Safe, Clean Water Priority E3: Flood Risk Reduction Studies

Coyote Creek at Rock Springs Flood Protection Project

Problem Definition Report

October 2016

Santa Clara Valley Water District

This page intentionally left blank.

SANTA CLARA VALLEY WATER DISTRICT

Coyote Creek at Rock Springs Flood Protection Project

Planning Study

Project No. 26041024

PROBLEM DEFINITION and CONCEPTUAL ALTERNATIVES REPORT

Prepared by the Hydrology, Hydraulics and Geomorphology Unit

Liang Xu, P.E., Ph.D., Unit Manager
Emily Zedler, P.E., Ph.D., Associate Civil Engineer

Ngoc Nguyen, P. E.
Assistant Officer

October 2016

Contents

Chapter 1: INTRODUCTION

This report has been prepared as part of the Coyote Creek at Rock Springs (RS) Flood Protection Project planning study to document the existing and historical site conditions, flooding problems, and opportunities and constraints.

1.1 Background and Origin of Study

The RS Project is part of the Safe, Clean Water and Natural Flood Protection Program (1), which was put on the ballot by the Santa Clara Valley Water District (District) and approved by the voters of Santa Clara County in November 2012. The RS Project falls under Priority E3: Flood Risk Reduction Studies, with a goal to increase understanding of flood risks in high priority flood-risk zones.

The District has investigated flood protection solutions for the RS Neighborhood in the past. The following summarizes the history and origins of this project.

- 1973. The District's general plan identified the high risk of flooding in the RS Neighborhood. No work was done at that time due to higher priorities (2).
- January 1997. The neighborhood was flooded, with damages to between 20 and 25 buildings, and flooding depths of up 5 feet. The condominium complex now known as Bevin Brook also had 1 ft of water in the garages; no damages to the condominiums were reported (2; 3).
- 1998. The RS Neighborhood was again threatened. Water reached 1 ft below the top of bank near the neighborhood (4).
- Jan 2000. The District entered a $1.16 million cost sharing agreement with the Corps of Engineers (Corps) under their Section 205 authority. Under that authority, the Corps could provide up to $7 million to fund construction for projects that meet b/c ratios greater than 1. The initial agreement funded a study with the goal to identify alternatives which would provide 1% flood protection project for the neighborhood and compute estimated b/c ratios(5).
- Mid 2002. Due to lower than expected estimates of the dollar value for benefits (about $3.5 million for the 1% flood event), the District asked the Corps to provide early cost estimates for constructing the levee. The Corps cost estimates came in at ~ $6.2 million (5), yielding a b/c ratio of 0.56. The District reviewed their estimates carefully, and developed independent b/c ratios which both increased the benefits and reduced the costs. The most favorable ratio computed was 0.76, and would not qualify for Corps' funding under Section 205. As a result, a memo dated August 15, 2002 recommended that the District

pursue the project on their own, either as an interim solution or a permanent flood protection project (5).

- December 2002. Emergency Action, Emergency Response, and Emergency Preparedness plans were completed for the RS Neighborhood (6; 7; 8). These serve as interim flooding solutions for the RS neighborhood. At this time also, the District's Board reached out to the City of San Jose to request a partnership for a flood protection project there (4).

- January 2003. The District ended the joint study with the Corps (9).

- November 2012. The Safe, Clean Water bond measure was approved by voters, which included funding for this planning study to identify flood protection solutions within the neighborhood, and updating the costs and benefits. If the project is deemed feasible, the District will need to obtain funding for its construction.

1.2 Goals and Objectives of the Study

The project objectives are as follows:

- Update the floodplains for flood events of various recurrence intervals, including the 100 year flood event.

- Using the developed floodplains for various recurrence intervals, develop a flood damage curve

- Identify feasible alternatives which would provide 100 year flood protection.

- Explore feasible alternatives for providing flood protection for smaller flood events.

1.3 Previous and Current Engineering Studies

Past engineering studies that have been identified for this area include the following, listed in chronological order. Studies listed below in italics have not been found yet.

- 1973. A District general plan identified the flooding Risk in the Rock Spring Neighborhood; no work was done to address the risk due to higher priorities.

- 1990. A floodplain analysis was conducted by Schaaf and Wheeler to determine whether the 1% floodplain as shown on the Federal Emergency Management Agency (FEMA) floodplain maps would be modified as a result of constructing a new condominium complex consisting of six buildings, now known as the Bevin Brook complex (10). At the time, the FEMA 1% floodplain area was smaller than it is now, and included three of the condominium buildings and part of a fourth building. The study's purpose was to show that the floodplain would not be impacted by construction of the condominiums. Since then:

  - The condominium complex, now known as Bevin Brook, was constructed in 1994.

  - The condominiums were damaged with 1 ft of standing water in their garages during the 1997 flooding (with estimated recurrence interval of 15 years, according to the 1997 flood report(3)), and

  - The FEMA 1% floodplain was updated after the 1997 flood event to include all six of the condominium buildings.

- Early 2000's – geotechnical study for Rock Springs Neighborhood area, completed as part of the Corps Feasibility study. This study has not been found. It is referenced in the Corps' Section 205 Report (2) as a study with limited sampling. Further efforts will be made to locate this document...

- December 2002. Interim Flooding Solutions in the form of Emergency Action, Emergency Response, and Emergency Preparedness Plans were completed for RS neighborhood (6; 7; 8).

- 2003. The Draft Section 205 Corps' report was completed (2). This report is a feasible alternatives study which contains proposed flooding solutions for the RS neighborhood as well as background information on the engineering investigations done to determine feasibility (geotechnical investigations, cost estimates, etc). As noted above, the main conclusion of this study was that the proposed project did not meet Section 205 criteria for federal funding (i.e., the b/c ratio computed was less than 1).

- 2015. District staff updated and calibrated the HEC-HMS model for the Coyote Creek watershed (11). The updated hydrology will serve as the basis for this study. More details on this are summarized below.

- 2016. District staff updated the 1% floodplain for Coyote Creek with a two-dimensional model, using HEC-RAS 5 software (12; 13), updated hydrology and recent survey data (2006 for floodplain and in-channel cross sections from 2011, 2013 and 2014). Although the updated floodplain is not used for regulatory purposes, it is the most updated model and will be used as the basis for this investigation.

Chapter 2: PROJECT AREA

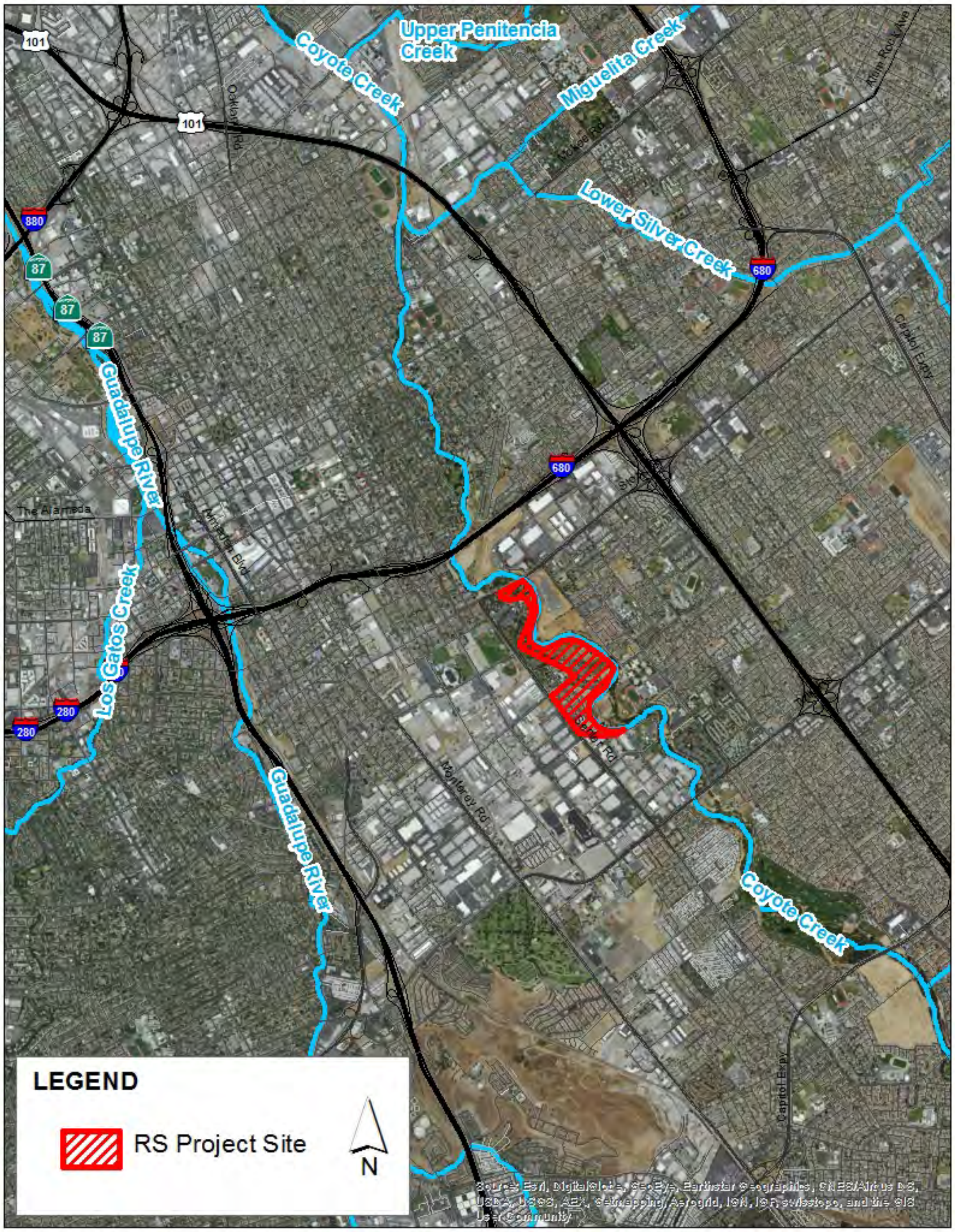

Figure 2.1 RS Project Site Location Map

Figure 2.1 above shows the project site location. It s approximately 83 acres in size and is located on the west side of the middle portion of Coyote Creek within the city of San

Jose. The project site boundaries are determined by the effective FEMA 1% floodplain area, which lies along the edge of the historical Coyote Creek floodplain. The project site has historically been subject to flooding because its elevation is about 5 to 10 feet below the area immediately to the west. There is also a 60 inch-diameter storm main that runs beneath Needles Ave and into Coyote Creek- it backs up into the RS neighborhood when the water level in Coyote Creek is high, causing localized street flooding.

2.1 Watershed Description

Figure 2.2 shows the coyote Watershed, its major water bodies, and the cities located within it. The Coyote Watershed is located on the east side of Santa Clara County and contains parts of Milpitas, San Jose, and Morgan Hill, with most of its area located within unincorporated Santa Clara County. It drains an area of about 322 square miles, mostly located within the Diablo Mountain Range, and is the largest watershed in the county. The northwestern portion of the watershed is in the valley and is heavily urbanized, spanning parts of Milpitas and San Jose. The eastern and southern areas are in the hills, generally open space or large lots. The south-western part of the watershed is open space located within unincorporated Santa Clara County.

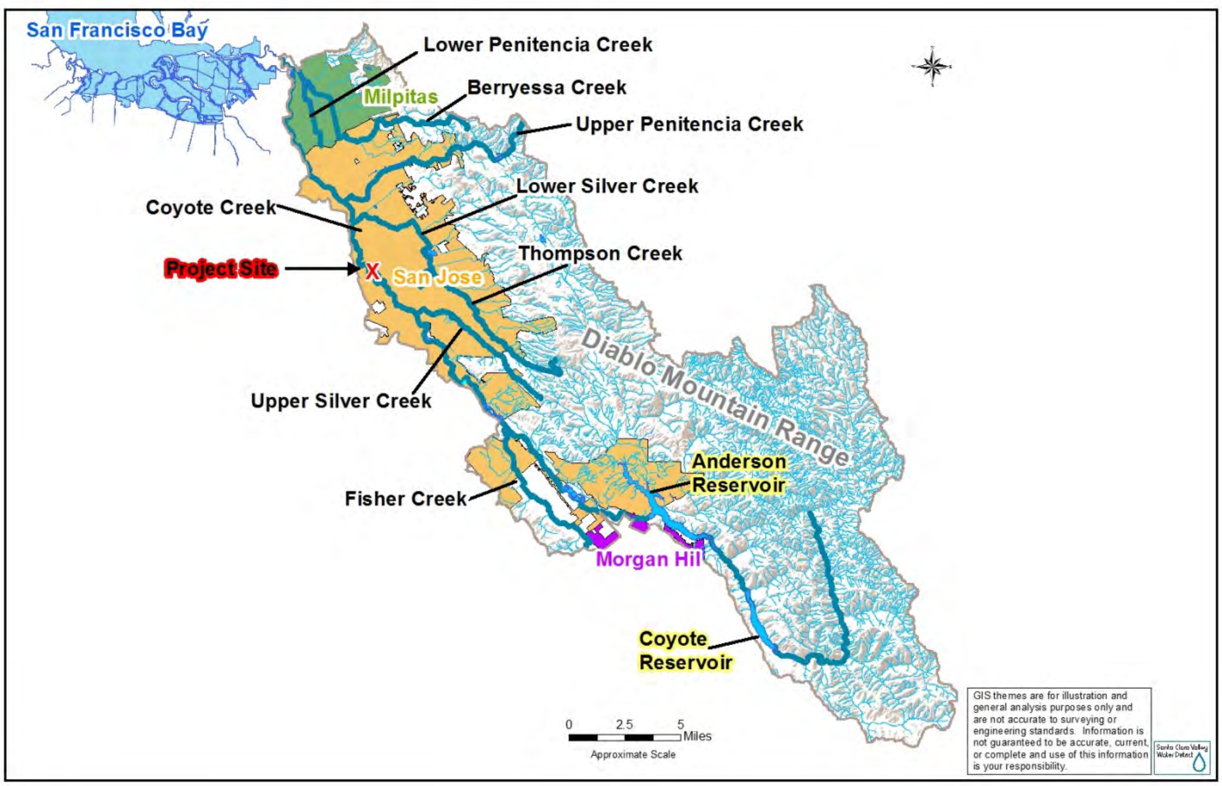

Figure 2.2 Cities, Creeks and Water Bodies within Coyote Watershed.

The watershed originates in the Diablo Mountain Range, draining southeasterly into the most upstream portion of Coyote Creek, which flows south. The creek then makes a U-turn to flow north towards the bay. There are two major reservoirs located within the watershed, Anderson and Coyote. Anderson Reservoir is the largest of the ten reservoirs in Santa Clara County, with a capacity of 90,000 Ac-ft. It was built in 1950 for storing drinking water and for releasing water to groundwater percolation ponds downstream. It was formed by damming off Coyote Creek at a southerly location just north of the U-turn, and receives runoff from about 60% of the watershed area. Coyote Reservoir, located upstream of Anderson Reservoir, was constructed in the 1930s, and has a much smaller capacity of about 23,000 AF.

In addition to reservoirs, there are a number of creeks and small mountain drainages located within the watershed. The watershed located above Anderson Reservoir is drained by many small creeks and drainages, which all drain to upper Coyote Creek. Below/north of Anderson Reservoir Coyote Creek flows out to the bay, receiving additional inflows from 5 major tributaries, listed here in order from upstream to downstream: Fisher Creek, Upper Silver Creek, Thompson/Lower Silver Creek, Upper Penitencia Creek, and Berryessa/Lower Penitencia Creek. Only two of these tributaries, Fisher Creek and Upper Silver Creek, flow into Coyote Creek upstream of the project site location.

2.2 Affected Neighborhoods

Figure 2.3 highlights the San Jose neighborhoods spanned by the project site – Kelley Park, Bevin Brook, Rockspring, and Wool Creek. In total about 80 structures (most of them multi-family apartment buildings) are subject to flooding risk. The areas within the project site are described in more detail here.

- **Kelley Park**
    - Mostly open space
    - Owned by City of San Jose
    - Structures with flooding risk include a few park-related buildings.
    - Jan 26-27 1997 flood event: Flooding depths in Kelley Park reached a maximum of about 6 ft; the Tea House at the Japanese Friendship garden was flooded with 2 ft of water.

- **Bevin Brook**
    - Small urbanized area (4.6 acres)

    - Structures with flooding risk include 6 condominium buildings, built in 1994.
    - Jan 26-27 1997 flood event: Garages flooded to a depth of 1' of water.

- **Rockspring**
    - ~11 urbanized acres, plus 5 acres of open space. The open space area is owned by San Jose Water Works (located adjacent to creek), which contains some public utilities located in the center of the property.
    - high density residential, with 25 – 40 units per acre
    - 1998: 64 structures owned by 42 separate property owners
    - Structures with flooding risk include 62 multi-family (4-5 unit) residential structures (mostly apartment buildings), four structures on the San Jose Water Works parcel, and one small mall.
    - Jan 26-27 1997 flood event: 20 apartment buildings flooded to a depth of 1 ft of water, with possibly up to 5 ft of water in some buildings.

- **Wool Creek**
    - A small portion (~ 7 acres) of Wool Creek is located within the project site, completely urbanized.
    - Structures with flooding risk include three large office buildings and one urban lot (immediately adjacent to the creek), which could potentially be developed in the future.

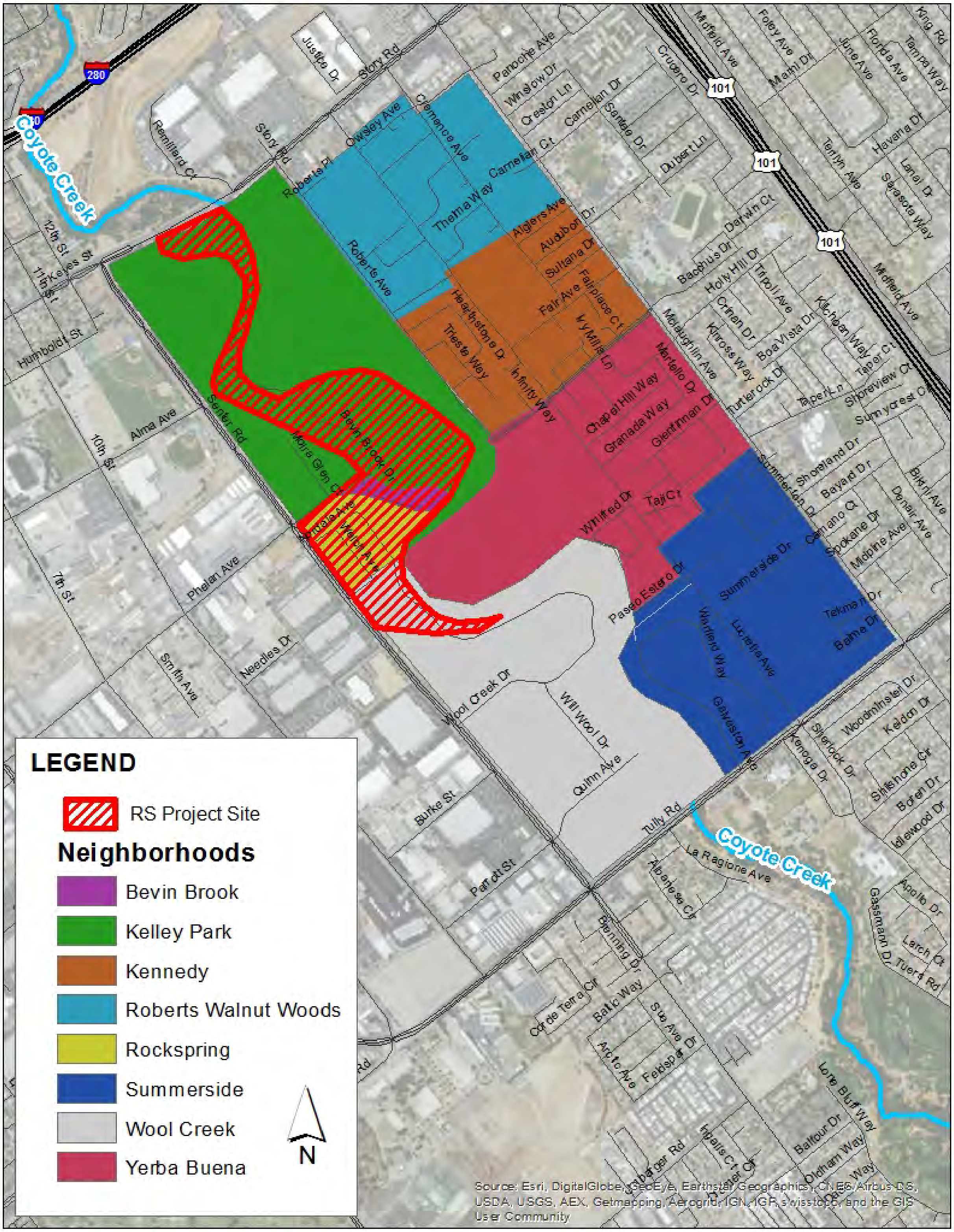

Figure 2.3 Neighborhoods located within and near Project Site.

2.3 Demographics

The RS Neighborhood consists of about 62 multi-family (mostly four-or five unit) residential buildings and two commercial buildings located at the corner of Phelan Ave and Senter Rd. The apartment buildings appear to have been built in the 1960s; it is not clear whether any have been replaced since then. Some of these buildings are well cared for, while others are in need of maintenance and repair. According to the 1990 census data, the Rockspring Neighborhood had a population of about 1560 residents, many of them immigrants (about 57%). The ethnic composition was as follows: 57.5% Hispanic, 31.5% Asian, 8.6% White, and 2.4% Black. Compared with the City of San Jose, the neighborhood has about double the percentage of Asians and Hispanics, and double the percentage of immigrants. The per capita incomes were also significantly lower, 36% of the average value for San Jose.

Gang and drug incidents have been a recurring problem in the neighborhood, but have been improved in the later 1990s due to gang abatement activities conducted by the City of San Jose.

2.4 Hydrology

The hydrology for Coyote Creek was last updated by the District in 2015(11). The District developed a new HEC-HMS model based on recent 2006 LIDAR data, which was further modified for more-recent changes and features missing from the LIDAR set, such as floodwalls. In general surface runoff was computed with the Soil Conservation Service Curve Number loss method combined with the Clark Unit Hydrograph transform. Curve numbers, which represented antecedent moisture conditions, varied spatially within the watershed and were based on the National Land Cover Database (14). Special routing procedures were used for certain urban drainage areas which would only drain through the storm drain network and for the four major water bodies located within the watershed (Anderson Reservoir, Coyote Reservoir, Cherry Flat Reservoir, and Lake Cunningham).   The HEC-HMS model reach routing assumed that flows were contained within the channel, with no spills. The model was calibrated with multiple storm events on record at six different stream gauge locations. Full details describing the development of the HEC-HMS model can be found in the accompanying technical memo (11). HEC-HMS outputs from various storm event simulations supplied input hydrographs for the two-dimensional HEC-RAS 5 models used in this study for delineating floodplains.

At the project site, the peak flow during large storms is mainly controlled by releases from Anderson Dam. Of the watershed area contributing to runoff at the project site, about 80% (~ 195 square miles) is upstream of and drains to Anderson Reservoir. The remaining 20% (~ 50 square miles), drains directly to the project site via Coyote Creek, Fisher Creek, and Upper Silver Creek.   During a storm event, the first peak, controlled by local drainage, is smaller and is followed by a second significantly larger peak flow due to spills from Anderson Dam.

The Anderson Dam currently has a storage restriction due to seismic concerns restricting the water level to about 45 feet below the dam crest, reducing the capacity from about 90,000 to 62,000 acre-feet. This restriction provides an unintended storage volume of about 28,000 acre feet for holding flood peaks during winter storms. It should be noted that the probability of a coincident earthquake and large storm event is very low, since the two events are not correlated. In response to the seismic concerns, the District is working on a project to retrofit Anderson Dam. The project design currently includes a 12 ft diameter discharge pipe which could potentially be used for drawing down the reservoir in advance of large storm events. Operations and rule curves have yet to be developed; this advantage may or may not be realized.

2.5 Habitat Area

According to the Corps' Section 205 report and District GIS records, the reach of Coyote Creek which runs along the project site provides prime habitat for the red-legged frog, according to District GIS records. The Section 205 Corps' report (2) cites a 2001 study of the site by Tetra Tech; the biologists conducting the study did not find any frogs on site. The site also provides habitat for mixed native fish. An updated survey of the area will be needed as part of the feasibility study, since District biologists disagree with the red-legged frog habitat designation (personal communication, Sara Duckler).

2.6 Public Access

There is no official trail access to Coyote Creek along the northeast side of the RS neighborhood or to the south. However, there is official access nearby. The creek can be accessed via trails in the Japanese Friendship Garden to the north. To the south, official access to the Coyote Creek trail begins south of the Tully Road Crossing. The Rockspring Neighborhood Revitalization Plan, dated 1999 noted a desire to construct a bridge for residents to shorten walking distance to Yerba Buena High School.

2.7 Hazardous Materials

A preliminary hazardous materials study was reportedly completed for the Corps' Section 205report and was provided to them by Innovative Technical Solutions, Inc. in January 2002. The report did not identify any hazardous materials within the project area, but the conclusion was considered to be "preliminary until all information was completely reviewed and the regulatory action file review was completed".

2.8 Right-Of-Way (ROW)

Figure 2.4 below highlights the owners of the creek itself and the District's right-of-way in the vicinity of the project site. The District has easement along the creek only in a small area located on the north-east corner of the project site, and for a distance extending south of the site. Most of the land along the creek is owned by either the City of San Jose or the Santa Clara Valley Water District. The San Jose Water Works property is called out because it is the only reach near the project site which is privately owned. Notably, the ground elevations on that property are low and the channel would overtop during large storm events. Depending on the alternative selected, property acquisition may be necessary to construct a flood protection project.

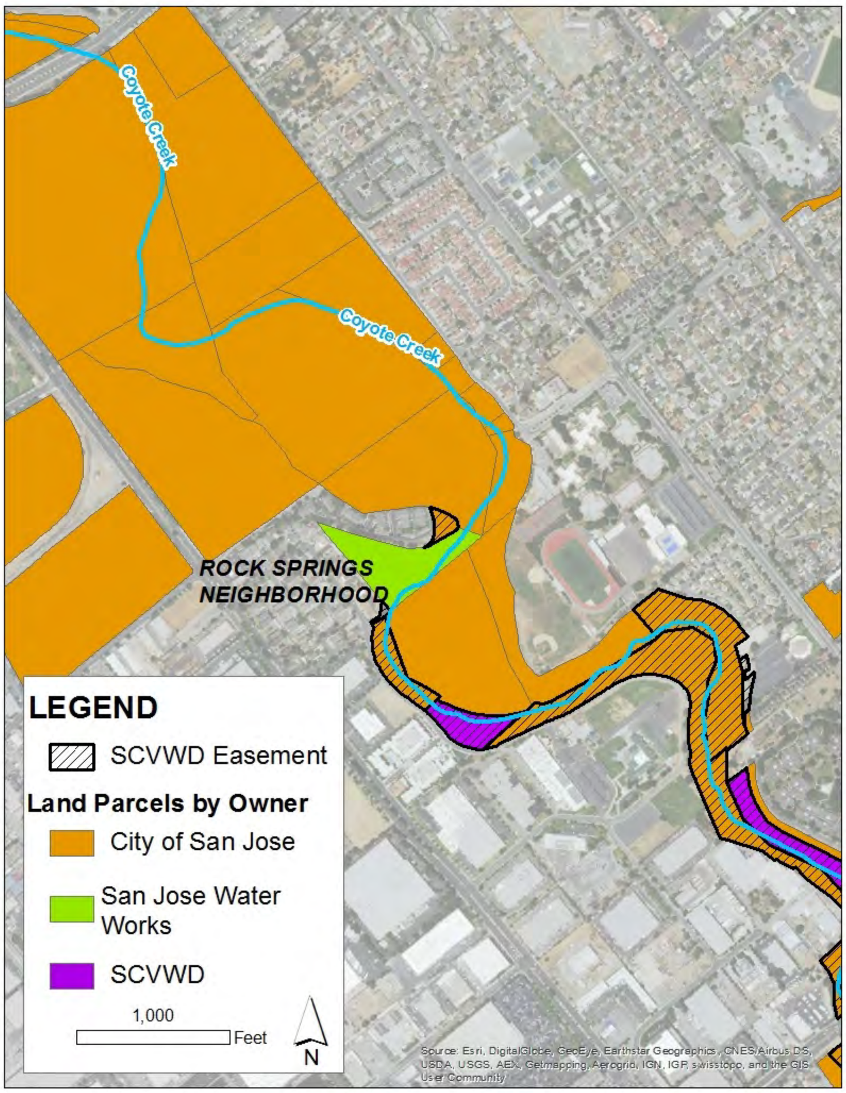

Figure 2.4. Creek Owners and District Right-of-Way near the Project Site.

2.9 Geology and Soils

The Section 205 Corps (2) report noted that the project site is composed of a layer of fill about 6' deep on top of sand, which could lead to liquefaction during an earthquake. The location of the fill is unknown; an attempt is being made to obtain the original report. Further geotechnical investigations will be conducted as part of the feasibility study.

2.10 Groundwater

The RS Neighborhood is underlain by the Santa Clara Valley Basin, a confined aquifer, which is 500 to 1000 feet below the ground level. The estimated depth to first/shallow groundwater based on current District GIS maps is 10 to 20 feet.

2.11 Cultural Resources

The Section 206 Corps' report references a 2002 cultural resources investigation by the San Francisco District Archaeologist. The recommendation from that investigation was that the Areas of Potential Effects contained no historic properties and that "no further fieldwork be conducted" for the flood control study. Since an original copy of the investigation has not been located, and maps of the proposed project are lacking from the Corps' report, additional work will need to be done during the feasibility study to identify potential cultural resources within the project site.

2.12 Storm Drain Network and Utilities

In the 1999 neighborhood revitalization plan (15), it was noted that the 60 inch storm drain along Needles Dr which empties to Coyote Creek backs up during storm events, causing local ponding. Therefore, both interior drainage and channel overtopping issues may need to be addressed to prevent flooding in the area.

The City of San Jose is conducting a comprehensive study of its storm drain network, which includes the RS Neighborhood. The District does not have records of the other utilities in the area. Such records will be collected during the design phase.

CHAPTER 3: PROBLEM DEFINITION

3.1 Flooding

3.1.1 Historical Flooding

According to District records, there has been substantial flooding in the neighborhood one time since the neighborhood was constructed. The flooding occurred during the January 26, 1997 flood event, which had an estimated recurrence interval of 15 years. Figure 3.1 below shows a photo of the flooding that occurred. The District 1997 flood report claims that 20 apartment buildings were damaged with flooding of about 1 ft inside of the buildings. Similarly, the Section 205 Corps' report(2) notes that 25 buildings were flooded up to a depth of about 5 ft. Figure 3.1 suggests that flooding reached a depth greater than 1 ft, given the partially submerged vehicles. The creek flow peaked again in February 1997, when the waters rose to 1' below the top of bank (4).

Figure 3.1. Flooding in the Rockspring Neighborhood

The frequency of high flow and flooding in the area now occupied by the Rockspring Neighborhood has decreased since the construction of Anderson Dam ca.1950. The estimated threshold flow rate capable of flooding the Rockspring neighborhood is about

7000 cfs based on recent HEC-RAS modeling. Flow records at the Edenvale gage, located about 6 miles upstream of the site, show that flow rates exceeded 7000 cfs one time in the in the 66 years of record since 1950 (the known flood event in 1997), compared with five times during the 33 year span between 1917 (beginning of record) and 1950 . Similarly, flows greater than 2000 cfs occurred 19 times prior to 1950, compared with seven times since 1950. Table 3.1 summarizes the annual peak flows at Edenvale gage larger than 7000 cfs since 1917.

Table 3.1. Flows Exceeding 7000 cfs on Coyote Creek: 1950 - 2015

Water Year X (Oct 1, Year X-1 to Sept 30 Year X)	Flow Rate (cfs)
1917	8590
1922	10000
1923	8800
1932	8520
1938	7920
1950 – Anderson Dam Constructed and High Flows on Coyote were reduced.	
1997	7380

In addition to flooding from channel overtopping, the neighborhood has also experienced localized ponding due to backing up of a 60” storm drain along Needles Ave. The storm drain discharges into Coyote Creek and backs up when creek water levels are high. The City of San Jose is in the process of modeling the storm drain network in this area to identify storm drain network deficiencies during a 10-year flood event and will be contacted to determine whether there are any records of the noted flooding issues. A field check will also be conducted to determine the condition of the existing storm drain outlet, including whether it has a flap gate (it probably does not since there is no floodwall at this location).

3.1.2 Description of Flooding Problem

There are multiple causes of flooding in the RS neighborhood. The District’s responsibility is to address the creek-related flooding problem; however, all potential known flooding sources are described here for completeness. Figure 3.2 illustrates the main causes of flooding in the Rockspring Neighborhood. These are also summarized here:

- *Creek Overtopping*. Lower bank elevations adjacent to the neighborhood are subject to channel overtopping during large events with flow rates greater than about 7000 cfs. This has occurred one time since neighborhood was founded in the 1960’s. The lower bank elevations are directly due to the fact that Rockspring

Neighborhood is located on the Coyote Creek floodplain. It is unknown at this point whether the neighborhood was padded up prior to construction, but it is known that it was not padded up to the same level as adjacent properties. Figure 3.2: See the 1 ft county contours.

- *Low-Lying Area*. The RS neighborhood is located on the historical floodplain for Coyote Creek and is depressed in elevation relative to the surrounding grounds, by as much as 10 ft. Figure 3.2: See the 1 ft county contours.

- . *Partial Blockage to Overland Flow*. Bevin Brook Condominium complex, located on the north side/downstream of the complex was padded up prior to its construction in 1994, and prevents the floodplain from draining as quickly as it otherwise would under pre-1994 conditions (during large events only). As noted above, when the Bevin Brook condominium complex was first built, the FEMA floodplain in this area was incorrectly mapped, such that the 1% floodplain did not impact the condominium complex. Figure 3.2: The Bevin Brook complex is highlighted in purple; the 1 ft county contours show that it is a few feet higher than the Rock Springs neighborhood.

- *High Roughness Reach*. As described below, the reach of Coyote extending between Story and Tully road is characterized by thick trees and dense understory. The high roughness contributes to higher water levels in this reach.

- *Sinuosity*. The RS neighborhood is located on the outer side of a bend in Coyote Creek, and is subject to superelevation. This will be further evaluated during the feasibility study, but is expected to have a small effect given that the flow is subcritical and velocities are relatively low (~ 3 to 5 ft/s).

- *Inundation due to failure of Anderson Dam*. This has a low risk of occurring. Currently the amount of water stored in the Dam is restricted to about 2/3 of its capacity, or 61, 810 ac-ft, due to seismic issues. Going into the future, the District has a project to replace the dam which is currently underway.

- *Limited Storm Drain Capacity/Storage*. High water levels in Coyote creek cause the 60-inch storm main along Needles Dr. to back up. Figure 3.2: See the note; yellow lines show the storm mains.

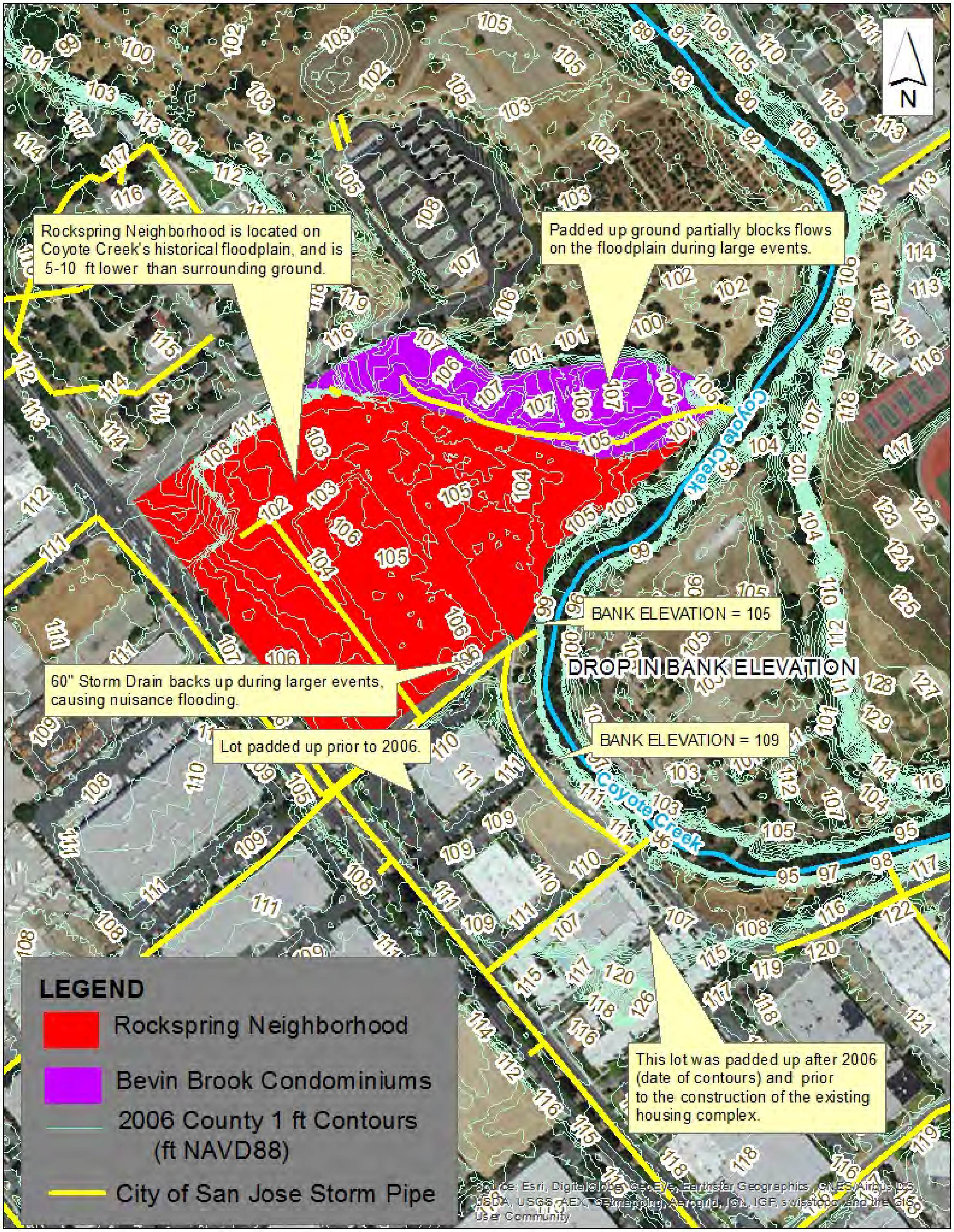

Figure 3.2. RS Neighborhood- Description of Flooding Problem

3.1.3 Updated Floodplains

Figures 3.3 and 3.4 compare the updated floodplain areas for the 10- and 100-year flood events in the Rockspring Neighborhood area with the 1997 floodplain (with an estimated recurrence interval of 15 years(3)) and the effective FEMA 100 year floodplain, respectively. The updated floodplains are based on 2D HEC-RAS 5.0 models of Upper Coyote Creek completed by the District in 2016. In the figures, the updated floodplains are shown in blue, the historical and FEMA floodplains are shown in yellow, and overlap areas are shown as green. The 2D HEC-RAS models directly compute maximum flooding depths and those are indicated in Figures 3.5 and 3.6 as color contour maps. District technical memos (12; 13) provide more detail about the modeling conducted. The main underlying assumptions used in the modeling are summarized here.

- Geometry Data:
  - Channel Cross Section Data Source- 2015 field (point) survey; cross sections surveyed every 300 ft or so; all bridges surveyed
  - Floodplain Geometry: 2006 LIDAR Data. At some locations, the LIDAR data was modified to reflect changes (for the Rockspring Neighborhood, the ground elevations for properties at 1908 & 1989 Senter Road were modified to reflect the complexes built after 2006 (ca 2007/2008)).
  - Mannings Roughness Coefficients: judged by field observations(12; 13)

- Flows Data & Downstream Boundary Condition
  - 10- and 100-year hydrographs from updated District hydrology computations completed by District Staff, ca. 2015(11). Peak flows for the 10 and 100 year events, including spills occurring upstream are 7400 cfs and 12,600 cfs, respectively. To provide some context for these flow events, the threshold flow rate at which overtopping into the RS neighborhood begins is about 7000 cfs.
  - Downstream Boundary Condition- 97 ft NAVD88. This was used for both the 10 and 100 year runs and is from the 100 year FEMA FIS model (converted from NGVD29 datum).

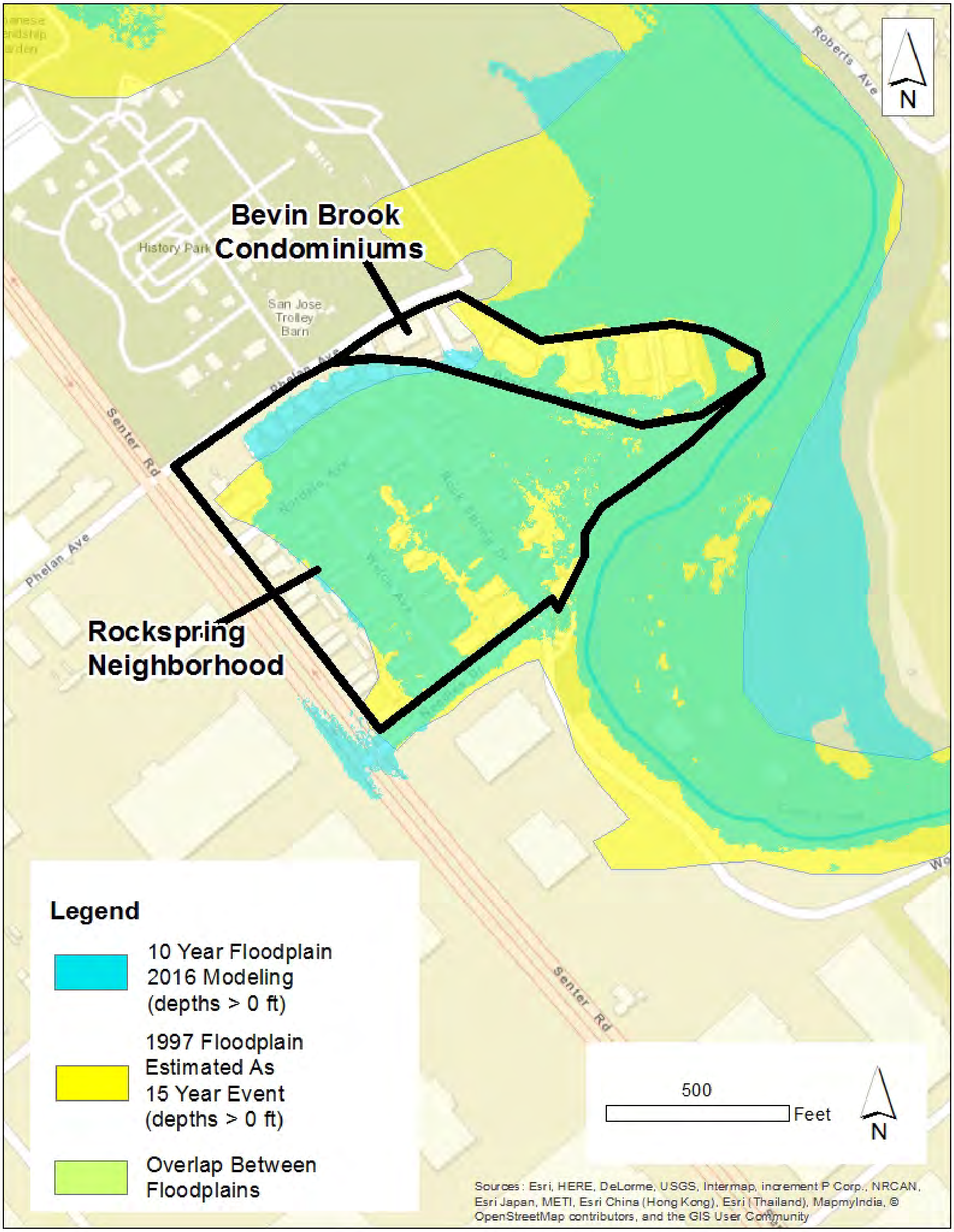

Figure 3.3- Comparison of Updated (2016) 10 Year Floodplain with 1997 Floodplain Footprint.

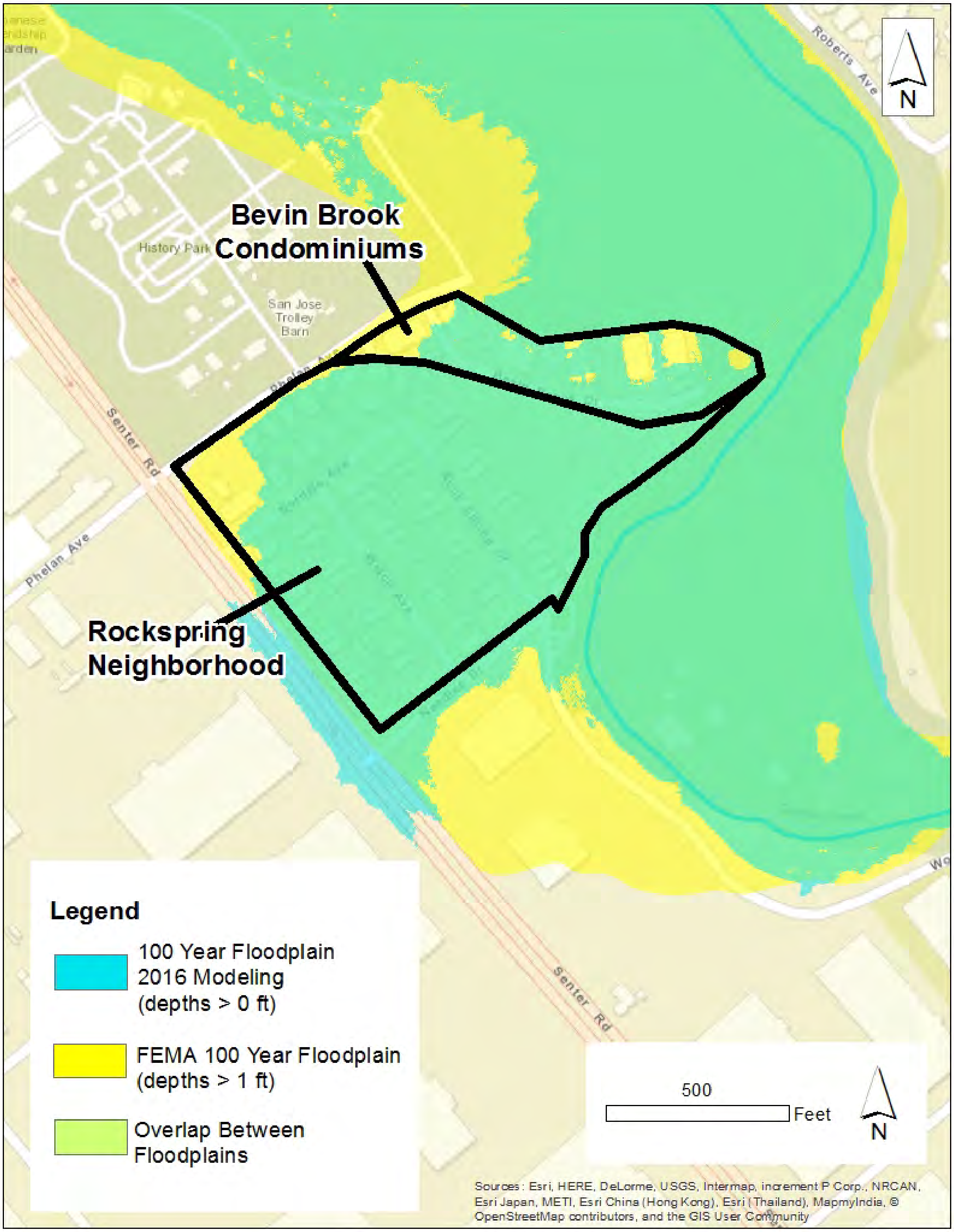

Figure 3.4- Comparison Of the updated (2016) floodplain with the FEMA effective floodplain for the 100 year flood event.

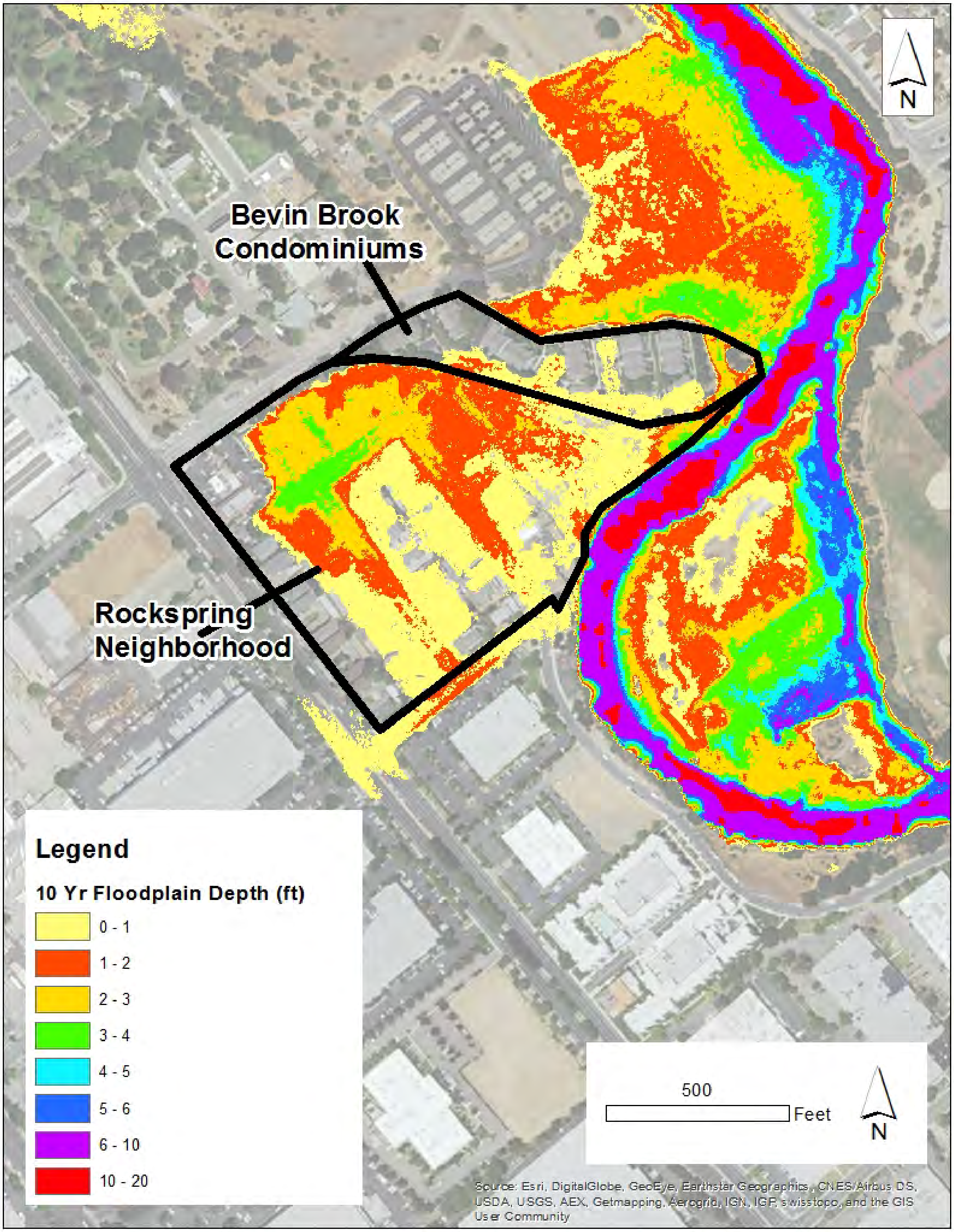

Figure 3.5- Updated (2016) 10 Year Floodplain in RS Neighborhood Area

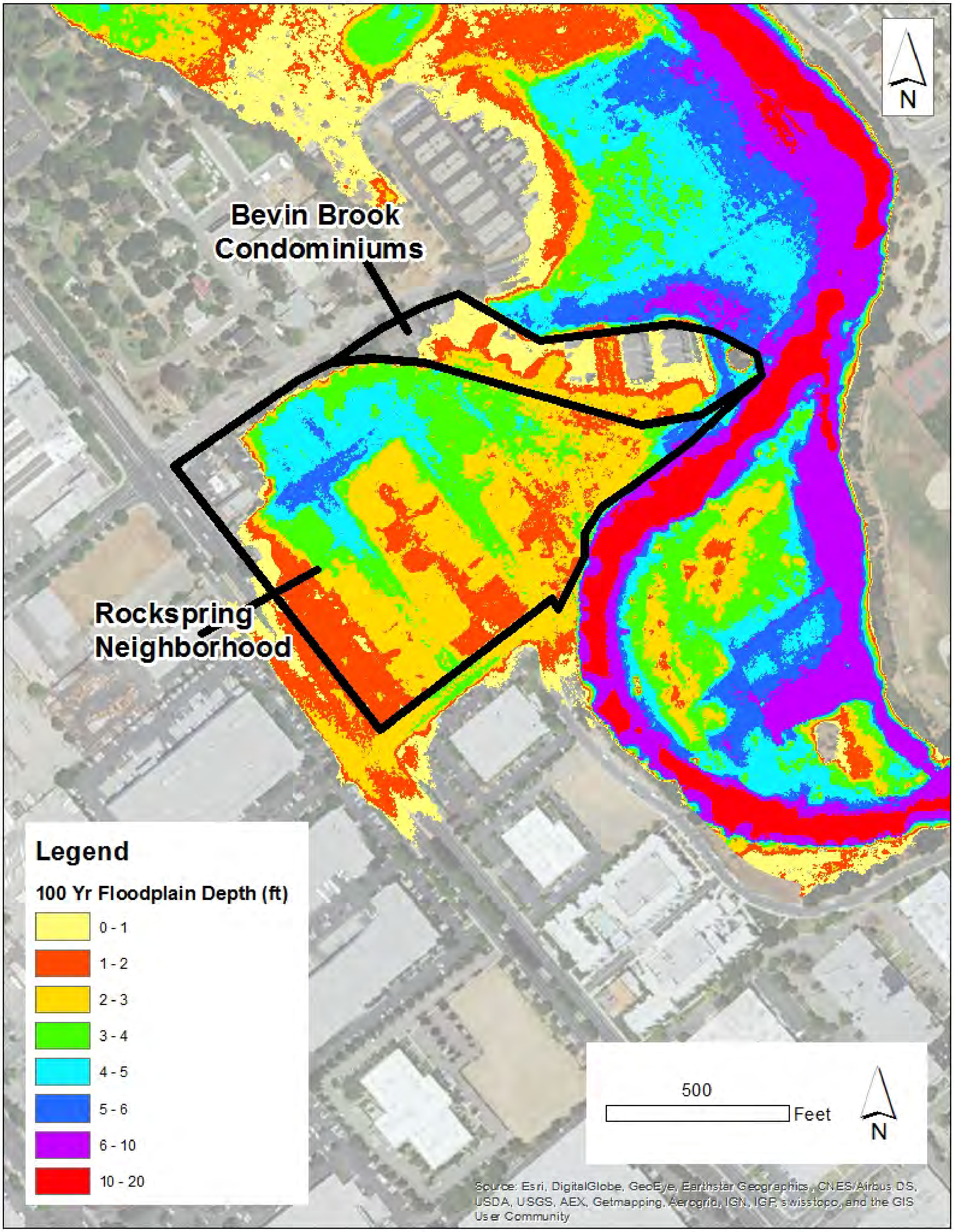

Figure 3.6- Updated (2016) 100 Year Floodplain in RS Neighborhood Area

3.3 Channel Stability

Historically, many factors have affected the channel stability of Coyote Creek, including construction of the Coyote and Anderson Dams, urbanization of the watershed, in-stream and floodplain sand and gravel mines (e.g. the Ogier Ponds), and construction of the Coyote Canal and Diversion in 1939. The reach of channel near the Rockspring Neighborhood has been affected by all of these factors to some extent, but has had tens of years to adjust to them. Anderson Dam was constructed in 1950, most of the area was urbanized by the 1960s and 1970s, and gravel mining on Coyote Creek ended in the 1990s.

The most recent change to the watershed in the area was the 2008 construction of two multi-family residences on 1898 and 2008 Senter Road, which were partially located on the historical Coyote Creek floodplain. The land was padded up prior to construction with a significant amount of fill which reduced the size of the floodplain and raised ground elevations near the creek by as much as 4 to 5 feet. However, this change may have had minimal impacts even to large flows on the creek, because the floodplain abruptly ended at the next property boundary downstream, where the ground had already been padded up. The downstream property at 1888 Senter Rd has been in place since at least 1998, according to historical photos from Google earth. Accordingly, the mapped floodplain from the 1997 flood shows expansion onto the historical floodplain; flows abruptly stopped at the downstream property, reentering the creek.

The channel cross section can be described as a bankfull channel with heavy vegetation (trees and bushes) on the channel banks. Figure 3.7 shows a picture taken on February 5, 2016 of the channel in the Rockspring area, at Needles Dr, looking upstream; the photo shows mainly the west bank, and the low flow channel is not visible. Figure 3.8, also taken on February 5, 2016, shows a photo of the channel cross section a distance of 1.3 miles upstream of the neighborhood, looking upstream from Tully Rd. Figure 3.8 establishes that the channel characteristics are similar to those near the neighborhood, and the low flow channel can be seen. As you move further downstream towards Kelley Park, the channel has a wider floodplain; Figure 3.9 shows the view, looking upstream from Bent Bridge at Happy Hollow Zoo, photo taken February 5, 2016.

Maintenance activities in this reach are minimal. There are no Maximo records of sediment removal, bank repair, or vegetation maintenance in this reach; records go back to 1998. Some vegetation work is being considered, however, for this summer (Riper Kaur, personal communication). A main reason that no maintenance has been performed in this reach is that the channel in this reach has not been improved to provide a specific level of flood protection. In addition, the district has no right-of-way (fee or easement) and therefore does not have authority to enter the creek, even for maintenance. It is possible that the creek owner in this area, the City of San Jose, has performed some maintenance, but it would not have been very extensive, given the relatively undisturbed condition of the creek.

Based on the information above, the current channel condition is thought to be in a state of quasi-equilibrium to smaller flow events. However, during larger flood events, it is possible that bank erosion could occur due to the inability of the creek to spread out onto its floodplain. Near Rockspring Neighborhood, this problem may be somewhat mitigated since the neighborhood itself is the floodplain. Risks associated with channelization may occur at the Bevin Brook constriction and immediately upstream, where the floodplain was eliminated with fill. During the feasibility study, the channel stability will be investigated further.

Figure 3.7 Coyote Creek Looking Upstream from Needles Drive, West Bank. Photo taken 2/5/2016.

Figure 3.8 Coyote Creek looking upstream from Tully Rd. Photo taken 2/5/2016.

Figure 3.9 Coyote Creek looking upstream from Bent Bridge (Near Happy Hollow Zoo). Photo taken 2/5/2016

3.4 Possible Constraints

Based on previous studies(2), a flood protection project for the RS neighborhood would likely involve constructing a floodwall or setback floodwall extending between Needles Dr and the Bevin Brook condominium complex. Constraints associated with this proposal are briefly described here.

- Local constraints listed in the Corps' Section 205 report include:
  - Some residents expressed a desire to retain the existing playground located on Rocksprings drive and immediately adjacent to the creek, near the channel overtopping location. The playground is owned by the City of San Jose; it is separated from the creek by a 6' tall chain link fence.

  - Retain the apartment building located immediately adjacent to the creek (and the playground facility).

- Hazardous Materials: There are no hazardous materials on this site that are known. This will be addressed further in the feasibility study.

- Regulatory Issues: Potential impacts to red-legged frog and steelhead and other listed species would need to be minimized.

- Applicable plans and adjacent projects: There aren't any known adjacent projects, but these will be investigated further during the feasibility study. There is an empty lot located upstream of the site which could be developed during or prior to construction.

- ROW & Access: Purchase of ROW would be necessary to construct this flood protection project as the District does not own any of the Creek adjacent to the neighborhood. Purchase of ROW from the San Jose Water Works and/or the City of San Jose may be necessary.

- Settlement and Liquefaction: Both are concerns for the project going forward. It is thought that the Rockspring Neighborhood may be on fill placed atop sand deposits, even though it is depressed relative to other properties. This will be addressed further during the feasibility study.

- Utilities: Will be addressed during feasibility study. The locations of existing storm drains are already known.

- Funding Issues: The District does not currently have funding for construction of this project. Cost estimates created during the feasibility study will provide a tool to assist management with prioritization.

- Other:
    - The number of existing structures within the neighborhood will make flooding solutions involving raising the structures or building a bypass channel significantly less feasible.

3.5 Community Outreach

Community outreach for this project should be done carefully, as funding has only been allocated at this point for a feasibility study. To date, the main stakeholders for this project have been identified, and a community outreach plan has been put together:

- City of San Jose
- Residents of the Rockspring Neighborhood and any others who would be affected in this area
- Internal Staff
- SCVWD Board of Directors

At this time, the community outreach plan is written to adapt to an evolving project. Stakeholder meetings with the city and/or community will be conducted as the alternatives are more fully flushed out.

3.5 Summary of Previous Alternatives Considered

The Corps' Section 205 study explored various alternatives for providing flood protection, including both "structural" components such as floodwalls to increase channel capacity and "non-structural" elements such as raised or relocated structures.

The documents obtained to date (we are searching for more) do not provide many details on these alternatives or their costs. The draft report concludes by identifying two alternatives which would solve the flooding problem in the RS neighborhood:

1. A floodwall constructed of sheetpile located closer to the channel banks, requiring more mitigation but less purchase of real estate, and

2. A setback levee, connected at the south end via a floodwall.

The draft report copy that we have obtained lacks the appendix detailing costs for the separate alternatives, but the main text in the report provides a cost estimate for the project of $7.4 million dollars, failing to indicate the associated alternative. The report claims that the project has a b/c ratio of 0.55.

At this point, both alternatives will continue to be explored as part of this study. The rationale is as follows:

- There are no known changes to the neighborhood that would affect the feasibility of these alternatives

    - The neighborhood itself has the same street layout and is still composed of multi-family residences, and thus most likely has had few, if any, changes to its utilities.

    - The storm drain network should not have changed since 2002, given that the buildings and street layout in the neighborhood is the same. (However, runoff to the area has increased somewhat, due to urbanization of a few lots located to the south and near the creek).

- The set-back levee alternative will be retained because it is more feasible from an environmental perspective. However, this alternative has more complications in terms of its alignment – e.g., it would require the purchase of property from San Jose Water Works (5).

Chapter 4: REFERENCES

Bibliography

1. **SCVWD.** Safe, Clean Water and Natural Flood Protection Program. [Online] http://www.valleywater.org/safecleanwater.aspx.

2. **United States Army Corps of Engineers.** *DRAFT. Internal Draft Only. Section 205 Detailed Project REport for Flood Control. Coyote Creek at Rock Springs, San Jose, CA.* 2003.

3. **SCVWD.** *Report on Flooding and Flood Related Damages in Santa Clara County. December 31, 1996 to January 27, 1997.* 1997.

4. **SCVWD**. Letter from SCVWD Board Member Rosemary Kamei to Mayor of San Jose Gonazales, Subject: Coyote Creek at Rockspring Project, Partnership withy City of San Jose. August 6, 2002.

5. **SCVWD**. Memorandum by Steve Bui: Coyote Creek at Rockspring (Project No. 402101) Project Approach. August 15, 2002.

6. **SCVWD**. Emergency Action Plan for Coyote Creek at Rockspring. December 2002.

7. **SCVWD**. Rockspring Community Emergency Response Plan. Winter 2002.

8. **SCVWD**. *Flood Emergency Preparedness plan for the Rockspring Community.* Date Unknown (~2002).

9. *Letter from SCVWD (CEO, Stan Williams) to US Army Corps (Lt. Colonel Michael McCormick) Subject: Coyote Creek at Rockspring Project (SCVWD Project No. 402101): Termination of Feasibility of Cost-Sharing Agreement.* January 6, 2003.

10. **Schaaf & Wheeler.** *Letter from Schaaf & Wheeler (James R. Schaaf) to SCVWD (W.F. Carlsen). Re: PT 90-10-106, Historical Park Meadows (Now Bevin Brook Apartments), Phelan Ave at Coyote Creek, San Jose.* May 6, 1991.

11. **SCVWD.** *Coyote Creek Hydrology Study, Prepared by Jack Xu.* December 2015.

12. **SCVWD**. *Technical Memorandum: Coyote Creek Hwy 280 to Anderson Reservoir, Steady State HEC-RAS Models Developed for Project. Prepared by Emily Zedler and Wendy Chang.* June 12, 2015.

13. **SCVWD**. *Technical Memorandum: Upper Coyote Creek. Prepared by Robert Chan.* July 7, 2016.

14. **SCVWD**. *Technical Memorandum: SCS Curve Number Delineation (Update #1). Prepared by Jack Xu.* February 10, 2015.

15. **City of San Jose.** *Rockspring Neighborhood Revitalization Plan.* November 1999.

16. **SCVWD.** *Design Flood Flow Manual for All District Watersheds. Prepared by Jack Xu & Robert Chan.* December 2015.