phone calls, government relations meetings at Washington D.C., and the project website which can be found at:

https://www.valleywater.org/project-updates/creek-river-projects/upper-penitencia-creek-flood-protection

## 4.1 Objectives and Benefits of Outreach

One of the most important aspects of the planning process is the identification and participation of interested external parties (stakeholders). Interested parties include individuals, agencies, and organizations which may affect or be affected by the Project. These entities may have a vested interest in the objectives, activities, implementation, and outcome of the Project. The Success of the Project depends in part on effective collaboration with interested parties. The benefits of outreach to interested parties include:

- Facilitates better decisions;
- Produces buy-in and support of the project;
- Promotes ownership of the project by interested parties;
- Guards against the project becoming too inwardly focused;
- Aids decentralized decision making; and
- Helps to identify issues not addressed by the project staff.

The majority of the stakeholders will be those directly affected by the project and those interested in possible impacts to the site from an environmental or regulatory nature. Throughout the planning process, outreach activities have been carried out to inform the public of project progress and solicit public feedback. The Project's webpage on the Valley Water website has been updated as the Project planning has progressed.

At the time of finalizing this PSR, COVID-19 has significantly impacted the way outreach is being conducted at Valley Water. Due to the significant health dangers of in-person meetings, outreach efforts for Valley Water projects have been using the Zoom application to hold online meetings, including public meetings. A potential benefit is that it may be easier for some to attend since they do not have to drive to location and can multi-task while taking part in meeting.

## 4.2 Public Outreach

Proof of the importance of outreach and the input received is the community meeting held for the USACE Feasibility study (mentioned above) in 2014. The public was presented with the preliminary proposed project (at that time) and there was much outcry, mainly due to the project's significant structural features such as floodwalls. There was much internal discussion after this, and Valley Water eventually moved forward with a new planning phase to create a multi-beneficial project with local-only funding.

In order to update the community and solicit feedback; the project team held two major public meetings as the project went through the multi-objective local-funding only project. The first was held on October 2, 2018 to present the problem definition, Vision process, and initial conceptual alternatives. The second was held on May 15, 2019 to present project updates, the feasible alternatives, and the next steps. In general, the feedback was positive, and most were supportive of the project and the multi-beneficial alternatives.

## 4.3 **City and County Outreach**

As the planning process progressed, meetings were held with the affected local jurisdictions: The City of San Jose (City) and Santa Clara County (County). These meetings were opportunities to discuss potential project benefits and impacts and collect early feedback and comments. As mentioned previously in this PSR, there is much public land along the riparian corridor owned by Valley Water, the City, and the County. Therefore, communication and coordination with them was important to make sure all were in agreement with the project and use of the land, and it benefited all three parties.

The City and County participated in several workshops during the Landscape Vision Process and provided valuable input. There were also meetings held together and separately with the City and County, depending on any issues or updates to their individual lands. Further outreach will continue throughout the design and construction of the project.

## 4.4 **Resource Agencies**

Throughout the project, the project team has worked closely with the resource agencies to present the project and any updates and to receive their input. Various resource agency permits will be required prior to construction of the project. This close coordination with the resource agencies prior to the CEQA process improves the project status with the agencies and expedites future reviews. The resource agencies were involved with the Landscape Vision Process and took part in several workshops. In addition, there was a field visit on September 21, 2018, and a workshop to review the alternatives on May 2, 2019. The agencies have been very supportive of the project and the multi-beneficial alternatives presented. A final planning meeting with the agencies was held in December of 2021 where the project team reiterated the project history and problem definition and presented the preferred project.

## 4.5 **External Stakeholders Outreach**

The project team has worked with external stakeholders on this project. One key stakeholder is the Flea Market developer (Bumb family owners). Valley Water has been working with the developer to receive a 17-acre dedication of land at the Flea Market along Reach 1. The developer is planning to build an urban village at the site and is looking to dedicate land adjacent to both Upper Penitencia and Coyote Creeks for Valley Water to build its flood protection and riparian enhancement projects. Initially, the project team met quarterly with the flea Market developer but now meets monthly as both projects move forward.

As part of the upper reaches of the project, the East Side Union High School District is an important stakeholder that the project team has had close coordination with. Several meetings were held regarding the detention facility alternative at the Santa Clara County property in Reach 4. The school district was looking to build sports fields for the school and the public use, and the project team worked closely with them to see how this could be done with a flood detention facility. Even though the coordination went well the school district project fell through for other reasons.

## 4.6 **Ongoing and Future Outreach**

During the design phase, the project team will continue to work with internal and external stakeholders to develop relationships and lines of communication that will further project development and implementation. During the design phase, the project team will prepare an EIR complying with requirements of CEQA. The project team will use the CEQA process as a primary tool for engaging and informing stakeholders, including the City, the County, landowners, utility service providers, residents, and regulatory agencies. Information on the project will be provided to stakeholders to:

- Acquire real property rights needed for project construction,
- Arrange necessary relocation of utility lines,
- Provide residents project updates, and
- Obtain required project permits.

These efforts may include public information meetings, multi-agency meetings with regulatory agencies, and regular updates of the project status on the Valley Water website.

This would include continuing to work closely with the City of San Jose and the Flea Market developer to optimize the use of public land along Reach 1 for the flood protection project as well as for the Berryessa BART Urban Village.

During construction phase, Valley Water staff will be available to respond to inquiries from stakeholders about project implementation. Valley Water will continue to update the project page on the website to keep interested parties informed of project progress.

# Chapter 5: Formulation and Evaluation of Alternatives

## 5.1 Alternative Approach

Valley Water's planning process generally has three steps: development of conceptual alternatives, development of feasible alternatives, and the development of the staff-recommended project. The Upper Penitencia Project approached it a bit differently after the USACE feasibility study, which came up with mainly structural solutions to the project, was not well received by the public. Upper Penitencia Creek has been left largely untouched with man-made structures and even though the public respects that there is a significant flooding problem, there is strong support for not allowing any hardscape along the riparian corridor. Therefore, Valley Water decided to focus the project as a multi-objective project with natural restoration in mind and worked with the San Francisco Estuary Institute and outside scientists to come up with the Landscape Vision Process that would focus on natural solutions to the flood problem.

## 5.2 Landscape Vision Process

As Valley Water moved forward with the local Project, the project team worked with the SFEI, technical advisors, and numerous stakeholders (most critically tri-party agency partners City of San Jose and Santa Clara County) to employ SFEI's Flood Control 2.0 approach to aid the development of a comprehensive and multi-benefit conceptual plan for Upper Penitencia Creek (see Appendix 1). It is referred to as the Landscape Vision Process (Vision) for the Upper Penitencia Creek Project. The Vision recognizes the creek's complex history, land use, and challenges, and explores a suite of actions that could help meet various management objectives including reducing flood risk, improving ecosystem functions, expanding recreational opportunities, and supporting water supply needs. The Vision gathered and evaluated historical information (hydrology, hydraulic, ecological, geomorphic, water supply) as well as future needs to explore a range of multi-benefit management opportunities along Upper Penitencia Creek.

The Vision suggested two major types of landscape measures: channel and riparian enhancements and off-channel flood and stormwater detention. The Vision developed opportunities to develop these measures at multiple locations along the Project. The channel and riparian enhancement measures included various new configurations for the creek channel, including levee and berm setbacks, floodplain benches, native vegetation restoration and management, and development and expansion of recreational trails along the creek corridor. See figure 5-1 below for details. Off-channel flood detention concepts would expand flood storage capacity and reduce peak flows downstream by temporarily storing flood waters in flood basins of various types and sizes. During non-flood periods, the basins would not be inundated and could serve as natural parks or recreational sports fields, depending on the needs of the public and desires of the agency which owned the facility. During the flood event, the basin would fill and afterwards naturally drain back to the creek and the basin land use would be restored afterward.

While different from Valley Water's typical planning process, the Vision process was an effective way to vet various ideas and narrow down to a limited set of alternatives. Charrettes were conducted with the City of San Jose and Santa Clara County, other stakeholders, resource agencies, and internal Valley Water experts. Since the conceptual alternatives were mainly just

different combinations of the same concepts, the main difference between alternatives was the level of flood protection the alternative would provide.

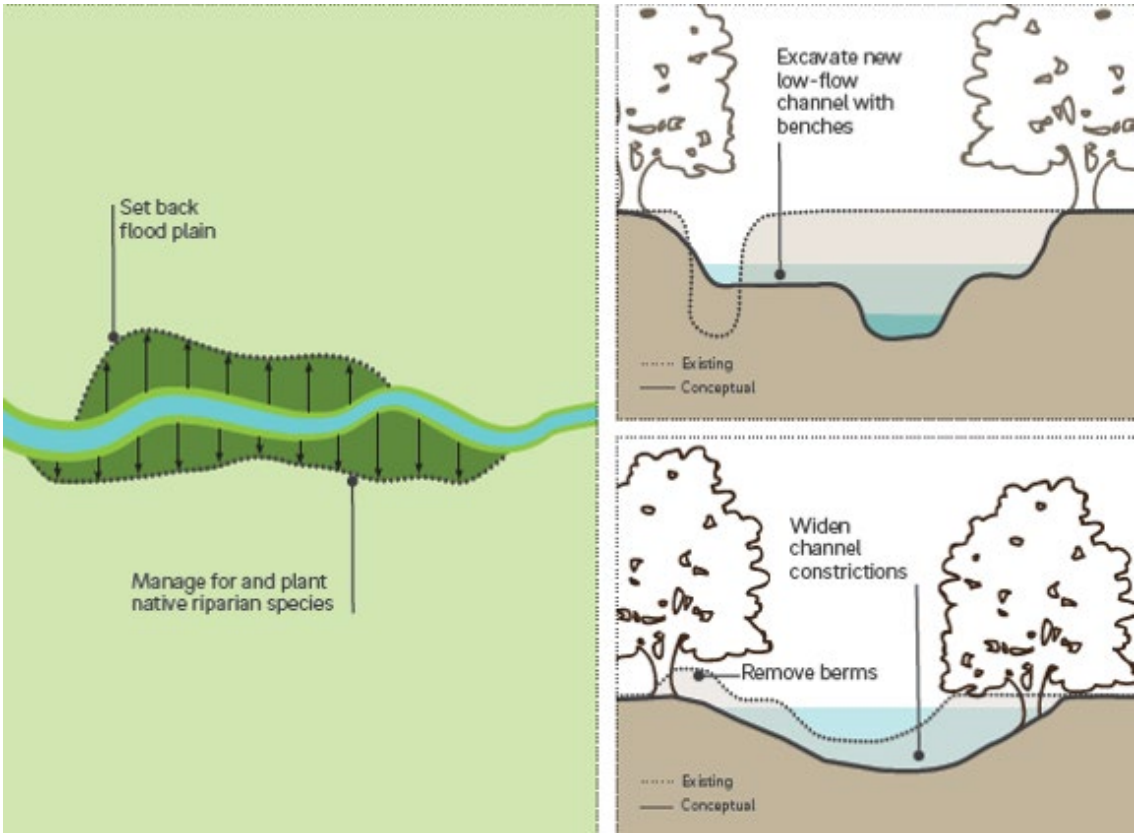



**Figure 5-1: Vision Landscape Measure: Riparian Setbacks & Enhancements**

Figure 5-1 depicts the general landscape measure proposed by the Vision. It would expand the floodplain with excavated flood benches and setback levees if necessary. It would enhance the riparian habitat by creating or improving willow, sycamore, and/or oak savanna habitats and incorporating a native shrub layer. The managing of non-native species, such as Eucalyptus and palm trees, will be part of the plan. Recreational opportunities include expansion of the trail system, educational signage, and benches.

Key benefits include the utilization of public open spaces for flood protection, recreational benefits, and environmental enhancements. The environmental benefits include enhancement of riparian functions, improved wildlife habitat, enhancement of sediment movement, fish rearing habitat enhancements, and providing refuge habitat for aquatic life during high flows.

## 5.3 **Conceptual Alternatives**

During the conceptual alternative stage, numerous approaches to meet the project objectives were identified. The conceptual alternatives had to satisfy:

- Flood risk reduction (at minimum, 100-year protection from Coyote Creek confluence to King Road)
- Preserving current water supply functions
- Minimizing Long term maintenance costs
- Financial feasibility
- Technical/Logistical Feasibility
- Cannot induce flooding downstream

A significant constraint that was discovered through the planning process was inherent in the current watershed floodplain hydrology and hydraulics. Because of the current creek capacities upstream, only a limited amount of any flow coming downstream out of the upper watershed can work through the channel and floodplain to reach Coyote Creek. Thus, flows exceeding 2,000 cfs (approximately the 20-year event peak flow) break out into the urbanized floodplain and do not get to Coyote Creek directly. Because Coyote Creek itself has capacity limitations at various locations downstream of the confluence with Upper Penitencia, the current hydrology should not be altered, as Valley Water cannot induce more flooding downstream in Coyote Creek. This practically limits channel improvement alternatives for Upper Penitencia Creek to match the existing inflows to Coyote Creek; any higher level of flood protection would require construction of a flood detention project element along Upper Penitencia Creek and/or further flood protection elements on Coyote Creek.

During the original development of conceptual alternatives, the project team had looked at the possibility of providing flood protection for flow events smaller than the 100-year event, such as the 50-year and 25-year events. This was in consideration of finding a cost-effective recommended project looking at different levels of service. Alternatives providing less than 100-year protection were eliminated due to: the small cost difference between a 50-year flood protection project and a 100-year project; and flow detention would be needed for any project that would provide flood protection above 2,000 cfs due to the constraint of not inducing flooding downstream in Coyote Creek.

Table 5-1 below summarizes the alternatives that were reviewed further.

**Table 5-1. Final Conceptual Alternatives**

| Alternative | Description |
|---|---|
| A1 | R1: From confluence to BART Tracks - widening channel along the southside with a 70-ft wide bench. Floodwalls for small stretch between BART tracks and Berryessa Station Way. Widening with 40-ft flood bench downstream of King Road, for 500-ft. King Road expansion with 3 box culverts (bore and jack).<br><br>R2 & R3: Mabury Bypass reconfigured as the main channel w/ ecological enhancements. Some excavation & short levees required along stretches of the bypass. Flow split between Bypass and existing channel would be in R3.<br><br>R4-R6: Channel widening with ecological enhancements (widths vary); minor floodwalls/levees.<br>Detention basins located at Gross Ponds (R6), Penitencia City Park (R5) and open County land (R4): reduce peak Q from 4,000 cfs to 2,000 cfs.<br><br>R7 channel widening with ecological restoration/enhancement. Much vegetation removal would be required, although would be fully restored. |
| A2 | R1-R6: same as A1.<br><br>R7: 10'x10' RCB bypass under Penitencia Creek Rd. to carry flood flows. Bypass would travel full extent of R7 (Dorel Dr. to Nobel Ave.). |
| A3 | R1-R6: Same as A1.<br><br>R7: Passive Floodwall along Penitencia Creek Rd. (along south bank) to contain the 100-year flows. The passive floodwall would be underground most of the time, only rise during large flow events and the WSEL rises above the bank. |
| I | No Project |

## 5.4 **Feasible Alternatives – Proposed vs No-Project**

Since the federal funding and participation has been on hold for the Project since 2015, the local funding option is being applied. This option requires flood protection for Reach 1 to meet the SCW KPI. Staff recommended constructing the project in phases, beginning with the most downstream reaches, which are also most critical to reducing flood risk and improving habitat conditions. The Project was broken up into:

Phase I: Coyote Creek Confluence up to King Road (SCW)
Phase II: King Road up to Capitol Avenue
Phase III: Capitol Avenue to Dorel Drive (Just downstream of Alum Rock Park)

With the limited budget and constraints, staff proposed to move forward with design and construction of Phases I and II. This would meet the Project objectives and exceed the SCW KPI as well under the local funding only budget. Section 5.5 of this Report describes the Natural Flood Protection ranking process of the alternatives which showed that Alternative A

significantly ranked higher than Alternative I. Therefore, Alternative A is referred to as the Proposed Project below.

The Proposed and No-Project "projects" are discussed in more detail in the following text and tables.

**Table 5-2. Feasible Alternatives Description**

| Alt. | Description |
|---|---|
| A | 100-Year Protection for Reaches 1, 2, and 3 (existing conditions 1% flow)<br>2,000 cfs design flow (cannot allow more into Coyote Creek)<br><br>Reach 1A: Coyote Confluence up to BART Tracks – 2000ft length widening with ecological enhancements. Approximately 70ft wide flood bench(es) and 20-30ft maintenance road/trail at top of bank. Two existing vehicular bridges would be removed and replaced with new vehicular bridges. A new pedestrian bridge would be constructed at the confluence to connect the trail system.<br><br>Reach 1B: BART Tracks up to Berryessa Station Way. 4-ft high floodwalls along both banks, approximately 250-ft total length of floodwalls.<br><br>Reach 1C: Berryessa Station Way to King Road.<br>Widening 500-ft segment downstream of King Road with an approximately 40-ft wide fully vegetated bench. King Road's capacity would be expanded with three 12'x5' box culverts jack and bored just south of the existing culvert. Note: Design can change with collaboration with City of San Jose.<br><br>Reaches 2 & 3:<br>King Rd to 500-ft U/S: 40-ft channel widening with a vegetated floodplain.<br><br>Mabury Bypass combined with main channel by removal of portions of the separating farm berm; the Bypass will act as a floodplain w/ ecological enhancement. The Bypass would be planted with sycamore groves and other native vegetation. Eventually, the bankfull channel may naturally meander into the floodplain. Short 2.5 to 3-ft levees would be needed in some areas.<br><br>Just U/S of the easterly Mabury Road Crossing: an overflow weir flow split structure would be constructed to keep the main flows through Mabury Bypass (1,600 cfs max) and divert only higher flows into the smaller main channel along the Mabury meander (400 cfs max). Some excavation in the Bypass is needed for capacity, there are existing box culverts under Jackson Ave that would convey flows from Reach 3 to reach 2.<br><br>I-680 undercrossing: geomorphic and fish habitat restoration. |
| I | No Project |

**Preliminary Environmental Review - Impacts**

Preliminary environmental review has revealed potential for impacts to biological resources and water quality. Detailed results will not be available until an evaluation of potential impacts and mitigation measures has been carried out through the California Environmental Quality Act (CEQA) process. Below is some preliminary information to consider as the Project goes into the design and CEQA phases.

Best Management Practices (BMPs) would be followed during construction to minimize the potential impacts to the environment. Valley Water's BMP Handbook will be used during construction activities. The BMPs will include but not be limited to:

Hydrology and water quality: The design of the project would allow the creek to be self-sustaining and use vegetation that adds structural integrity to the stream banks. Excavated areas would be seeded and planted with native vegetation as soon as is appropriate, this with erosion control and weed suppression. To prevent scour downstream of sediment removal, the channel would be graded so that the transition between the existing channel both upstream and downstream of the work area is smooth.

Biological resources: Negative impacts would be removal of existing vegetation during construction, but it would be mitigated with the significant restoration/enhancement included in the project. The channel restoration/enhancement aspects would significantly benefit the biota of the creek. The channel would be vegetated with native species and geomorphic restoration with riffles and pools would benefit the aquatic life. Large woody debris and gravel augmentation can be used to provide aquatic habitat. Typical BMPs would be followed to avoid temporary construction impacts, especially to steelhead and nesting birds.

Cultural resources: Due to the creek side location involving excavation of natural land, it is highly possible that cultural resources would be found. An action plan needs to be created to deal with this issue. There is a high potential of discovering archaeological artifacts during construction. This could restrict or stop construction in affected areas causing significant delays and increase in costs. A detailed cultural resources plan will be developed in early design to help minimize the impacts.

Traffic: there would be some temporary impacts during construction due to the number of trucks needed to haul out the excavation material. The most significant impact to traffic would be with the work required at the King Road crossing.

Utilities: There may be some limited impacts to the utilities along the Flea Market segment of Reach 1. The most significant impacts may be at King Road, especially if the whole culvert structure would be replaced with a bridge.

**Construction Schedule**

2024 to 2026

**Costs (see appendix C for Costs details)**

Capital costs for the entire project would be $24.3 million in 2019 dollars.

Total 50-year maintenance cost would be $15.4 million (about $308,000/year) in 2019 dollars.

## Alternative I Description (No-Project)

### Description

This is the "No Project" alternative. This alternative proposes to continue the current level of sediment, bank, and vegetation maintenance efforts. The sediment deposition problems along reaches 1, 2, and 3 would continue. With there being no improvements, the flood risk would persist with most of the channel having less than 10-year capacity. There would be no impacts to the water supply system and operation would continue as normal.

### Construction Schedule

There would be no new capital work involved with this alternative.

### Operation and Maintenance (O&M)

Minimal maintenance has been conducted due to limited Valley Water right-of-way along the creek; Valley Water would only conduct maintenance where it has fee or easement. Existing O&M activities include herbicide application and weed abatement plus limited tree/bush trimming where needed (mainly between I-680 and King Road). Existing maintenance activities also include sediment removal at the Coyote Creek confluence and along reaches 2 and 3. These maintenance activities would continue with Alternative I.

The current water supply operations would continue. These operations mainly occur at the Mabury Diversion and County Pond in Reach 2; the City park pond along reach 5; and the Piedmont and Gross ponds along reach 6.

### Costs

Capital cost for this alternative would be: $0

50-year maintenance cost (current maintenance activities) would be $5 million (approximately $100,000/year) in 2019 dollars.

The following table presents the costs associated with each alternative (see Attachment 3 for costs details):

**Table 5-3. Alternative Costs (in millions)**

| | Alt A (Proposed) | Alt I (No Project) |
|---|---|---|
| CAPITAL COST | | |
| Phase I: Reach 1 (SCW) | $17.1 | $0 |
| Phase II: Reaches 2 & 3 | $7.2 | $0 |
| MAINTENANCE COST | | |
| Phase I 50-yr Maint. Cost: | $7.1 | $0 |
| Phase II 50-yr Maint. Cost: | $8.3 | $0 |
| TOTAL COSTS | | |
| **Total Capital Cost** | **$24.3** | **$0** |

| | | |
|---|---|---|
| **50-yr Maintenance cost** | **$15.4** | **$5** |
| **Total Cost** | **$39.7** | **$5** |

## 5.5 **Alternative Ranking Methodology**

Valley Water Board of Directors (Board) has adopted an Ends Policy E-3 which states "There is a healthy and safe environment for residents, businesses and visitors, as well as for future generations." As part of this policy, the Board has adopted a goal that states that "natural flood protection" is to be the method Valley Water uses to provide flood protection. The CEO has interpreted the policy and goal as documented below.

The following objectives are balanced when selecting the preferred alternative to modify or maintain creeks to provide flood protection:

1. Homes, schools, businesses and transportation networks are protected from flooding and erosion.
2. Projects are integrated within the watershed as a whole.
3. Ecological 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 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.

To comply with the ends policy and CEO interpretation, the Natural Flood Protection (NFP) evaluation process was developed to rate and compare flood protection project alternatives. Various criteria were developed to help rate each objective. The objectives and corresponding criteria are listed below.

**Objective 1: Homes, Schools, Businesses and Transportation Networks Are Protected from Flooding and Erosion**

Criterion 1.1: Safety—Protection of public safety if conditions exceed design assumptions

Criterion 1.2: Economic protection—Protection from damage due to floodwater, erosion or sediment for homes, schools, businesses, transportation systems and other infrastructure
Criterion 1.3: Durability—Future Valley Water effort required to maintain design level of protection
Criterion 1.4: Resiliency—Adaptability to future changes external to Valley Water activities
Criterion 1.5: Local drainage—Support of local storm drain systems
Criterion 1.6: Time to implementation—Practicality of implementation accounting for logistical, negotiation and cost issues

**Objective 2: Integrate Within the Context of the Watershed**

Criterion 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 Ecological Functions and Processes**

Criterion 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
Criterion 3.2: Quality of habitat—Quality and variety of habitat provided by the alternative
Criterion 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
Criterion 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**

Criterion 4.1: Floodplain—Inclusion of appropriately-sized overflow area within the flood conveyance corridor that effectively conveys high flows and dissipates erosive energy ("multi-stage" channel)
Criterion 4.2: Active channel—Appropriateness of size and configuration of the "active channel" relative to watershed inputs (water and sediment) and reach characteristics
Criterion 4.3: Stable side slopes—Stability of channel side slopes using geotechnical or biotechnical methods
Criterion 4.4 Upstream/downstream transitions—Stability of channel's integration with upstream and downstream reaches

**Objective 5: Minimize Maintenance Requirements**

Criterion 5.1: Structural features—Maintenance requirements associated with structural features within project corridor
Criterion 5.2: Natural processes—Maintenance requirements associated with vegetation growth, erosion and sediment processes
Criterion 5.3: Urban flows—Maintenance requirements resulting from smaller, more frequent storm events and outfall flows

Criterion 5.4: Access—Incorporation of adequate access for maintenance crews

**Objective 6: Protect the Quality and Availability of Water**

Criterion 6.1: Water availability—Impact on ground-water recharge and on ability to maintain or improve the water supply functions in the project area
Criterion 6.2: Groundwater quality—Groundwater quality protected from contamination and the threat of contamination by preventing contaminant entry into groundwater
Criterion 6.3: Instream water quality—Water quality protection through vegetation and instream hydraulic complexity
Criterion 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
Criterion 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**

Criterion 7.1: Mutual local goals—Ability to achieve project-specific goals and objectives developed jointly by Valley Water and local agencies/municipalities
Criterion 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**

Criterion 8.1: Community safety—Overall safety for appropriate access and recreation
Criterion 8 2: Recreation—Quality of recreation experience provided by alternative
Criterion 8.3: Aesthetics—Quality of aesthetic form provided by alternative
Criterion 8.4: Open space—Incorporation of open space into alternative design
Criterion 8.5: Community support—Alternative reflects community concerns/ feedback

**Objective 9: Minimize Life-Cycle Costs**

Criterion 9.1: Capital cost—Net present value of capital cost
Criterion 9.2: Maintenance cost—Net present value of all maintenance costs over the life of the project
Criterion 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**

Criterion 10.1: Compliance with S.F. Bay Basin Plan—Assesses potential effects of Alternative on water quality via regulatory standards (Basin Plan)
Criterion 10.2: Identify the Least Environmentally Damaging Practicable Alternative (LEDPA) —Determines the preliminary LEDPA and ensures it is carried forward

**NATURAL FLOOD PROTECTION EVALUATION RESULTS**

The first step of the NFP evaluation process is to establish relative weights (high, medium, or low) for each of the objectives. Due to the multi-benefit approach that was used for the Project

and the high importance on all NFP objectives, equal values of "high" was given to all the objectives.

The second step of the NFP evaluation process is to rate the feasible alternatives based on the individual criteria and overall objectives. The NFP evaluation methodology includes 10 objectives and 36 distinct criteria. The two feasible alternatives were rated against all of the objectives and criteria. The Project team that rated the alternatives consisted of:

- Gabriel Vallin, Associate Engineer
- Benjamin Hwang, Assistant Engineer II
- Saniya Maroof, Assistant Engineer I

Each feasible alternative was rated according to how well it accomplished each criterion. The ratings for the criteria under each objective were then compiled into a summary objective rating as defined by the NFP evaluation process. Completed NFP rating sheets are included in Attachment 4. The following table summarizes the NFP results with the final scores for each alternative.

**Table 5-4 NFP Scores for Feasible Alternatives**

| District Ends Policy 2.2.1 (Natural Flood Protection): | Objective Weight: | Alt. A | Alt. I |
|---|---|---|---|
| 1. Provide protection from flood damage | High | **3.1** | 1.1 |
| 2. Integrate within the watershed | High | **4** | 2 |
| 3. Support ecological functions and processes | High | **3.5** | 2 |
| 4. Geomorphology: physical stream functions and processes | High | **4** | 1.85 |
| 5. Minimize maintenance requirements | High | **2.5** | 1.5 |
| 6. Protect the quality and availability of water | High | **3.4** | 3 |
| 7. Cooperate with other local agencies to achieve mutual goals | High | **3** | 1 |
| 8. Community benefits beyond flood protection | High | **3** | 2 |
| 9. Minimize life-cycle costs - Total Lifetime cost($ millions) | High | 3.75 | 3.75 |
| 10. Impacts are avoided, minimized or mitigated (LEDPA) | High | 3 | **4** |
| Total Score out of 50: | | 33.25 | 22.2 |

With only two alternatives, Alternative A rated highest and significantly better than the No Project alternative. Flood protection, geomorphology, maintenance requirements, protecting and enhancing water quality. In addition to providing much more flood protection than having no project, Alternative A scored high in ecological and stream functions as well as integrating with the overall watershed. Alternative A scored higher than Alternative I in all objectives except objective 9, where they were equal, and objective 10 (LEDPA). Although Alternative A scored well in the LEDPA objective, Alternative I rated better due to the avoidance of impacts with no project.

# Chapter 6: Staff Recommended Project

## 6.1 Design Basis & Criteria

The overall design basis for the recommended project is to focus on channel expansion with riparian enhancements and minimal hardscape. Land purchases will not be necessary since public land along the riparian corridor plus a dedication along the Reach 1 Flea Market will be used for the channel expansion. In order to not induce flooding downstream in Coyote Creek, the design flow can only be up to the existing condition flows that currently reach Coyote Creek (see figure 6-3 for design flows). there is great potential to utilize public land upstream to build flow detention facilities that would reduce the peak flows to the current flows reaching Coyote Creek. This could be accomplished in a second phase of the project.

- Design Flow: 2,000 cfs
- Project design life is 50 years.
- recreational enhancements – Proposed trails will meet city guidelines and standards. The trail system improvements and extensions will be maintained and operated by the City of San Jose.
- Freeboard – 2ft for levees and floodwalls. (4ft within 100ft of bridges/culverts)
- Levees – side slopes of 3:1 (horizontal: vertical). Minimum 10ft top width.
- Widening – vegetated benches. Constructed at approximately the bankfull channel maximum height.
- Floodwalls – designed per the USACE Engineering Manual for Retaining and Floodwalls (EM 1110-2-2502, 1989).
- King Road modifications – the top of the road elevation for the bridge shall remain as existing, to avoid impacts to adjacent roadways. Culverts will be designed per the American Association of State and Highway Transportation Officials Load and Resistance Factor Design Bridge Design Specifications.

Design Flow

The 1% flow is approximately 3,800 cfs at the upstream end near Dorel Drive and 4,000 cfs at the confluence with Coyote Creek. Due to flooding in the upper reaches, the 1% flow that reaches the lower reaches near I-680 is reduced to 2,000 cfs (existing conditions 1% flow). In addition, there is the constraint of not inducing flooding downstream in Coyote Creek. The maximum flow allowed into Coyote Creek is approximately 2,000 cfs. Therefore, the design flow is 2,000cfs for the lower reaches.

Freeboard

As stated in the Project objectives (Chapter 1.4), it is not necessary for the freeboard to meet FEMA standards. This distinction is important when considering levees/floodwall heights above

ground and the public's strong stance against the Project blocking access or view to the creek. A Risk & Uncertainty analysis may be done in the early part of the Design Phase to better determine the freeboard to use. It may later be determined that using FEMA's standards for freeboard may be the best option.

## 6.2 **Staff-Recommended Project Description**

Figure 6-1 below is the 100-year floodplain, existing conditions versus Post-Project conditions. The existing flooding footprint is the combination of the blue and red flooding. The Post-Project conditions flooding is just the blue footprint, the red would be removed from the floodplain.

The Proposed Project is laid out along the reaches in Figures 6-2A and 6-2B. The schematic flow diagram in Figure 6-3 displays the post-project 100-year flow progression through the creek system (with spills). Although not shown in the diagram, flow reductions going downstream are due to flooding into the floodplain. 2,000 cfs reaches I-680 with current conditions, the Proposed Project would provide flood protection to this level in reaches 1,2 and 3. Section 6.4 goes through detailed Proposed Project descriptions reach by reach. The following table summarizes some key issues between the Proposed Project and No Project.

**Table 6-1: Summary of Proposed Project & No Project**

| **Alternative:** | **A** | **I** |
|---|---|---|
| Alternative Description: | 1% flood protection (2,000 cfs design flow – existing conditions 100-year flow)<br>R1: Channel widening with riparian restoration. 1 new pedestrian bridge at confluence, plus 2 vehicular bridges replaced with new bridges. Minor Floodwalls for 100-ft reach. King Road expansion.<br>R2/R3: Mabury bypass reconfiguration as main channel w/ restoration (Sycamore Alluvial Woodland), plus short levees. Diversion in R3 split flow: 1,600 cfs to Mabury Bypass and 400 cfs kept in existing channel. | No Project: no new construction. |
| Operation and Maintenance: | Continue existing maintenance (see Alternative I).<br>R1: channel would be designed to be fully vegetated, but minor vegetation maintenance still required (weed/non-native removal).<br>R2: Vegetation removal would be needed. Levees may require minor repairs.<br>R3: Split between Mabury Bypass and existing channel may need minimal maintenance to keep flow split optimal (vegetation/sediment removal). Water Supply to Mabury Diversion - Gate would need to be open to maintain waters to Overfelt ponds, minimal operation needed. | Continue current maintenance: sediment removal & vegetation maintenance, trash/debris removal, erosion repair. Levee repair when needed. Maintain operation of water supply Mabury Diversion to Mabury Pond and Overfelt Ponds. |
| **Socio-Cultural Environmental** | | |

| | | |
|---|---|---|
| (A) Land ownership/access/ROW | Tri-Party Agreement would help facilitate easements and access on public land: Valley Water, City of San Jose (CSJ), and Santa Clara County (SCC).<br>R1A: Working with the developer of the Flea Market and CSJ to get a dedication for the land required. R1B: Easement from CSJ and VTA required. R1C: Easement required from CSJ.<br>R2 & R3: easements required from CSJ; possibly from SCC and SJWC. | None needed |
| (B) Aesthetics | R1 enhancement: remove concrete parking lot, replace with natural vegetated riparian corridor. Short 100ft stretch of floodwalls, 2-4ft height above ground. Low aesthetic impact. R2/R3 enhancement: Mabury Bypass restoration w/ Sycamores. | current values: majority of creek is natural with minimal man-made structures. |
| (C) Recreational Potential: | Extend public trail from King Rd down to Coyote Creek to the west and from Dorel Drive up to alum rock park to the east. Educational kiosk along trail. | Potential to extend Upper Penitencia Creek Trail from King Rd down to Coyote Confluence in the future. |
| **Physical Environment** | | |
| (A) Sedimentation: | R1 - R3: reduce sediment removal with redesigned meandering channels and confluence, although sediment removal will still be needed. Sediment analysis study needed. | current sediment removal activity would continue |
| (B) Water Quality: | Geomorphic design and vegetation restoration would improve water quality into Coyote Creek. | Water temperature from water supply input at Gross ponds considered potential issue for fish - low risk. |
| (C) Geology & Soils: | site-specific geotechnical and/or geophysical analysis would be conducted. | N/A |
| **Environmental Review** | | |
| (A) Biological Resources: | Potential impact in Reach 2 due to low flow channel relocation to Mabury Bypass. Impacts of channel widening with vegetation removal; but would be restored/enhanced with native vegetation plantings. | N/A |
| (B) Cultural Resources: | Project footprint may include indigenous people's burial grounds - potential disturbance of sub-surface cultural resources in excavation areas. High risk for construction delays - Have Cultural Resources Mitigation Plan ready. Temporary construction phase impact to park users at the City Park and along the trail. | N/A |
| (C) Public Utilities, Services, Traffic: | Significant traffic issues with hauling of excavation material. Potential utility impacts with King Rd and Noble Ave modifications/replacements. | None |
| | | |

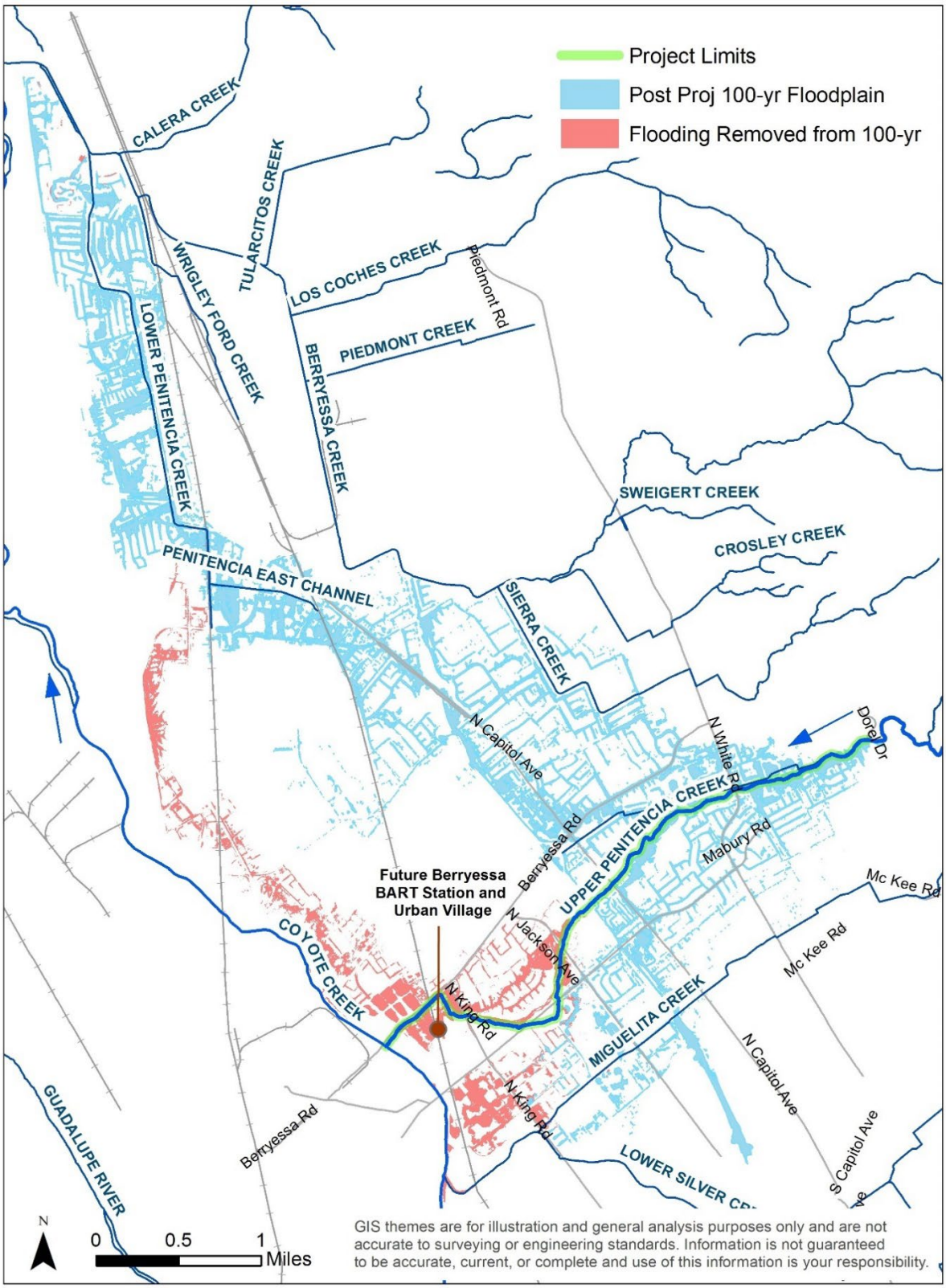



**Figure 6-1. 100-Year Flood Map: Post-Project vs. Existing Conditions**

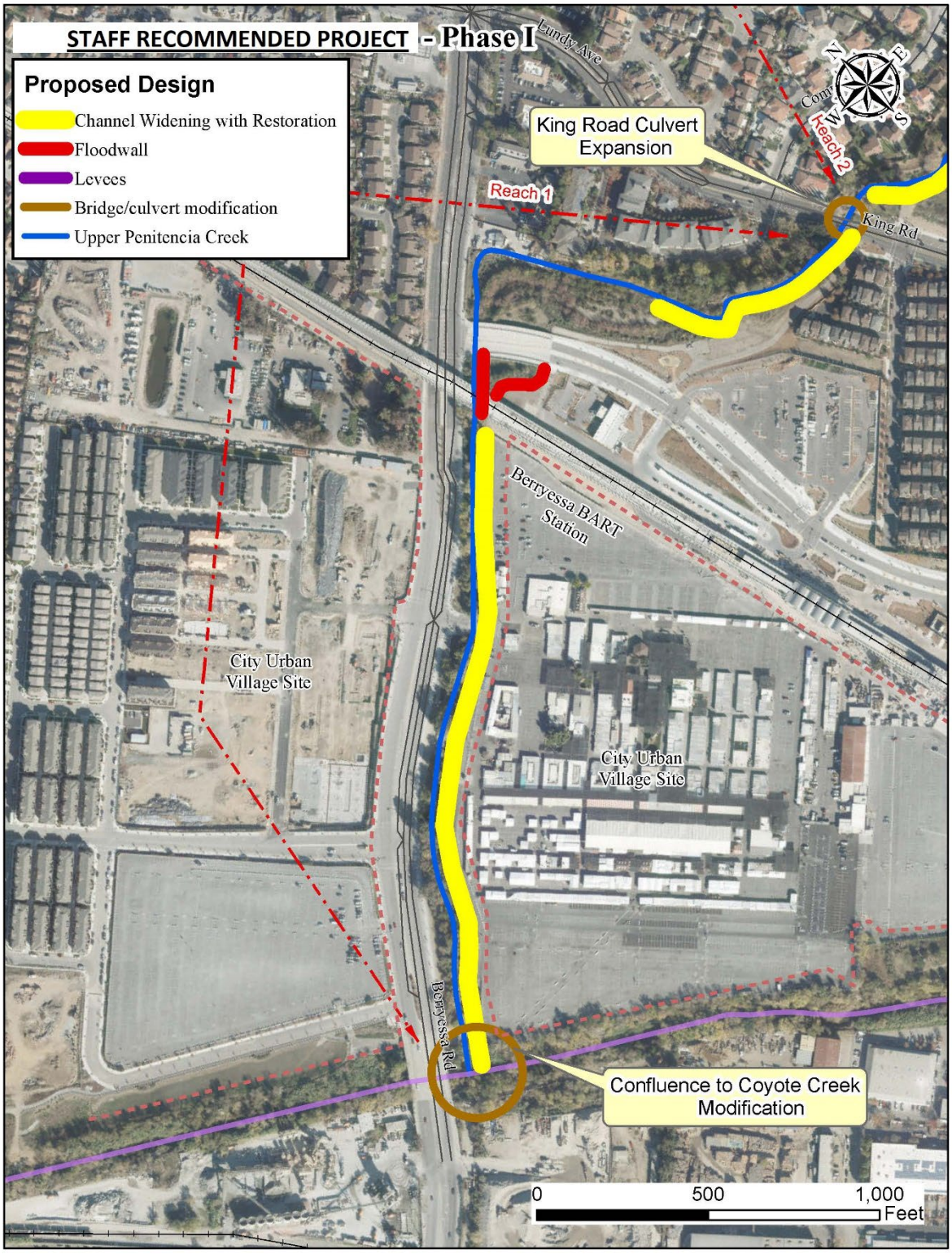



**Figure 6-2A. Staff-Recommended Project Layout – Phase I**

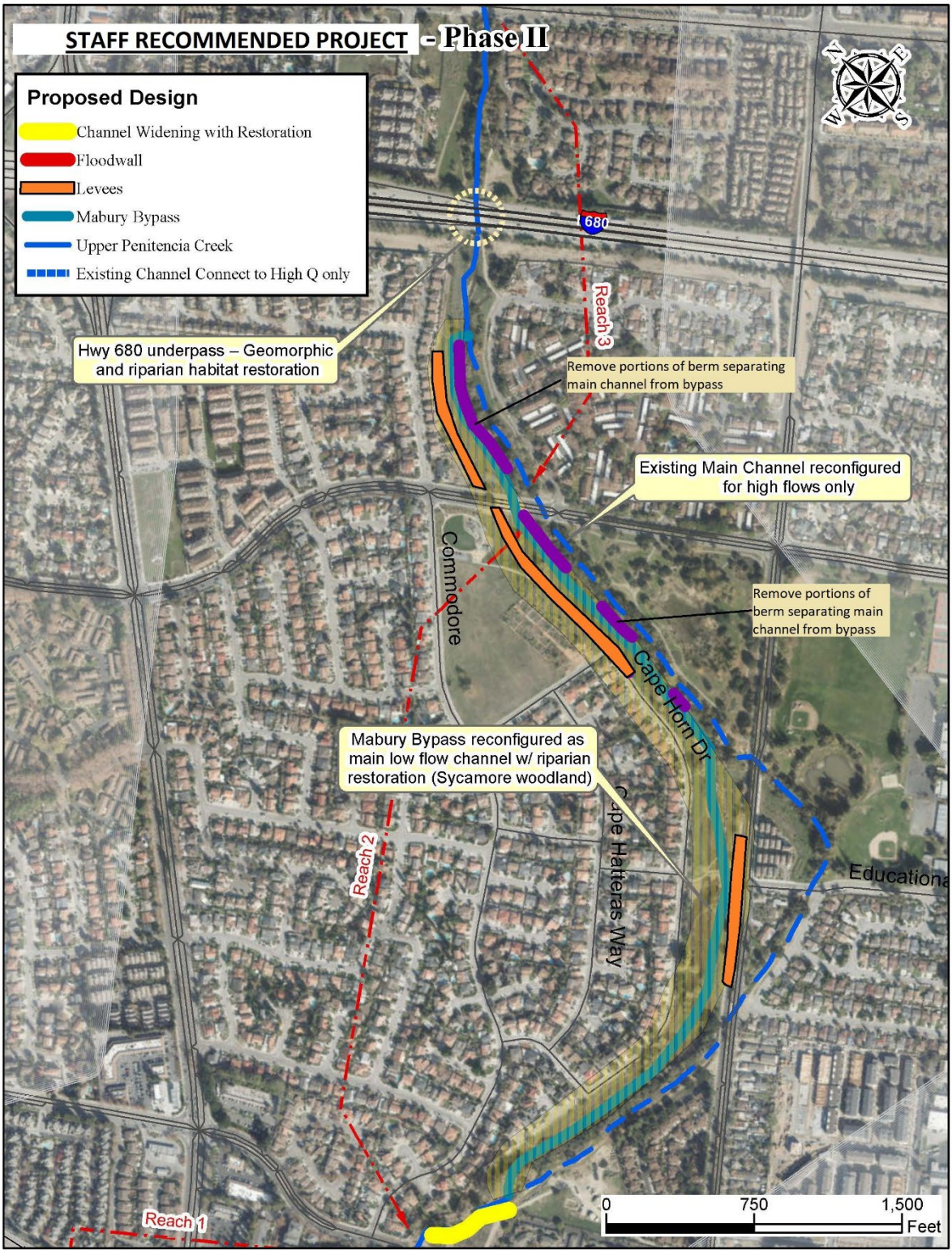



**Figure 6-2B. Staff-Recommended Project Layout – Phase II**

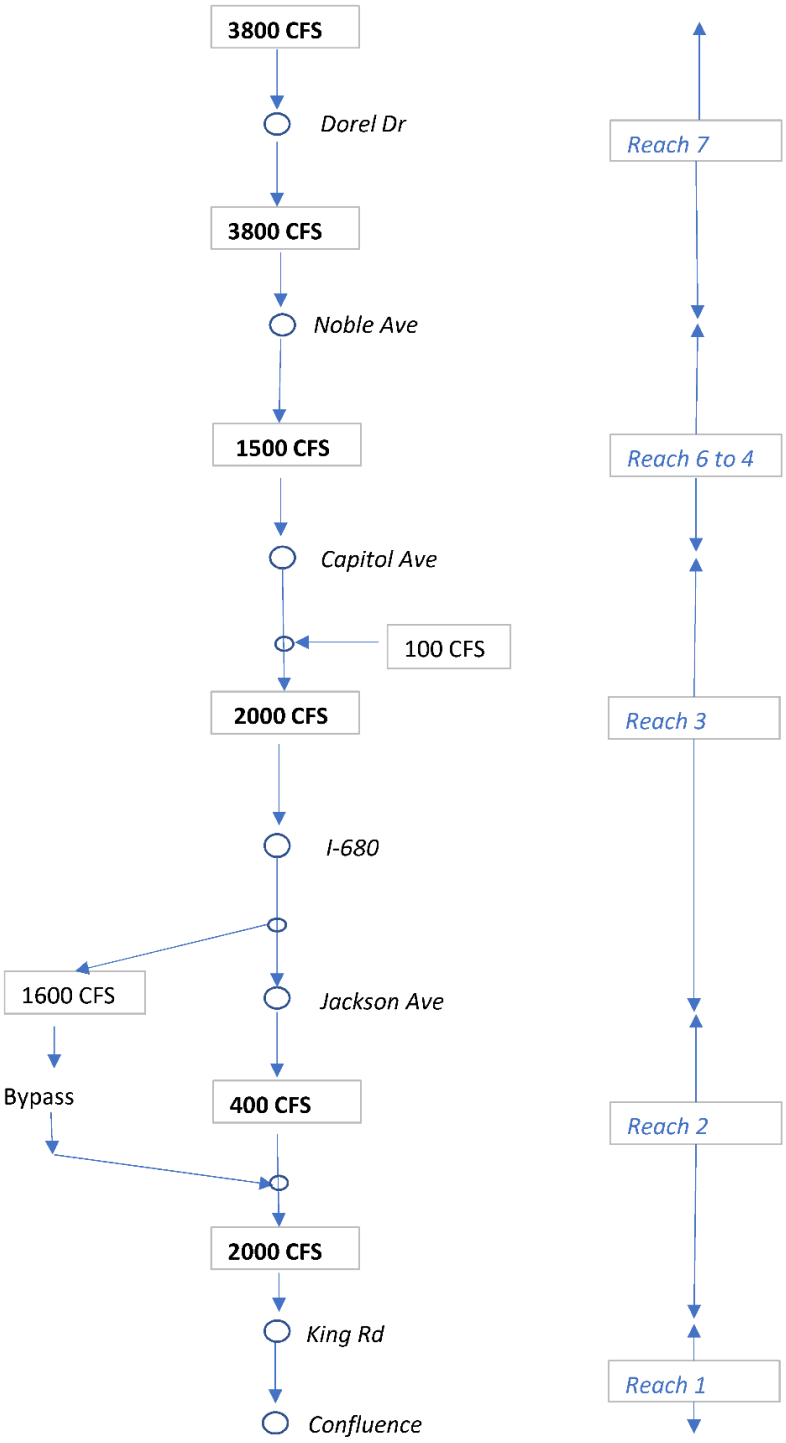



**Figure 6-3. Post-Project Conditions Flow Schematic: Flows remaining in creek during a 100-year flow event (spilling flows are subtracted)**

## 6.3 **Geomorphology Study**

The project team worked with a consultant, ESA, to conduct a Geomorphology Study to analyze the existing geomorphic conditions and develop a more detailed plan to properly restore the channel in consideration of the geomorphic and ecological conditions. A report was produced that summarized the current geomorphic conditions of the creek and the details of the geomorphic analysis and recommended design plan. The report can be found in Appendix G.

Approaches to river restoration can be categorized in terms of process versus form based and active versus passive. Process based restoration works with and is sustained by the geomorphic processes, while form-based restoration is inconsistent with and not sustained by the geomorphic processes. Active restoration involves a prescriptive intervention through detailed design of the river morphology, while passive restoration involves a non-prescriptive intervention in which the river morphology is allowed to self-develop. In settings where stream power and sediment supply are high and there is close proximity of the river to high value development, there isn't space to accommodate the river's geomorphic dynamism, and highly engineered active and form-based restoration with regular maintenance is likely needed to protect infrastructure from erosion and/or maintain flood capacity given deposition. In contrast, with sufficient room for the river, high stream power and sediment supply can enable a more passive and process-based restoration approach in which the river has the capacity to develop its own morphology by eroding and depositing sediment.

Upper Penitencia Creek exhibits a highly variable flow regime with infrequent large events that erode and deposit significant volumes of sediment. It has an average slope and bankfull discharge that are more consistent with a transitional braided/meandering planform than a highly meandering planform (Leopold and Wolman, 1957). Historical analysis of Upper Penitencia Creek also supports this planform designation (SFEI and Jordan studies). When compared to other creeks in the area, the flow and sediment regimes of Upper Penitencia Creek are relatively intact and the lateral space for the creek is relatively wide such that a more passive and process-based restoration approach could be pursued.

The effective discharge, the flow that moves the most sediment over time, was estimated to be 350 cfs for Upper Penitencia Creek. The study analysis estimated a bankfull width of about 25 feet and a bankfull depth of 1.5-3 feet. These bankfull dimensions may be expected to develop naturally over time within the project reaches. Based on the study recommendations, the proposed alternative can self-develop to these dimensions without significant earthwork or construction of man-made geomorphic design features such as chute-pool design. This requires very little channel modification, except in Reach 1 where the channel would be widened, and floodplain benches would be constructed.

## 6.4 **Staff Recommended Project Details**

**Reach 1A. Coyote confluence up to the BART/VTA Tracks Crossing**

The existing channel is approximately 10 feet deep with the width varying from 60 to 90 feet bank to bank. For the length of this sub-reach (2,000-ft), the design is to widen to the south side of the channel by excavating a 70-ft wide flood bench. A 20 to 30-ft wide combined maintenance road/trail would be constructed at the top of south bank. The bank and flood bench would be planted with appropriate native vegetation The vegetation palette would include native trees, such as oaks and willows, and non-native vegetation would be removed from the north bank and replanted with appropriate native species. This reach would require a dedication from the landowner. The project team has been working with the site owner and the City of San Jose throughout the planning process and would continue to acquire the necessary dedication in design. The meandering low flow channel should be studied in further detail during the design phase for optimizing sediment transport.

A key aspect in this sub-reach is the confluence with Coyote Creek. Currently, Upper Penitencia Creek enters Coyote Creek at a 90-degree angle, resulting in a sediment deposition and Arundo problem at the confluence. The Project would widen the channel and redirect the bankfull channel to meander smoothly into Coyote Creek. The existing maintenance bridge, a major obstruction, would be removed and replaced with a pedestrian bridge that would traverse over the channel approximately 200-ft upstream of the confluence.

There are two existing vehicular bridges that provide access to the Flea Market from Berryessa Road. These would be removed and replaced with bigger bridges by the developer of the Flea Market. The developer is responsible for constructing the bridges over the existing channel, Valley Water would be responsible for any increase in bridge span needed to overpass the proposed widened channel. It would be ideal if the construction of the Proposed Project coincides with the developer's construction of the bridges. In that case each bridge could be built as one structure and a cost share agreement worked out between Valley Water and the developer. If not, Valley water could expand the bridges after they have been built.

The channel in reach 1A is highly confined and the major component of the recommended design is the widening of the corridor to approximately 200 feet. The following details were determined and recommended by the Geomorphology study. The depth of this channel where sediment is actively transported and where vegetation is unable to colonize is a couple feet, which informed a proposed bankfull depth of 1.5 ft for reach 1A. The low bench is correspondingly located at this stage, a mid bench at 3 ft stage, and a high bench at 5 ft stage to encourage a gradient of riparian to more upland vegetation based on other field observations. The alternating planform distribution of the benches is intended to encourage more planform variability and increased sinuosity within a range that's appropriate for this creek system. The realigned channel shouldn't be considered the exact flow path that will be maintained but rather a pilot channel that the geomorphic processes will further develop over time. Similarly, the

meandering planform distribution of the benches is intended to provide the opportunity for increased sinuosity as opposed to strictly prescribing a meandering bankfull channel alignment. Large wood structures could be added to the leftover existing main channel as a backwater alcove habitat feature where the adjacent realigned channel transitions back to the existing main channel just downstream. Further downstream, there is also space along the creek's north bank to lay back the bank to a more stable side slope and create additional floodplain. The confluence with Coyote Creek can be allowed to evolve on its own given the extra space set to a low bench stage.

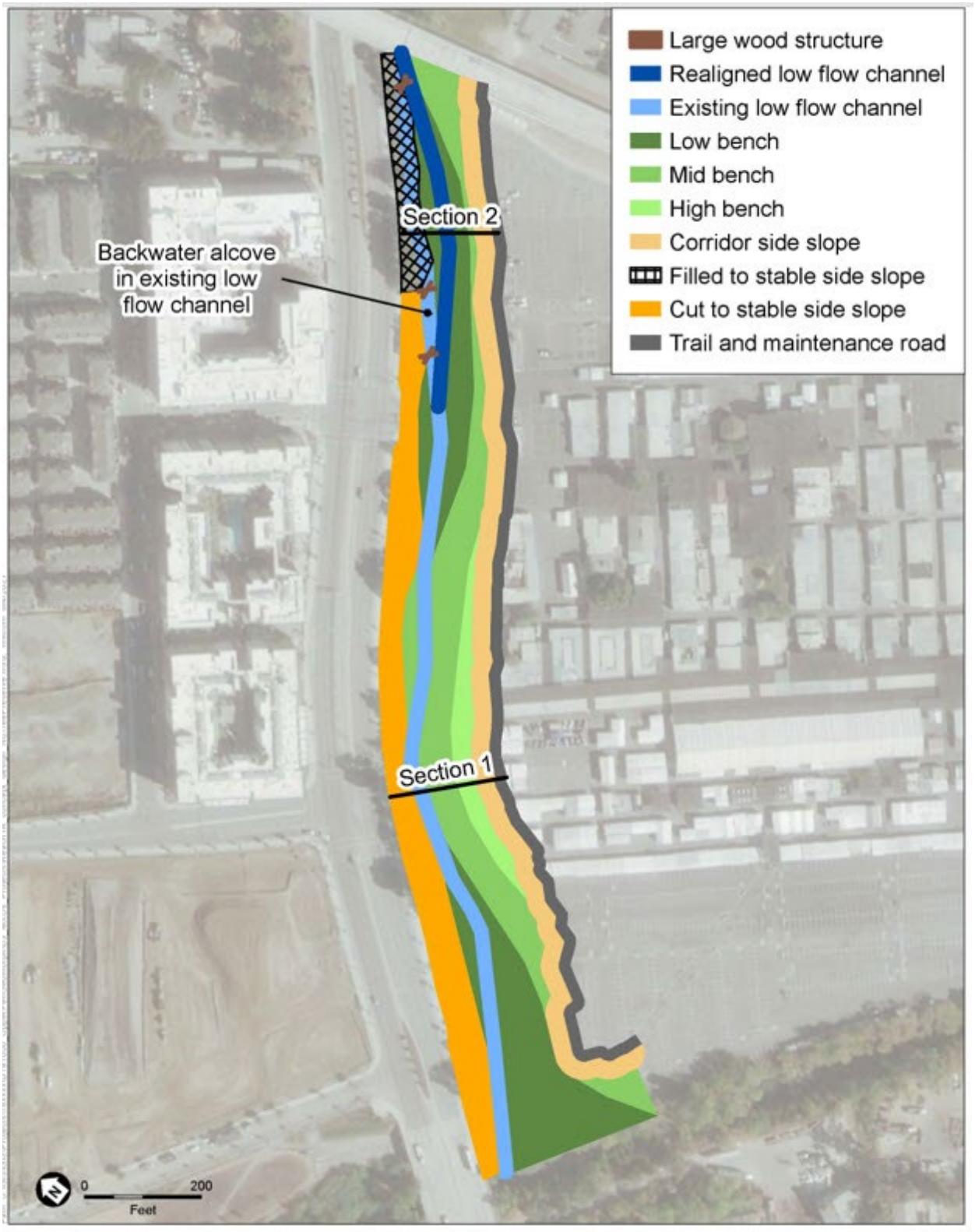



**Figure 6-4. Design Layout: Reach 1 Channel Widening w/ Ecological Enhancement**

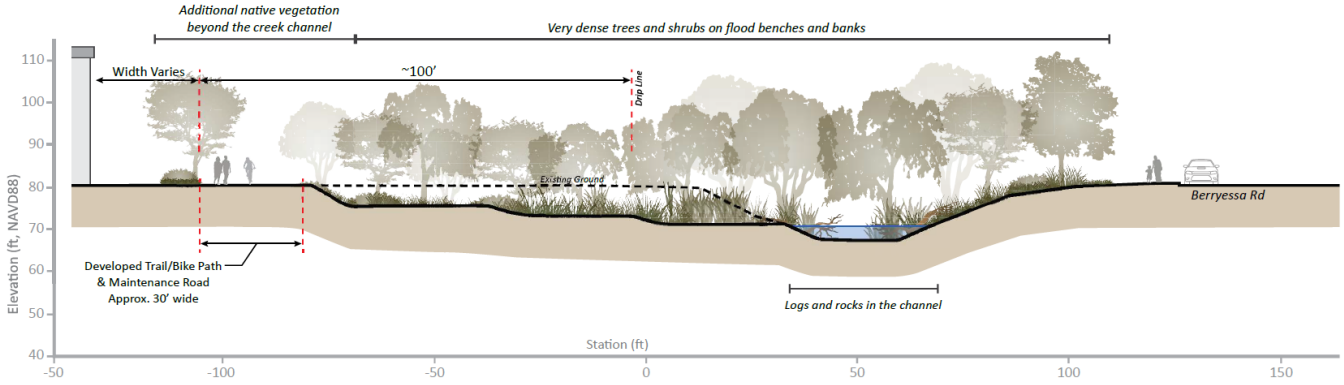



**Figure 6-5. Reach 1 Proposed Channel Widening w/ Ecological Enhancement (Section 1)**

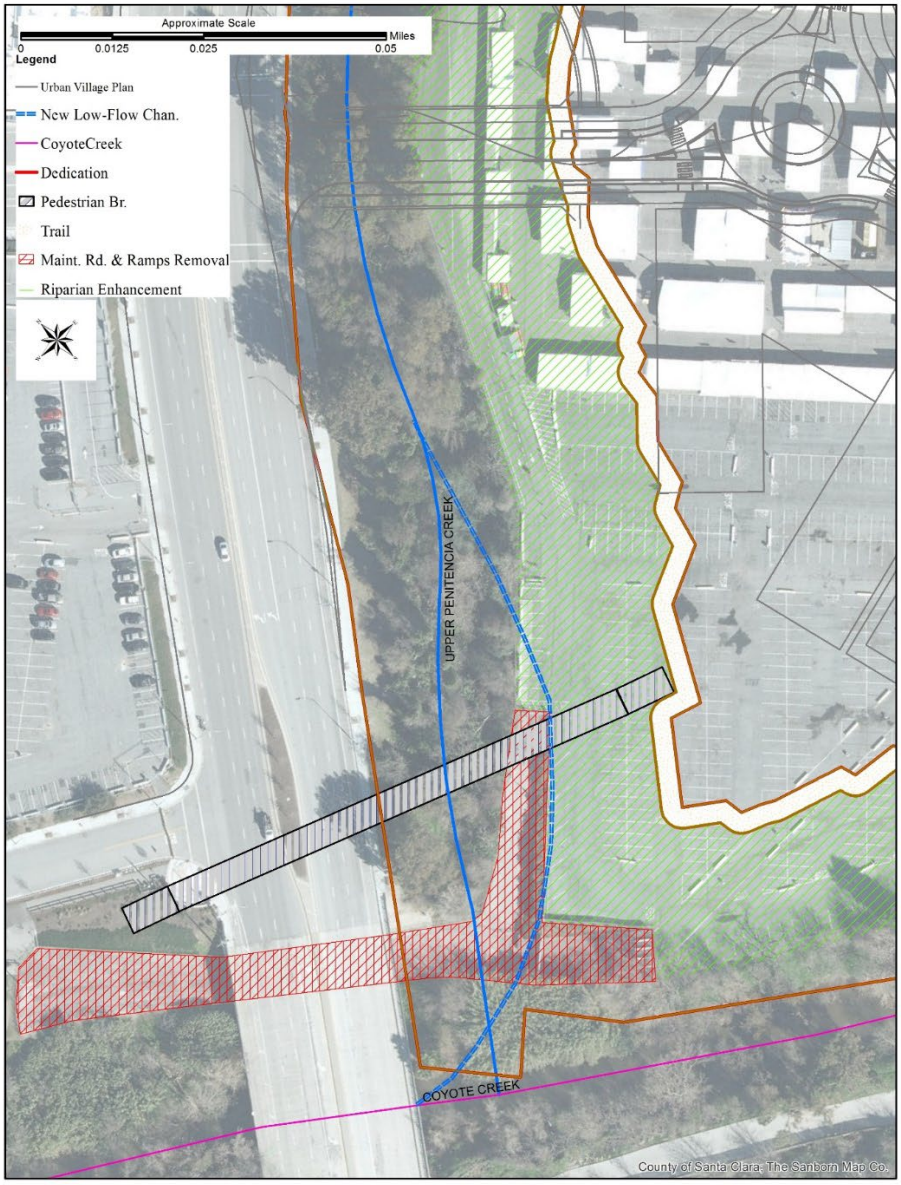



**Figure 6-6. Reach 1 Coyote Creek Confluence Proposed Work**

## Reach 1B. BART/VTA Tracks Crossing to Berryessa Way Bridge

The existing creek narrows from 200-ft wide along the new BART station down to approximately 75-ft under the BART tracks. Due to the elevations of the Central Pipeline under the creek, widening is not recommended. 4 feet high floodwalls (above ground) are proposed along both bank banks for this segment of Reach 1, which is only approximately 150-ft in length. These are needed to contain the flows as the water surface rises due to the constriction of the existing channel.

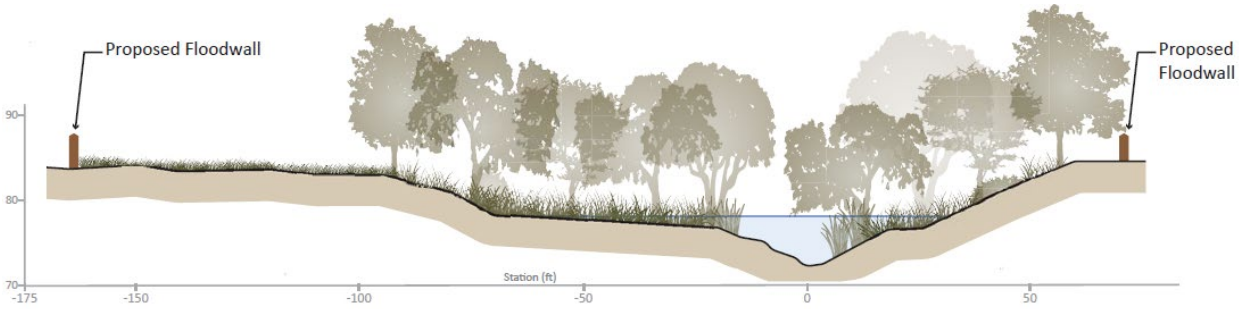



**Figure 6-7. Reach 1 Proposed Floodwalls at Berryessa Station Way**

## Reach 1C. Berryessa Station Way Bridge up to King Road

The majority of this segment was widened and ecologically restored with the BART/VTA project in 2013. Upstream of the BART station, a 500-ft long reach of the existing channel (up to King Road) would be widened along its south bank with a flood bench about 35 feet wide. Impacts would include existing vegetation and maintenance road removal, but a new maintenance road and trail would be added plus native vegetation would be planted along the flood bench and channel slopes.

King Road would be expanded to contain the design flow; proposed design is jack and boring three 12'x5' culverts adjacent to existing culvert. The City of San Jose is currently considering expanding the road crossing to include more lanes for traffic, so it is possible the design could change to work with the City to build a larger bridge for flow capacity.

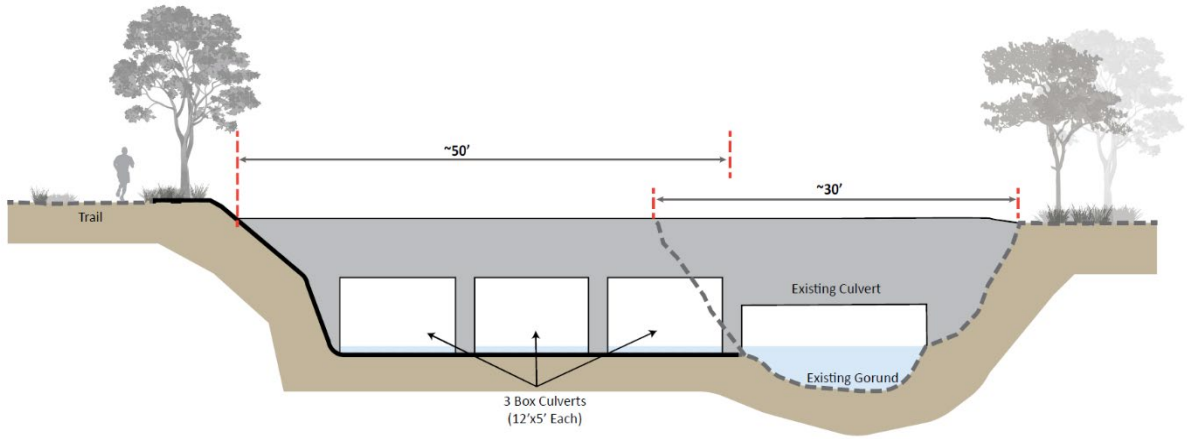



**Figure 6-8. Reach 1 Proposed King Road Expansion**

## Reach 2

Current Main Channel – King Road to Jackson Avenue King Road

As mentioned above, King Road would have to be widened to increase the capacity to the design flow. For the most part, the main channel in Reach 2 would be left in its current conditions, except for a 500-ft stretch from King Road up to the confluence with Mabury Bypass. The existing channel would be widened 40-ft to the south with a densely vegetated flood bench.

Mabury Bypass

The most significant aspect of the alternative in Reach 2 is converting the Mabury Bypass to the main flow channel. The majority of flows (up to 1,600 cfs) would be diverted into the Mabury Bypass (diversion structure would be in Reach 3) while the existing main channel would be used for extra capacity for higher flows (up to 400 cfs). The capacity of the Mabury Bypass would be increased to approximately 1,600 cfs with 2.5 to 3-ft levees along portions of the south bank adjacent to Mabury Road and north bank adjacent to Cape Horn Drive. The ecological restoration aspect can include Sycamore groves throughout the bypass.

The Upper Penitencia main channel in reaches 2 and 3 is separated from the adjacent 200+ ft wide corridor by a high berm and is fully non-adjacent to the corridor in the bypass area between the Mabury Road crossings. Lowering of the berm and any high floodplain as well as shifting the main channel into the bypass are high priorities to allow the creek to more frequently access the floodplain to erode and deposit sediment and shape its own morphology. The stage to which the berm and any high floodplain can be lowered is based on estimates for the size of the bankfull channel, which was estimated as 25 feet wide and 1.5 to 3 feet deep. In the bypass sub-reach between the Mabury Road crossings, a wide low bench is proposed on either side of the low flow channel to encourage lateral dynamism and the development of bars across the channel as found in more braided systems. Relative to reach 1, reaches 2 and 3 exhibit less dense vegetation that is likely due to drier conditions from a deeper water table. Given the stabilizing influence that vegetation can have on channel morphology by resisting erosion and the development of new flow paths, the sparser vegetation in reaches 2 and 3 may result in more dynamic channel behavior once the creek has access to more of the corridor. Rather than prescribing a precise morphology that the creek is expected to maintain, the preferred design concept reflects a more passive design approach that gives the creek the ability to further develop its own morphology over time. Net sediment deposition magnitudes were estimated to be on the order of a couple feet averaged over the corridor area over the course of two decades, which is compatible with flood capacity objectives for the creek as well.

## Reach 3

Jackson Avenue up to Highway 680

There are three extra box culverts at Jackson Avenue that are currently not in use, these would connect the Mabury Bypass from Reach 2 to Reach 3. As mentioned in the Reach 2 description, the Mabury bypass would be used as the primary channel with the majority of the flows, while the existing main channel would be used to increase capacity during high flow events.

Downstream of Highway 680, the existing riparian corridor consists of a low flow meandering channel with floodplains along the existing public right of way. This configuration would be

optimized with some excavation along the floodplain and setback levees to contain the design flow and allow the floodplain to inundate under design flows; decreasing downstream flood impacts and increasing refuge habitat for fish during flood events. The diversion of the flows to the Mabury Bypass would be located approximately 500-ft downstream of I-680 and would be optimized to split the design flow with 1,600 cfs to Mabury Bypass and 400 cfs kept in existing channel.

At I-680, large woody debris and cobble/boulder features would be placed within the channel near I-680 underpass to increase velocity refuge and cover habitat for steelhead and other fish as well as increasing sediment deposition and overall habitat complexity.

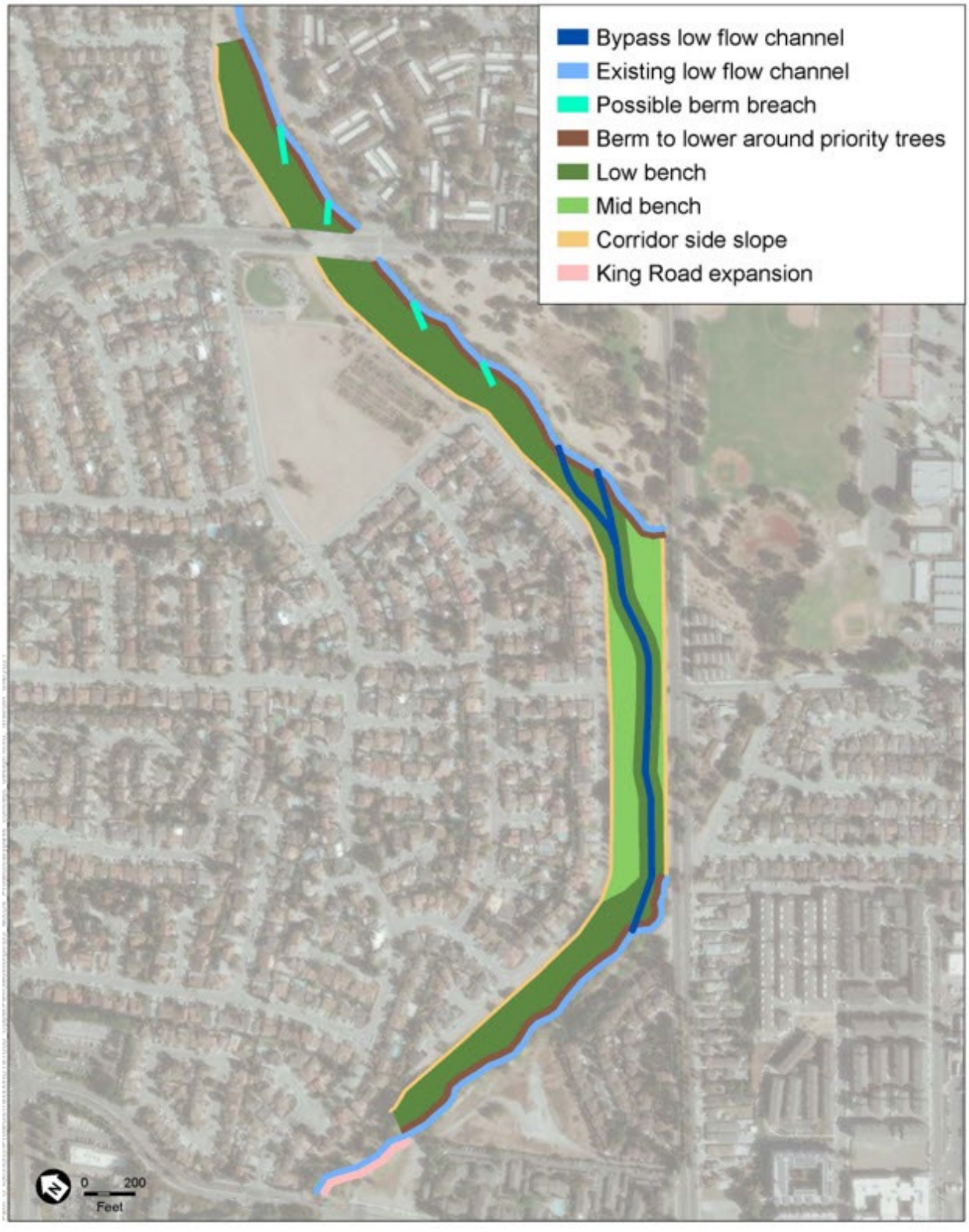
## 6.5 **Right-of-Way (ROW) Requirements**

The majority of the proposed work is on public land (Valley Water and City of San Jose). It is expected that a portion of the Flea Market property will be needed for the proposed widening along Reach 1. Valley Water has been working closely with the City and the owner of the land to receive a dedication of the land required to build and maintain the proposed Project. With the flood City of San Jose riparian setback policy and the flood protection that would be provided, the owner of the land has been very cooperative in working with Valley Water to ultimately result in a dedication of the land from the owner to Valley Water.

The proposed work at King Road and just upstream and downstream of the culvert will require close coordination with the City of San Jose and receiving easements to build and maintain the proposed box culverts and widened channel.

Along Reach 2, the majority of the proposed work is within the Mabury Bypass which is owned by the City of San Jose with Valley Water having an Easement. No additional right-of-way is required.

The proposed work along Reach 3 is on Valley Water land and no additional ROW is required.




SOURCE: ESA 2021

Upper Penitencia Creek

**Figure 6-9. Reach 2 & 3 Design Layout: Mabury Bypass and Main Channel**

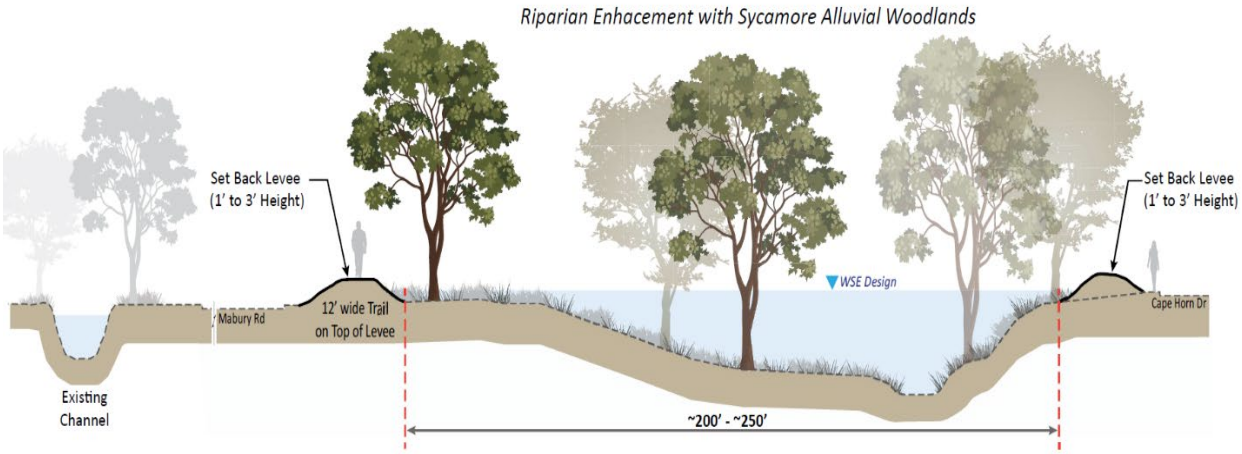



**Figure 6-10. Reach 2 Proposed Work: Mabury Rd (South) to Mabury Rd (North)**

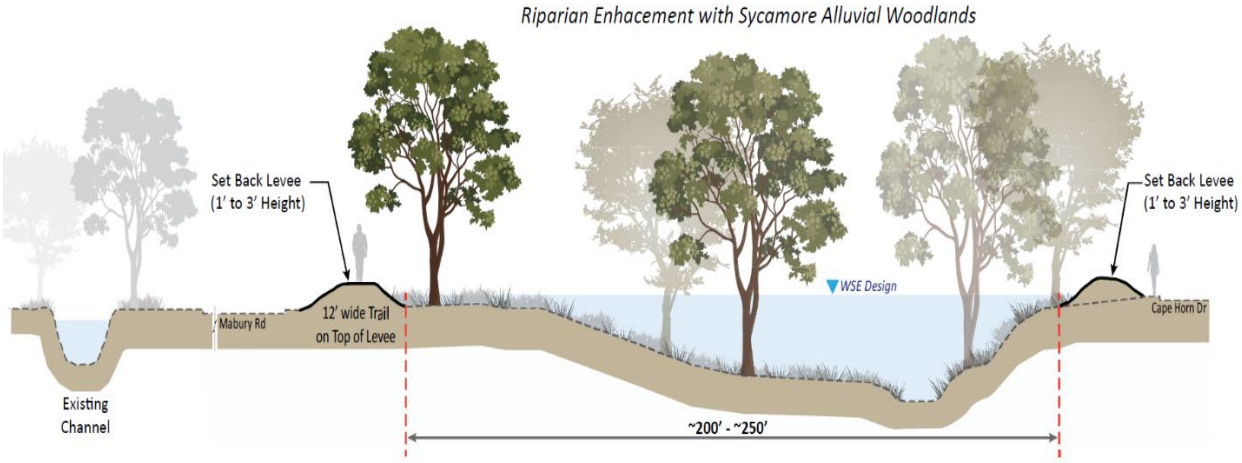



**Figure 6-11. Reach 2 Proposed Work: Riparian Enhancements and Levees**

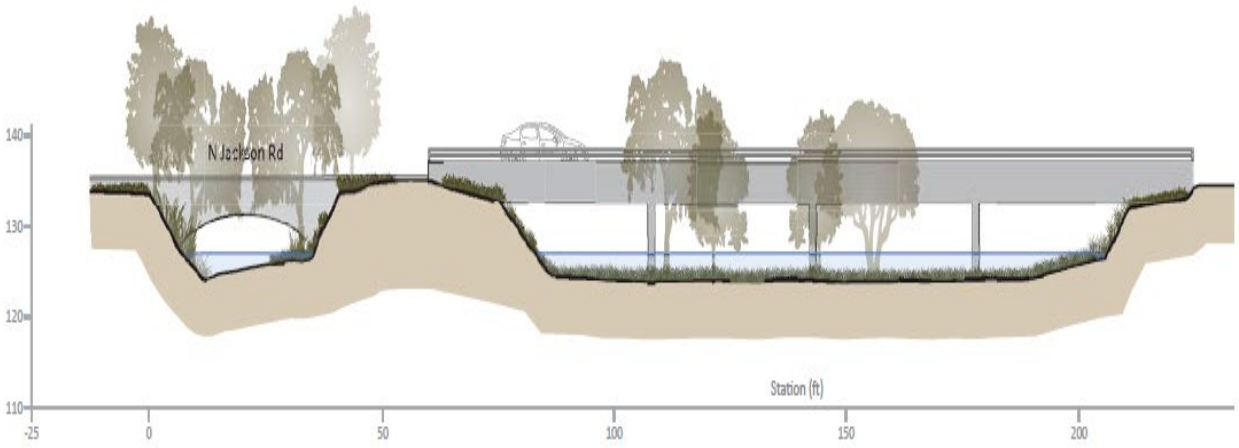



**Figure 6-12. Reach 3 Jackson Rd. Culverts on Existing Channel & Mabury Bypass**

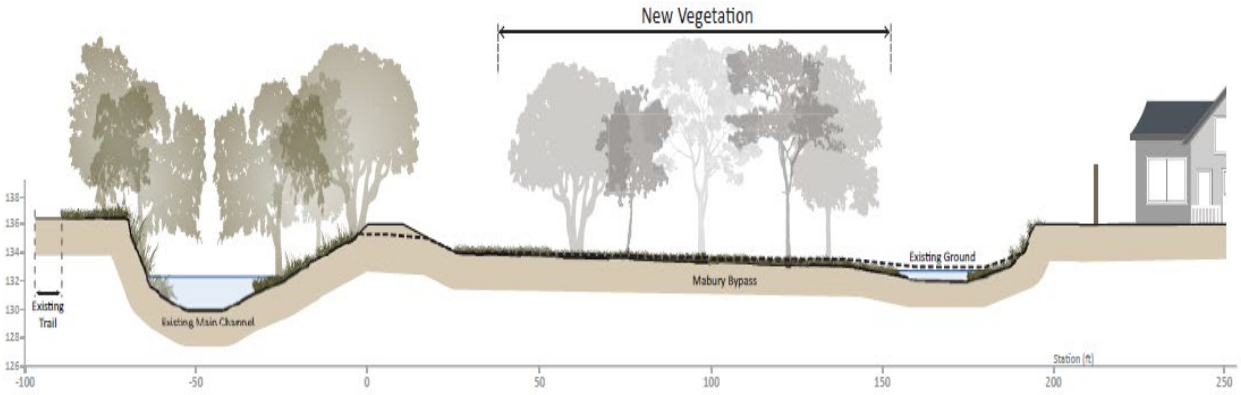



**Figure 6-13. Reach 3 Main Channel & Mabury Bypass Proposed Work**

# Chapter 7: Maintenance Program

An important component to include with the PSR is a detailed Maintenance Plan. This will be updated as the Project moves along in Design, but it would be ideal to have a solid idea of the detailed maintenance work that would be needed for the proposed project. This would include the initial maintenance within the first 5 years to make sure the new vegetation grows as intended. It would be important to clearly outline the existing maintenance work that would need to continue, additional maintenance that would be required, maintenance access, and how often it would be needed.

After the Geomorphic study and a more detailed design of the channel restoration aspects is established, a thorough Maintenance Program will be created. This can be done in coordination with the Maintenance Unit to update the Upper Penitencia Creek "Waterway Existing Level of Service."

## 7.1 Maintenance History - Stream Maintenance Program

Over the years, minimal maintenance has been done along Upper Penitencia Creek due to the fact that Valley Water has limited right-of-way throughout the project area. Valley Water will only conduct maintenance where it has fee or easement. The majority of the maintenance activity has been herbicide application and weed abatement but there has also been tree/bush trimming where needed (mainly I-680 to King Road). It is important to note that Reach 1 has a significant issue with non-native vegetation overgrowth, but Valley Water has very little right-of-way along the reach. Although not routine, there has been some sediment removal in the past under the Mabury Road crossings in reach 2 due to concerns of flooding. Analysis was done to show that this deposition in the culverts is the equilibrium condition, does not induce flooding, and there is no need to remove the sediment since it will just re-deposit as part of the creek's natural processes.

## 7.2 Ongoing Maintenance & Operation Activity

Ongoing Operation Activity

Maintain function of water diversion structure and fish ladder at the Mabury Diversion. Located along the main channel of Reach 2, just downstream of the East Mabury Road crossing. Diversion must be fish passable with sufficient flow during up- and down-stream migratory period: Sept 16 through May 31. Operation includes screened inlet to prevent diversion of fish.

Ongoing Vegetation Maintenance

Ongoing maintenance activities include trimming/removal of overhanging vegetation growth, weed abatement with hand mowing, VWG, and herbicide application (including aquatic). As mentioned earlier, Valley Water only conducts maintenance where they have fee and easement. Valley Water has very little fee and easement in reach 1, mostly along the VTA site. This site is currently maintained by the VTA. In Reach 2, this is from King Road up to Educational Park

Drive; along the main channel mainly. Most of the Mabury Bypass area is owned by the City of San Jose. The stretch of Reach 2 from Educational Park Drive up to Jackson Avenue has a problem with trees dying and falling into the creek, but Valley Water does not maintain since it is not on their fee or easement.

Ongoing Sediment Maintenance

Site visits to the West Mabury Road culvert showed a very large amount of deposition within the culvert, filling up the original 8ft high culvert so that only about 3-4ft of clearance remained between the channel bed and the soffit. When sediment removal to restore full capacity has been done in the past, the creek deposits sediment there to the same elevation after a few years.

The Jordon geomorphic report on Upper Penitencia Creek compared the longitudinal profile between 1985 and 2004. The results indicate 0 ft to 1.5 ft of deposition along West Mabury Road, far short of the 4 ft deposition to bury the culvert. Reconnaissance assessments performed in 2003 by PWA also characterize this area as slightly depositional using a basic sediment budget analysis.

Construction plans from 1991 which widened West Mabury Road show an existing upstream and downstream channel profile that is much higher than the concrete invert of the culvert. It was designed this way with it being backfilled to match the existing invert (at that time). These plans support the evidence that the stream bed is generally in equilibrium, with a slight depositional trend occurring over long term, when there is only 4 ft of clearance between the channel bed and soffit.

It is evident that any sediment removal or stream alteration near West Mabury Road crossing will be offset by eventual sediment deposition that will force the equilibrium condition that is its current state. In addition, the buried West Mabury culvert does not pose a threat to flooding due to most of the flows leaving the creek upstream and passing through the bypass channel. It is recommended that no sediment removal be performed, and the crossing left as-is.

## 7.3 New Maintenance Activities for Project

Table 7-1 below summarizes the typical maintenance triggers and activities for different flood protection elements. A draft Operation & Maintenance (O&M) Plan for the Project is being worked on and will transition into the Design Phase. Once the Project is constructed, the O&M Plan will be used to direct the maintenance of the Project elements and eventually be rolled into the SMP. The following is a brief description of the O&M that will be needed for each reach.

**Reach 1 Operations and Maintenance**

The Proposed Project is designed to allow for a densely vegetated channel and hence, vegetation control for creek capacity is not expected. But certain maintenance activities would still be required such as non-native species removal, weed abatement, minor tree trimming along the

trail, and sediment removal. The vegetation planting would have to be closely monitored within the first 5 years to ensure that it fully establishes, but this should be the responsibility of the contractor. The floodwalls may require graffiti control. The main maintenance access points would be at the Coyote Creek confluence, BART Tracks, Berryessa Station Way, and King Road. There would be maintenance ramps leading down from the maintenance road into the main channel. Maintenance is expected to be carried out annually and likely to include an encampment cleanup program.

**Reach 2 Operations and Maintenance**

Proposed ecological restoration along the Mabury Bypass may require some vegetation control for flow capacity. The Bypass is expected to establish as Sycamore woodland and not to be densely vegetated. In addition, the vegetation planting would have to be closely monitored within the first 5 years to make sure that it established appropriately. Maintenance is expected annually and may include sediment removal vegetation management with removal of non-native species, trimming, weed abatement, and debris removal. It may also include an encampment cleanup program.

**Reach 3 Operations and Maintenance**

Proposed ecological restoration along the Mabury Bypass may require some vegetation control for flow capacity. The Bypass is expected to establish as Sycamore woodland and not be too densely vegetated. The vegetation planting would have to be closely monitored within the first 5 years to make sure that it established appropriately. Maintenance is expected annually and may include sediment removal vegetation management with removal of non-native species, trimming, weed abatement, and debris removal. The diversion/split would possibly require sediment and vegetation removal for optimal performance. In addition, it may need minimal operation for the water supply purposes of allowing flows to be diverted to Overfelt Ponds.

## 7.4 **Maintenance access**

There is a lot of open public space adjacent to the creek that allows relatively easy access to remove sediment and vegetation. For the project work, there are/will be maintenance roads and ramps where needed to access for maintenance work.

**Table 7-1: Typical Operations & Maintenance triggers and activities for the proposed flood protection elements**

| Floodwall | | |
|---|---|---|
| Component | Trigger | activity |
| Sheetpile & floodwall coating | observed damage to coating such as penetration, chipping, or corrosion | recoat floodwall or repair coating |
| Structure | Observed damage to structure, alignment or foundation, concrete deterioration, exposure of steel and wear, significant floodwall deflections from established survey control points | Repair structural deterioration, consult structural engineer to analyze significant floodwall deflections and repair as needed in order to maintain floodwall to design specifications |
| Vegetation | Vegetation growth on gate panel or any component | To allow inspection of the outboard and inboard side of floodwalls, remove vegetation via hand removal, mechanical removal or chemical treatment |
| Vandalism | Observed graffiti on panel, removal of parts or visible damage | Paint and repair any defaced surfaces, repair or replace items that have been stolen or vandalized |
| **Levee** | | |
| Component | Trigger | activity |
| Structure | Observed levee deflections and settlement of more than one foot | 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 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 | Erosion of levee crown, observed animal burrows, damage to crown integrity, slumps and cracks | Reconstruct or repair levee crown due to sags, depression or groundwater subsidence to design specifications |
| Slopes/Banks | Erosion of slopes, scouring that undercuts banks, animal burrows, seepage, slumps and cracks | 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 | Vegetation growth that obstructs inspection of levee or compromising its integrity, observed woody vegetation establishment | 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. |
| **Maintenance Roads/Trails & Access Ramps** | | |
| Component | Trigger | activity |

| | | |
|---|---|---|
| Roads | Surface damage to access roads/blockage | Repair access roads and pathways to design specifications |
| Ramps | Surface damage to ramps/blockage | Repair ramps to design specifications |
| Vegetation | Observed vegetation growth hindering access to roads or ramps, hazardous tree conditions, channel blockages | 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. |
| **Miscellaneous** | | |
| Component | Trigger | activity |
| 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 | 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 | Observed graffiti, fence and sign damage within areas containing project elements | 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 | Removal of any project components or parts of them, destruction or damage to project elements, littering | Repair or replace any components which are damaged or stolen, remove littering within project components location or Right of Way |
| Unauthorized encroachments | Unauthorized obstructions and/or additions to areas of project elements or Valley Water Right of Way | 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 |
| Unhoused encampments | Observed encampments obstructing inspection passage, repair activities or visual inspections of project elements or Valley Water Right of Way; observed blocking access to roads or ramps. | Monitor, evaluate and repair impacts from encampments, abate encampments with the assistance from local authorities |
| Riparian restoration & enhancements | | Invert, flood bench, and restored banks would be left as natural as possible with no required regular maintenance other than non-native species removal and the removal and replacement of hazardous trees as needed. |

# Chapter 8: Project Cost, Funding, and Schedule

The estimated capital cost for the recommended Project, Phases I and II, is $24 million in 2019 dollars, including design, construction, and contingencies. The overall (including current effort) current value maintenance cost for the 50-year project length is $12.55 million. Thus, the overall project cost in 2019 dollars would be $36.55 million. Below are the cost breakdowns, the detailed cost estimate is in Appendix 3.

## 8.1 Capital Cost

Since the project's budget is limited, it is recommended that the project continue with the design and construction of phases I & II: reaches 1, 2, and 3. Phase III, reaches 4 through 7, will be saved for future design and construction efforts.

The capital design/construction estimate is summarized below in table 8-1. The detailed cost estimate is provided in Appendix 3.

**Table 8-1. Project Capital Costs**

| Reach | Capital Cost (millions 2019 dollars) |
|---|---|
| **1** | $17.1 |
| **2** | $5.0 |
| **3** | $1.7 |
| **Staff-Recommended total Capital Cost (Phases I & II): $24 million** | |
| | |
| 4 | $12.3 |
| 5 | $15.7 |
| 6 | $9.1 |
| 7 | $5.7 |
| Phase III future Capital Cost: $43 million | |

## 8.2 Maintenance cost

The maintenance cost for the staff-recommended project would be $251,000 per year. The total maintenance cost for the 50-year life of the project would be $12,550,000. The cost estimate is broken down in the following table.

**Table 8-2: Staff-Recommended Project Maintenance Cost**

| Reach | Yearly Maintenance Cost | 50-year Maintenance Cost |
|---|---|---|
| 1 | $150,000 | $7,500,000 |
| 2 | $71,000 | $3,550,000 |
| 3 | $30,000 | $1,500,000 |
| | | |
| TOTAL: | $251,000 | $12,550,000 |

## 8.3 **Funding**

The estimated staff-recommended project cost is as follows:

Design/Construction: $ 24,000,000
50-Year Maintenance: $ 12,550,000
Land Acquisition: $ 0
---
Total Lifetime Cost: $36,550,000

The design and construction phases of the Project would be paid by funds from the Safe, Clean Water fund.

## 8.4 **Schedule**

The Board elected to accept the staff recommended alternative and authorized the design and construction of the Project. The following milestones are the next steps:

- Commence with the design phase in winter 2022;
- Finalize design phase and Certification of EIR in 2025;
- Construction commencement in 2025 and completion by 2028.

# Chapter 9: Conclusion and Recommendations

The Staff-Recommended Project meets all the specific project objectives and the NFP objectives adopted by the Valley Water Board. Therefore, it was recommended that the Project should be approved, and that detailed plan and specifications be developed for its construction. In December 2019 the Board approved the project to move forward with design and construction of Phases I and II.

Here is a brief description of the Staff Recommended Project that was presented to the Valley Water Board of Directors:

Phase I (Meets SCW Local Funding KPI) –Reach 1 (Coyote to King Rd)

- Widened bank to provide additional channel capacity and stream restoration
- $17 million capital and $150,000 annual maintenance cost
- Phase I would protect 450 parcels from 100-year flood including the BART Station area

Phase II –Reaches 2 & 3 (King Road to Capitol Ave)

- Channel widening and stream restoration and short setback levees and floodwalls
- $7 million capital and $101,000 annual maintenance cost
- Phases I and II would protect 1,250 parcels from 100-year flood including BART Station area

The project team recommended to the Board moving forward with Phases I and II of the project. With a cost of less than $30 million, the Project can still provide 100-year flood protection to the most flood prone areas, downstream of Highway 680, and not induce flooding in Coyote Creek. This is significantly below the budget of $43 million with some major benefits: protect the new BART station plus future Urban Village being planned at the Flea Market, flood risk reduction for the most flood prone reaches, extension of Penitencia Creek trail down to Coyote creek, and major ecological restoration.

The upper reaches, Highway 680 up to Dorel Drive, would add another $43 million and require further coordination with the City of San Jose and County of Santa Clara to develop detailed plans for detention basins. With the large number of parcels this would protect, it would give a good benefit to cost ratio and that may bring the USACE back into the project at a later time.

Figure 6-1 is the 100-year floodplain, existing conditions versus post-Project conditions. The existing flooding footprint is the combination of the blue and red flooding. The Post-Project conditions flooding is just the blue footprint, the red would be removed from the floodplain.

**On December 17th, 2019, the Board approved the Staff Recommended Project. The Project will move forward with the design and construction of Phases I and II.**

The project team worked closely with internal and external expertise, as well as with regulatory agencies, to develop an ideal multi-objective solution. As the project goes into design, the project team looks to continue this communication and meetings with internal experts (environmental planners, biologists, maintenance, water supply) as well as with regulatory agencies.

Phase III: Highway 680 up to Dorel Drive

Due to constraints, the Staff Recommended Project only covered the lower reaches of the project reach with protection up to the 100-year event existing conditions flow, which is 2,000 cfs after flood waters leave the creek upstream. With Phase III, the planning study provides conceptual alternatives that would cover the whole project reach with full 100-year flow event protection. Phase III includes detention facilities that would be on public land, Valley Water as well as the City of San Jose and County of Santa Clara property. Much collaboration was conducted with the City and County through the planning study and there is also a Tri-Party agreement to help facilitate developing a feasible project to provide 100-year protection. But considerable collaboration and teamwork with both the City and County is still needed to develop a project that would meet all party's needs, including the community. The following is a brief summary of Phase III:

Phase III –Reaches 4-7 (Capitol Ave. to Dorel Dr.)

- $43 million capital and $300,000 annual maintenance cost (note: capital costs depend on developing plans and agreements with City of San Jose and County for use of land for flood detention)
- Completion of Phases I through III would protect all 8,000 parcels at risk from 100-year flood