APPENDIX D

Coyote Creek Parkway County Park
Integrated Natural Resources Management Plan and Master Plan

TECHNICAL MEMORANDUM - EXISTING HYDROLOGICAL CONDITIONS

Existing and Historical Hydrologic Conditions of the Coyote Creek Parkway, Santa Clara County, California

Letter report prepared for:

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May 2005

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Balance Project Assignment 204067

by

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1. INTRODUCTION

1.1 Location and Purpose

The Coyote Creek Parkway ("Parkway") represents a unique regional park because it consists of 16 continuous miles of creek and riparian habitat within a highly urbanized setting. The Parkway serves an important role in managing and preserving the natural resources associated with the Coyote Creek watershed, while also providing the public with an educational and enjoyable place to recreate. The Coyote Creek Parkway is located in the middle Coyote Creek watershed downstream from the Anderson Reservoir in central Santa Clara County (see Figure 1). The Parkway is a linear conglomerate of several County parks (e.g. Hellyer County Park, Metcalf Park, Coyote Creek Park, Anderson Lake County Park) that are linked together by a multi-use trail system with Coyote Creek serving as the common feature throughout.

As a component of the Natural Resource Management Plan and Master Plan (the Integrated Plan), this report describes baseline conditions and explores the functions and values of the Parkway, with regard to hydrology and geomorphology. Prior to the development of the Integrated Plan three different levels of decision-making will occur: 1) a cohesive set of guiding goals and objectives will be identified for the Parkway, 2) a set of criteria will be established and applied to program proposals to determine inclusion into the Parkway, and 3) a classification system that identifies natural resource, recreation, and historical units will be applied to the Parkway. Information on the hydrologic and geomorphic conditions of the Parkway will guide all three levels of decision-making that will occur during the development of the Integrated Plan.

1.2 Regulatory Setting

A Coyote Creek Integrated Plan will provide guidance and information for current and future natural resources planning for the Coyote Creek Parkway. The plan is being developed by the Santa Clara County Parks and Recreation Department, which will look to the plan to direct its programs and policies for the entire Parkway. If changes are proposed within the Parkway there are several local, state, and federal regulatory bodies that would direct protection, permits, and processes associated with a water resource. The regulatory agencies, listed below, may only pertain to guidelines and permits associated with hydrologic resources. It may be necessary to consult with additional agencies.

The Santa Clara Valley Water District (SCVWD) is an independent district responsible for water supply, flood protection, and watershed management in Santa Clara County, California. Governed by a seven-member board of directors, the SCVWD's mission is to provide high quality water, and to manage flood and storm waters along the county's 700 miles of creeks and rivers in an environmentally sensitive manner. The SCVWD operates Anderson and Coyote Reservoirs as well as several ground-water recharge facilities within the Parkway. Recently, the SCVWD has begun implementing many programs within the Coyote Creek Watershed to improve habitat and water quality conditions.

San Francisco Regional Water Quality Board ('Regional Board' and recently renamed the San Francisco Bay Water Board). The Clean Water Act (CWA), Section 401, requires that an applicant pursuing a federal permit to conduct any activity that may result in discharge of a pollutant obtain a water quality certification or waiver. The certification requires the evaluation of water quality considerations associated with dredging or placement of fill materials into *waters of the United States*[1]. In California, certifications or waivers are issued by one of nine Regional Water Quality Boards (Regional Board) with jurisdiction over the permitting area. Coyote Valley and the Parkway fall under the jurisdiction of the San Francisco Regional Water Quality Board (SFRWQB).

In April 2003, the Regional Board revised stream restoration guidelines emphasizing "the concepts and processes for the avoidance and minimization of impacts to aquatic ecosystems" using geomorphic principles. Proposed or future channel improvements, relocation, enhancement and/or restoration designs should consider these guidelines.

United States Army Corps of Engineers (USACE). In addition to Section 401 of the CWA, Section 404---regulated by the USACE—requires a permit for the placement of clean fill materials into waters of the United States. A water quality certification or waiver from the SFRWQB is required before the proposed activity can be permitted by the USACE.

Federal Emergency Management Agency (FEMA). FEMA administers the National Flood Insurance Program (NFIP) to provide subsidized flood insurance to communities that comply with FEMA regulations by limiting development within floodplains. FEMA flood maps are available for the Coyote Valley and updated to 1998. Executive Order 11988 (Floodplain Management) addresses floodplain issues related to public safety, conservation and economics.

[1] Waters of the United States applies to surface waters, rivers, lakes, estuaries, coastal waters, and wetlands.

The order generally requires all federal agencies proposing to construct, permit, or fund development activities to: a) avoid incompatible floodplain development; b) be consistent with the standards and criteria of the NFIP; and c) restore and preserve the natural and beneficial floodplain values.

California Department of Fish and Game (CDF&G) CDF&G regulates streambed alterations, including release of materials into stream. A streambed alteration agreement (SAA) will be required for any work within a creek or stream and its floodplain. An SAA would be required for work within Coyote Creek, its tributaries and/or floodplain.

1.3 Work Reviewed

Balance Hydrologics reviewed multiple historical and current documents describing hydrologic and hydrogeologic characteristics of the Coyote Creek Parkway and interviewed several SCVWD technical staff. A full list of cited work is located in Section 7. Below, we list a few of the important documents/data we utilized for this report:

- Fisheries and Aquatic Habitat Collaborative Effort: Summary Report, multi-agency fisheries plan for Coyote Creek, Stevens Creek and Guadalupe River in Santa Clara County.
- Santa Clara Valley Water District
  - Coyote Watershed Stream Stewardship Plan
  - Stream Classification for Coyote Creek Watershed
  - Draft Stream Maintenance Program
  - Assessment of Stream Ecosystem Functions for the Coyote Creek Watershed
  - Hydrogeology of the Santa Clara and Coyote Valleys Groundwater Basins
- United States Geological Survey, Coyote Creek gaging station near Madrone

1.4 Acknowledgments

This report was made possible with the help of many individuals associated with local agencies and organizations. Among the many individuals Balance staff would like to thank include Brian O'Mara (SCVWD), who provided an understanding of existing and historical dam operations at Anderson Reservoir. Historical flow records for Coyote Creek were provided by Ken Stumpf , Joe Agulerra, Mark Merritt, and Wendy Chang (SCVWD). Kevin Sibley (SCVWD)

made available important Coyote Creek documents and Caltrans test boring information for California HWY 101 near Coyote Creek. Jeff Micko (SCVWD) offered information about the history and operations of the SCVWD's ground-water recharge facilities. Mark Merritt and Elizabeth Hayse (SCVWD) sent us GIS layers and shapefiles pertaining to designated 100-year flood elevations and maps for Coyote Creek. Robin Grossinger with the San Francisco Estuary Institute (SFEI) hopes to provide the SCVWD and Balance with geo-rectified historical aerial photographs and maps in the near future. The comparison of these documents may provide valuable insight into historical channel changes within the Parkway.

2. PHYSICAL SETTING

2.1 Climate

The climate of Santa Clara County is considered Mediterranean with the majority its annual rainfall between the months of October and April. Annual precipitation averages about 14.5 inches in downtown San Jose (Western Regional Climate Center, 2005) increasing to near 17 inches in Coyote Valley and more than 30 inches over the Diablo Range to the east (Saah and Nahn, 1998). The Santa Cruz Mountains exert a rain shadow over the Santa Clara Valley with most easterly moving storm events. Temperatures are relatively mild year round with a moderating influence by the Pacific Ocean to the west although summer temperatures can reach near 100 F. During the winter months, frosts can occur, especially along the streams.

Figure 2 presents historical, annual precipitation for a 55-year period of record in San Jose, California, approximately 20 miles northwest of Anderson Reservoir. Water years[2] with above and below average precipitation are easily detectable from the graph. In water year 1983, 29.7 inches still holds as the highest precipitation on record; in water year 1998, 28.4 inches was recorded; whereas, water year 1995 recorded 23.6 inches. It is important to note that a record monthly precipitation of 8.66 inches was recorded in January 1995; whereas 6.80 inches fell in January 1997—notable flood years in Coyote Valley. Water years with significantly below average precipitation included 1960 (8.39 inches), 1972 (6.85 inches), 1976 (6.67 inches), 1977 (7.90 inches), and 1987 through 1991 (6.78 to 11.64 inches).

2.2 Current and Historical Land Use

The following timeline describes some of the major land use and construction activities that changed the Coyote Creek landscape from the mid 1800's to the present. It also provides the background for the establishment of the Coyote Creek Parkway and possible future influences.

Mid-1800's to 1950's: The fertile land adjacent to Coyote Creek started to become utilized in the mid 1800's for agricultural production of fruit orchards and some grain crops. Orchards quickly became the dominant land use along the Coyote Creek corridor and boomed in the 1930's to 1950's, prior to significant urbanization and competition with other land uses. Some of these early orchards remain on the landscape today. As agricultural activities in the Coyote

[2] Most hydrologic and geomorphic monitoring occurs for a period defined as a water year, which begins on October 1 and ends on September 30 of the named year. For example, water year 2005 began on October 1, 2004 and ends on September 30, 2005.

Creek watershed increased, water began to be pumped from the ground water basin. Also, small canals and ditches were built to divert some surface waters.

1932: The Coyote Percolation Dam and Coyote Percolation Pond were constructed in 1932 by the Water Conservation District (an early precursor to the Santa Clara Valley Water District) to recharge the Santa Clara Valley ground-water basin, which was an important source of irrigation water for farmers downstream. This percolation pond was the first in-stream pond constructed in Coyote Creek and is still managed today by the Santa Clara Valley Water District. The Coyote Percolation Dam is located approximately 2,000 feet downstream of Metcalf Road and marks the boundary between the Coyote Valley ground-water subbasin and the Santa Clara Valley ground-water basin.

1936: The Coyote Reservoir and Dam were constructed by the Water Conservation District in 1936 as part of a basin-wide effort to increase ground water recharge to major aquifers. During the mid-1930's, the Coyote Reservoir was one of six reservoirs constructed in Santa Clara County. It is still in operation today and the Santa Clara Valley Water District manages it in tandem with the Anderson Reservoir.

1939: The Coyote Canal and associated Coyote Diversion were constructed in 1939 to transport controlled releases from the Coyote Reservoir to the Coyote Percolation Pond without flooding the orchards located in the Coyote Valley ground-water subbasin (downstream from the Coyote Reservoir to the Coyote Narrows) that were subject to very shallow ground water. Water released from the Coyote Reservoir was diverted into the Coyote Canal, which flowed along the east edge of the valley instead of down the main stem of Coyote Creek. The Coyote Diversion is located approximately two miles downstream from the current location of Anderson Reservoir and re-enters Coyote Creek near Metcalf Road upstream from the Coyote Percolation Pond. Currently, the Coyote Canal is in disrepair and is no longer used. However, it is possible that the canal may be repaired and used again in the future.

1950: As the Santa Clara Valley grew in population during the 1940's and 1950's, the need for adequate water supply increased. In response to this growing urbanization and water demand, a second reservoir was constructed at the headwaters of Coyote Creek by the Water Conservation District in 1950 for water supply purposes. The Anderson Reservoir and Dam are located downstream from the older Coyote Reservoir and upstream from the Coyote Diversion. The purpose of the reservoir was multi-fold; drinking water is directly stored in the reservoir and water is also released into creek and percolation pond system for ground water recharge. An incidental benefit of the dam is flood protection, but this was not the primary goal.

Late 1950's / early 1960's: Construction and operation of in-stream and floodplain gravel mines occurred along the Coyote Creek corridor sometime around the late 1950's to early 1960's. Most of these quarries have since been abandoned and have now become warm-water ponds. One of the larger complexes of abandoned quarry ponds, the Ogier Ponds, is located downstream from the Anderson Reservoir and upstream from the Coyote Creek Golf Course. Coyote Creek actually flows through several ponds in the Ogier Pond complex since a berm was eroded during a large storm event in 1997.

1969: The "Coyote River Policy Statement" was approved by Santa Clara County and the City of San Jose in 1969. This policy was a result of the County and City acquiring lands along Coyote Creek and proposed a vision of a park that stretched several miles along the creek corridor. An initial Coyote Creek Master Plan was completed in 1972 as an outcome of the "Coyote River Policy Statement." The Master Plan guided the creation and management of the Coyote Creek Parkway, which now has a continuous trail for 16 miles of the creek. This report will assist in the development of a new Master Plan that incorporates and emphasizes the natural resources of the Parkway.

Future: The FAHCE agreement was written in 1997 as part of a settlement between the Santa Clara Valley Water District (SCVWD) and the Guadalupe-Coyote Resource Conservation District, Trout Unlimited and the Pacific Coast Federation of Fisherman's Association. The FAHCE agreement has multiple implications for the Parkway because one of the three watersheds chosen by the California Department of Fish and Game and SCVWD to be a focus of restoration efforts is Coyote Creek. The goals of the planned restoration will be to restore and maintain healthy salmonid populations in the Coyote Creek watershed, with a specific coldwater management zone identified from the Anderson Dam downstream to the Coyote Creek Golf Course. The FAHCE agreement will be implemented by 2007 (Ramona Ramstead, pers. communication).

2.3 Geology and Soils

2.3.1 Summary of regional and local geology

The Santa Clara Valley is a part of the northwesterly trending, intermountain San Francisco Bay depression—a large structural trough created by downwarping of the geologic features to the valley's east and west. The Valley or trough is flanked by the San Andreas Fault along the western edge and the Hayward fault along the eastern edge (Iwamura, 1995). Unconsolidated alluvial sediments washed in from the Santa Cruz Mountains to the west and the Diablo Range to the east during the Pleistocene-Holocene to fill the valley. The accumulated alluvial fill within the valley constitutes the groundwater basin (Iwamura, 1995). Erosion resistant ultramafic rocks, part of the Coast Range Ophiolite, underlie much of Coyote Creek Valley and comprise the Diablo Range foothills. These rocks are visible as outcrops near Anderson Dam. Valley alluvium submerges these rocks downstream of the dam, but bedrock resurfaces near Parkway Lakes constricting the valley's width and depth, at a point known as Coyote Narrows. Large fan deposits originate from the Diablo Range foothills and splay into the Coyote Creek Valley. Coyote Creek continues to excavate the toes of these fan deposits adding to the coarse nature of the unconsolidated channel deposits through the Parkway. Figure 3 illustrates the geologic units of the Parkway.

2.3.2 Soil types and characteristics

Soils are described between Anderson Reservoir downstream to Coyote Ranch in the soil survey of the Eastern Santa Clara County (Lindsey, 1974). Downstream of Coyote Ranch, soil information is only available from an older University of California Extension soil survey (Weir and Storie, 1947). For the purposes of this document, soils are described starting with the active creek channel and then moving outward, or laterally, across valley floor. Table 1 provides additional soil information, including permeability rates. Figure 4 maps the soil units of the Parkway.

Channel environment (active channel corridor). The immediate channel environment is composed of loose coarse-grained material (riverwash) including sand, gravels, and cobbles. These materials are subject to movement by high flows. These materials have high permeability rates, and are often used for percolation ponds. Vegetation on these soils is limited to willows, sycamore and oak trees, with some perennial and annual grasses.

Channel benches (active floodplain). Channel benches and areas of overbank deposits are composed of a loam (Garretson Series) or gravelly loam (Cortina Series). The Garretson loams have a substratum of sandy loam down to 40 inches. Stratified sand and gravels or gravelly loam is common to a depth of 60 inches or more (Lindsey, 1974). The Cortina Series gravelly loams contain a greater percentage of gravels throughout its depth. Under a natural flow regime, the Cortina gravelly loams were subject to flooding, washout, or channeling about three times every 10 years (Lindsey, 1974) because of their non-cohesive, coarse structure. This soil structure also limits root density and fertility, but provides for rapid infiltration and permeabilities (<20 inches per hour).

Channel terraces (former floodplain). The soils east and above the floodplain occupy serpentine or ultramafic alluvial fan deposits. The soils are typically clays with high shrink-swell properties—generating deep cracks in dry periods. An unfavorable calcium-magnesium ratio available to plants from these soils results in a distinctive vegetation adapted to these specialized conditions.

The soils to the west of the Coyote Creek channel corridor occupy a flat alluvial plain. They are typically comprised of the Yolo Series silty clay loams. Large housing and commercial developments occupy these areas (only downstream of the Coyote Narrows), but also are the most agriculturally productive (Lindsey, 1974). The Pleasanton loam also occupies old river terraces and fans along the western area of the Parkway. Because these soils have a larger percentage of silts and clays, their permeability is much slower than the near-channel soils.

2.4 Geomorphology

2.4.1 Current and historical channel planform

Balance examined available aerial photographs (1939 and 2003), topographic maps, and other resources to understand the characteristics of Coyote Creek and its floodplain. Although the 1939 historical aerial photographs showed a landscape that had already been altered by the Coyote Reservoir, Coyote Canal, and multiple orchards, it is still possible to utilize these old aerials to characterize pre-dam and agriculture conditions.

Historically, the Coyote Creek channel appears braided[3], as there are several channel "scars" that can be observed on the floodplain in the 1939 aerial photograph, which suggests that the channel was very active and migrated laterally across the floodplain in the past.

[3] A braided channel is a stream flowing in several dividing and reuniting channels, common in systems with excessive sediment supply composed of unconsolidated materials.

The historical active floodplain of Coyote Creek downstream from the Anderson Dam ranged in width anywhere from 500 to 3,000 feet based on analyses of aerial photographs, topographic maps, and 100-year flood mapping, also suggesting a very active channel. The floodplain was narrowest just downstream from the Anderson Dam due to steep slopes and was the widest in the area that is now occupied by the Ogier Ponds. The floodplain also narrowed both upstream and downstream from Metcalf Road where several hills confined the channel.

At present, the active Coyote Creek floodplain has been reduced in size due to several factors. Urbanization and the construction of levees have confined the channel in many of the lower sub-reaches of the Parkway. Also, since the construction of the dams, the channel does not migrate across the floodplain as frequently as when flows were unregulated.

The San Francisco Estuary Institute (SFEI) is currently collecting information and conducting analyses to evaluate channel change between 1905 and today. Future collaboration with SFEI will provide valuable information on historical channel change that may be useful to the Integrated Plan.

2.4.2 Channel bed material

Channel materials and their characteristics are important for channel maintenance, restoration and enhancement planning. Balance staff examined channel conditions and channel substrate properties from earlier field work conducted in the Parkway (Chartrand and Ballman, 2002) and available borings in or near the channel (Boddie, P.J., and Schmoll, M.E., 1998, Dept. of Public Works, City of San Jose, 1995).

Chartrand and Ballman (2002) characterized two Coyote Creek riffles: one approximately one mile downstream of Anderson Reservoir, and another immediately upstream of Ogier Ponds. Visual estimates of the 50th percentile[4] grain size of channel bed material for riffles at each location ranged from coarse pebbles to small cobbles (16 to 128 mm). Estimates of embeddedness—the percentage of larger particles buried by fine sediment, ranged from 5 to 20 percent.

Geotechnical borings completed at the Silicon Valley Boulevard Bridge crossing to Coyote Creek near Hellyer County Park indicate channel substrate in the near-channel environment (Boring B-2). Depths to 11.5 feet are characterized as gravels with sand with occasional interbeds of

[4] 50th percentile is defined as the median grain size or 50% of the particles are larger and 50% of the particles are smaller that that indicated.

cobbles six-inches in diameter. Relative density of these deposits ranged from medium to very dense. Stiff or hard clays were encountered at depths. Boddie and Schmoll (1998) describe borings completed to a depth of 11 feet near the margins of the "low flow portion" of Coyote Creek. Soft and medium density clays were found, interbedded with lenses and layers of loose sands, gravels, cobbles with organic material. These characteristics may not be typical of other channel reaches but, in general, is typical of Coyote Valley deposits as described by Lindsey (1974).

2.4.3 In- stream gravel mining

Several open pit quarries, also known as the Ogier Ponds, were operated in the Coyote Creek floodplain between the late 1950's to the early 1990's. The operation included both in- and near-stream sand and gravel quarrying. Reportedly, the operation caused changes in stream elevations and morphology through the reach throughout its operation. In 1997, a January flood breeched the natural levee between the main channel and the Ogier Ponds. A large pond captured the main channel and re-routed a short segment of channel visible on recent aerial photographs (Figure 5). Reportedly, this has induced changes in local channel elevation, sediment transport processes, stream temperature and habitat.

2.5 Surface Hydrology

2.5.1 Surface water drainage

The Coyote Creek Parkway is a 16-mile reach within the larger Coyote Creek watershed. The Coyote Creek watershed encompasses over 320 square miles and is the largest watershed in the Santa Clara basin. Coyote Creek originates in the foothills of the Diablo Range and flows northwest 42 miles before entering the San Francisco Bay. There are two major dams in the Coyote Creek watershed: Coyote Reservoir and Anderson Reservoir. Both reservoirs are located upstream of the Parkway and operate in tandem for purposes of ground-water recharge, flood control, water supply, and recreation and wildlife. Tributaries to Coyote Creek within the Coyote Creek Parkway include Fisher Creek, Metcalf Creek, and several minor unnamed ephemeral tributaries. Coyote Canal is an earthen channel constructed within the Parkway and diverts flows from Coyote Creek 2.0 miles downstream of Anderson Dam and re-enters Coyote Creek near Metcalf Road.

Historically, Coyote Creek and its associated floodplain occupied much of the Laguna Seca area—a large alluvial plain primarily drained by the Fisher Creek tributary. Laguna Seca normally received overbank deposits from both Coyote and Fisher Creeks and included many wetland or marsh areas. Land use changes in the Valley began to manage water resources within the valley to alter the hydrology of Laguna Seca. The construction of the Southern Pacific Railroad through the center of Coyote Valley now acts as a levee between Coyote and Fisher Creeks. Additional development in the Laguna Seca sought to engineer and artificially drain the area.

A gaging station, operated by the USGS, yielded 100 years of mean daily flow data. The gaging station, known as Coyote Creek near Madrone or Station 82 is located on Coyote Creek downstream from Anderson Dam and immediately upstream from the Coyote Canal. Figure 6 illustrates the 100-year hydrograph.

2.5.2 Coyote and Anderson Reservoir operations

Coyote Creek Watershed, above Hellyer County Park, includes two reservoirs: Coyote and Anderson. The reservoirs are operated by the SCVWD and serve to recharge ground water in the Santa Clara Valley. Secondarily, they serve functions of water supply, flood control, and recreation and wildlife habitat.

2.5.2.1 Historic dam operations 1930s-1990s

Regulation of waters in Coyote Creek began in 1936 with the construction of the Coyote Reservoir and Dam. The original purpose of the Coyote Reservoir was to release controlled flows down Coyote Creek to assist with ground water recharge downstream from Metcalf Road (the Santa Clara Valley ground-water basin).

The construction of the Coyote Canal and diversion structure followed shortly afterwards in 1939. The Coyote Canal was constructed as a reaction to the Coyote Reservoir because orchards located downstream from the reservoir and upstream from the Coyote Narrows were being flooded due to increases in the already shallow ground-water table. Therefore, Coyote Canal was built to convey flows to the Coyote Percolation Pond (near Metcalf Road) via a route that bypassed the main stem of Coyote Creek and that followed the eastern edge of Coyote Valley (K. Sibley, personal communication). Between 1950 and the late 1990s, the diversion of Coyote Creek flow via Coyote Canal frequently resulted in a “dry” creek between Coyote Creek Golf Course and Metcalf Park year round. Recently, the SCVWD has discontinued use of Coyote Canal for safety and maintenance concerns. (B. O’Mara, personal communication).

In 1950, Anderson Reservoir was constructed and operated in conjunction with Coyote Reservoir primarily to manage ground-water recharge in the watershed, but the reservoirs also function as flood-control facilities. The construction and operation of both the Coyote and Anderson Reservoirs have regulated downstream flow. Regulated rivers often exhibit a different flow regime relative to unregulated rivers. Reservoirs absorb runoff and peak flows from the upper watershed and release flows periodically to accommodate subsequent rainfall-runoff events. The releases rarely mimic the timing or magnitude of natural flows. Figure 6 illustrates the last 100 years of mean daily flows for Coyote Creek downstream of Anderson Dam. The hydrograph indicates clear changes in flow patterns as the result of Dam construction and reservoir operations. Additional effects of flow regulation on hydrology and geomorphology are discussed in the sections below.

2.5.2.2 Current and projected dam operations 1990s-future

Under the Fisheries and Habitat Collaboration Effort (FAHCE) Agreement with California Department of Fish and Game (CDF&G) (described in Section 2.2), the SCVWD is authorized to release flows to maintain a wet channel below Anderson Reservoir to Metcalf Park. Flows are dependent on the existing conditions (i.e., reservoir storage, rainfall, safety) but are required to follow the following criteria:

- **Winter base flows** (Nov. 1 – April 30)—26 cfs or flow required to recharge will be released at Anderson Dam and allowed to bypass any diversion by the Coyote Canal. Releases are based on storage requirements in Anderson/Coyote Reservoirs

- **Pulse flows** (Feb. 1 – April 30)—two periods of five consecutive days of flows greater than 50 cfs.

- **Summer coldwater flows** (May 1 – Oct. 31)—flow released at a rate sufficient to maintain a continuous flow of water with a temperature less than 18 degrees C in the coldwater management zone[5] and a minimum flow of 1 cfs at the Coyote Creek Golf Course entrance.

Anderson Reservoir also functions as a flood-control operation and the above flow-related goals of the FACHE can only be met if the reservoir storage criteria are met. These criteria are required for flood control and water supply needs. Reservoir releases are subject to current rainfall conditions and available storage and therefore, vary in release rates. A maximum non-storm release would convey 550 cubic feet per second immediately downstream of Anderson

[5] Under the FAHCE, the cold water management zone is defined as the reach beginning at Anderson Dam downstream to the Coyote Creek Golf Course entrance.

Dam (B. O'Mara, personal communication). However, in multiple years since the construction of the reservoir, the dam has overspilled, resulting in peak flows over 5,000 cfs.

Coyote Creek often exhibits characteristics of a "losing" channel within portions of the Parkway—water in the channel tends to sink into the valley fill. This is a result of the high soil infiltration and permeability properties along the valley. As a result, some reaches become intermittent during the dry season or dry years. California Department of Fish and Game (CDFG) recognize these constraints and under a Memorandum of Understanding (MOU) with the SCVWD, and allow the creek to become intermittent or dry within a fixed reach. This reach is identified between Coyote Road Crossing at Fonick Road downstream to California HWY 101 near Hellyer County Park.

2.5.2.3 Effects of Anderson Reservoir operations on hydrology

Figure 7 presents a comparison of flow duration curves for Coyote Creek below Anderson Reservoir: a) unregulated record of flow (pre-dam), and b) a regulated record of flow (post-dam). The comparison indicates two major points regarding the current regulated Coyote Creek below Anderson Reservoir, Coyote Creek, within the Parkway, experiences:

- A limited range of flows most of the time;
- 85 percent of the time flows equal or exceed 10 cfs, whereas prior to the construction of Anderson Dam, 85 percent of the time flows equaled or exceeded 0.6 cfs.
- Only 5 percent of the time does flow equal or exceed 100 cfs, whereas, prior to the construction of Anderson Dam, flow equaled or exceeded 100 cfs 11 percent of the time.
- A reduced frequency of peak flows.
- Approximately nine (9) storm events have generated conditions causing flow to spill over the dam spillways.

2.5.2.4 Effects of Anderson Reservoir operations on geomorphology

The reservoir also captures sediment behind the dam. These changes in the sediment supply and flow regime have significant consequences for channel geomorphology:

- The active channel dimensions (depth, width) may be the result of the limited range of flows or a high frequency of a low magnitude flow. In other words, the present day channel may be smaller and less dynamic than historical channel geomorphology;

- A reduced frequency of larger flows likely limits sediment and nutrient transport downstream.

- A channel that experiences fewer or lower magnitude peak flows may experience an increase in channel roughness. Vegetation adapts quickly to manipulated water conditions, encroaching on the active channel. When a peak flow occurs (i.e., dam overspill, 1997), flood elevations likely increase as well as entrain large woody debris to the channel.

2.5.2.5 Flooding

Flooding in the Coyote Valley has been documented since the USGS installed the Coyote Creek gaging station at Madrone (1.2 miles downstream of the existing Anderson Dam) in 1903. Based on available data from the USGS gage, Coyote Creek experienced more frequent floods with much greater magnitudes of flow when compared to post-dam records of flow. Table 2 provides a record of peak flows within the period of record for Coyote Creek downstream of Anderson Dam. Ranking the 14 peak flows in the last 100 years indicates that seven greatest peak flows occurred prior to construction and operation of Coyote/Anderson Reservoirs. Anderson and Coyote Reservoirs greatly reduced mean daily and peak flows after 1950. Natural or pre-dam floods are 3 to 4 times greater in magnitude when compared to flood occurring after the construction of Coyote and Anderson Reservoirs.

Nevertheless, record rainfall years in 1958, 1969, 1982, 1983, 1995, and 1997 produced flows in Coyote Creek that overtopped the spillway of Anderson Dam. Floods in the past 50 years continue to have an impact on the Parkway and play important roles in the functions of the Parkway. The USACE and Federal Emergency Management Agency (FEMA) have identified flood prone areas within the valley since the 1950s (SCVWD, 1998, USACE, 1970). An updated 100-year floodplain map for the Coyote Creek Parkway is provided in Figure 8. It is clear from the map that Parkway resources may be affected under historical and predicted flood flows. At this time, we do not have information on what discharge equates to the mapped 100-year flood elevations illustrated in Figure 8. We are in the process of obtaining this information with the Santa Clara Valley Water District. Also, additional information may be required to assess a reasonable recurrence interval flood for planning purposes (i.e., 25, 50-year flood).

2.5.3 Water quality

Ground-water quality tends to reflect characteristics of the recharging surface waters because of the high infiltration and connectivity properties of the valley alluvium. Waters emanating from the Diablo Range are typically low in salts, but generally increase with distance downstream. In November 2004, Balance hydrologists measured specific conductance (a measure of dissolved salts) in several creek locations within the Parkway. Results ranged from 450 umhos/cm to 575 umhoms/cm at 25°C, categorized as non-saline waters. These observations appear consistent with other measurements recorded in the larger Coyote Creek Watershed (Owens and others, 2003). Salt concentrations may increase in the summer months because of low flows or concentration of irrigation and urban runoff; whereas, storm flows likely dilute or lower salt concentrations.

Coyote Creek is listed as impaired from high levels of diazinon—a pesticide. (SCVTA, 2005). SCVWC reported ground-water quality within the Coyote Valley ground-water subbasin in 1997-2000 and again in 2001 (Reymers and Hemmeter, 2001, 2002). Analyses included standard general minerals and nutrients or constituents required for testing under California drinking water standards[6]. Nitrate was the single constituent the exceeded California drinking water standards and agricultural objectives[7]. Sources of nitrate may include natural sources, irrigation runoff, and underground septic tanks. Given that agriculture is the dominant land-use in Coyote Valley, management of a continuous riparian Parkway may incorporate best management practices to reduce non-point pollution.

2.6 Hydrogeology

Coyote Valley is an extension of the Santa Clara ground-water basin and is commonly referred to as the Coyote Valley ground-water subbasin. The Coyote Narrows divides the Coyote Valley ground-water subbasin from the Santa Clara Valley ground-water basin. Characteristics of the basin and subbasin differ.

The Coyote Valley ground-water subbasin is composed of unconsolidated, young alluvial fill to a maximum depth of nearly 500 feet. The subbasin is bounded by bedrock of the Diablo Range on its eastern boundary and bedrock of the Santa Cruz Mountains on its western boundary. Runoff, primarily originating from the Diablo Range foothills, recharges the unconfined aquifer

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[6] Drinking water standards: Maximum contaminant levels (MCL), Title 22, California Code of Regulations.
[7] Agricultural objective: San Francisco Regional Water Quality Board directive.

from channel bed infiltration and overbank flooding. Bedrock constricts the subbasin at Coyote Narrows and transitions into the Santa Clara Valley ground-water basin.

The Santa Clara Valley ground-water basin is composed of older, consolidated silts, sands, and gravels and includes multiple aquitards—layers of less impermeable silts and clays. The basin widens and deepens beyond the Parkway.

Ground water generally moves in a northwesterly direction or in the direction of down valley. The ground-water level in Coyote Valley is typically shallow or within 50 feet below the surface Ground-recharge is predominately from percolation of flow in Coyote Creek in the first 5 to 10 miles downstream of Anderson Dam. Coyote Creek is quite responsive to winter rains and subsequent stormwater runoff. Further downstream, subsurface flow is forced to the surface as the valley becomes confined at Coyote Narrows. Figure 9 shows a cross-section schematic of the basin and illustrates aquifer and ground-water dynamics. Ground-water dynamics are also illustrated in Figure 10. Depths to ground water correspond to the dynamics of the basin geology. The lower portion of the Parkway shows the zone of shallow ground water. The basin-subbasin divide is shown for reference. Because the subbasins are manageable and viable, 100-percent of water supply used in Coyote Creek Valley is from ground water.

Historically, ground water typically re-surfaced over much of the lower Coyote Valley. As agriculture (orchards) became the dominant land-use in the valley, Coyote Reservoir and Coyote Canal were constructed in 1936 to regulate the quick responding surface-water, ground-water interactions in the valley. The Coyote canal diverted water from Coyote Creek along the eastern foothills and returned flow to Coyote Creek downstream of Laguna Seca. This diversion artificially lowering ground-water levels adequate for orchard agriculture.

Over time, ground water became a pre-eminent water-supply source, which required changes in how the valley water was managed. The SCVWD constructed ground-water percolation facilities both on- and off-stream to induce ground-water recharge from natural flows. Today, residential, commercial and industrial developments are becoming more prominent than agriculture, while preserving a green-space along Coyote Creek. In 2007, the SCVWD will begin changing dam operations at Anderson Reservoir to meet aquatic habitat goals downstream.

2.6.1 SCVWD ground-water recharge facilities

The SCVWD manages two ground-water recharge facilities within the Parkway: (1) Ford Road percolation ponds, and (2) Metcalf percolation ponds. These facilities detain stream flow in large ponds located in-stream and allow percolation.

- <u>Ford Road percolation ponds</u> are located upstream from Ford Road. Seasonally constructed gravel spreader dams create three in-stream ponds. However, the February 1997 flood changed channel conditions at Ford Road and the California Department of Fish and Game (CDFG) has withheld permits to continue new construction of the ponds. Therefore, these ponds currently do not function to recharge ground-water.

- <u>Coyote percolation ponds</u> are located downstream of Metcalf Road, also known as Parkway Lakes. A flashboard dam (Coyote Percolation Dam), installed in 1935, supports an instream pond. This facility includes a permanent concrete dam installed in 1934 with an 8 to 10 foot drop. Water from the pond supports additional small ponds downstream both instream and off. Operations of Metcalf ponds during summer months cause the river immediately downstream to become dry or intermittent. A fish ladder was installed on the dam in 1999.

3. FUNCTIONS AND VALUES

An assessment of the key functions and values of the Coyote Creek watershed is essential in establishing a solid understanding of the natural resources that are a part of the Parkway, and can be used to guide park plan options. Stream systems such as Coyote Creek have many functions and values, therefore, our review is restricted to only those we believe have the most relevance to the goals and objectives set forth as part of the Integrated Plan.

Based on our investigations of the Coyote Creek watershed, augmented by our experience in similar settings, the following groups of functions and values are described as part of the existing conditions of the Parkway.

3.1 Channel Connectivity

Channel connectivity describes how stream reaches are connected through the watershed. In a geomorphic sense, high connectivity is manifest by a lack of barriers to the natural flow of water, sediment, and other streamborne constituents downslope from the headwaters to higher order stream segments. Dams, in-stream structures, undersized culverts, road crossings, and other physical barriers represent a creek with low channel connectivity. It should be noted that temporary obstructions such as log jams or debris flows would not generally be considered indicative of low channel connectivity. Adequate channel connectivity will provide an element of biological connectivity with regard to fisheries, aquatic plants, and microfauna.

The creation of a wildlife corridor, both terrestrial and aquatic, is a significant function of stream corridors. Streams promote the movement of wildlife along linear corridors between larger habitat patches, which is especially relevant in urban or intensively farmed areas. Such corridors are seen as valuable for the dispersion and proliferation of plant and animal species. Riparian corridors provide several habitat features, such as a permanent or seasonal water source, high levels of primary productivity, microclimates, horizontal and vertical habitat diversity and migration pathways.

Channel connectivity is impacted in the larger Coyote Creek watershed due to the presence of several large, in-stream barriers, which consist of dams (e.g., Anderson Reservoir, Coyote Reservoir) and on-line ponds (e.g., Ogier Ponds, Parkway Lakes). Dams regulate the flow of water downstream and trap sediment behind spillways, disrupting the natural movement of flow and sediment downstream and inhibiting the movement of aquatic species to upstream reaches of the watershed. On-line ponds do not pose the same physical barrier as dams, but they substantially change flow velocities, water temperatures, and sediment transport processes. High water temperatures and slow-moving, sometimes stagnant, water creates a barrier for many aquatic species.

Although Coyote Creek has a number of in-stream hydraulic barriers at various locations throughout the watershed, there are many existing sub-reaches within the Parkway corridor that have relatively high channel connectivity or have the potential for high channel connectivity, with the removal of low-flow road crossings and other small barriers. The Parkway itself does not have many large-scale, in-stream barriers, as most of the dams are located upstream. The Parkway corridor, therefore, is an ideal setting for continued enhancement of channel connectivity and serves as an important flow corridor for the passage of sediment, microfauna, fisheries, etc.

3.2 Floodplain Connectivity

An important set of values in many stream corridors is derived from interactions between the channel and an associated floodplain. The concept of floodplain connectivity expresses not only the connectivity of the creek with the adjacent floodplain, but also the connectivity of the floodplain up- and downstream.

The biological values of floodplain interactions are well-documented. Geomorphic considerations include aspects such as peak discharge attenuation, reductions in channel erosion from reduced flow depths, sediment storage, and increased opportunities for ground-water recharge.

The Coyote Creek floodplain is an essential component of the Parkway. This floodplain remains functional and continuous for the length of the Parkway, which stretches over 16 miles. One of the highest natural resource values of the Parkway is the up- and downstream continuity of the Coyote Creek floodplain, which contains a diversity of creek, riparian, and upland habitat. Some opportunities exist for enhancing floodplain connectivity in the Parkway, especially in subreaches where the creek has incised and created a steep, deep channel that is no longer overtopped during high-flow events.

3.3 Surface-water and Ground-water Connectivity

The analysis of local hydrology and hydrogeology summarized in Section 2.6 demonstrates that Coyote Creek serves an important function for recharging the Santa Clara and Coyote Valley ground-water basins. These ground-water basins are relied upon for a large proportion of the water supply used by dozens of communities and agricultural practices. The Coyote Creek Parkway will serve an important role in managing ground water resources by preserving and enhancing surface-water and ground-water connectivity.

3.4 Upland Connectivity

Many tributaries within the Parkway are not hydrologically connected to Coyote Creek due to the construction of the Coyote Canal, which intercepts tributary waters along the eastern edge of the valley. Upland connectivity in a hydrologic sense is therefore limited in the Parkway. Opportunities may exist to improve upland connectivity in the Parkway if tributaries are diverted over the Coyote Canal or small diversions are constructed within the canal.

3.5 Flood Conveyance

One of the SCVWD's main priorities is to protect and maintain the ability of stream channels to convey the 100-year flood (1% probability flood). Based on the available 100-year hydrologic record, flows in excess of 6,000 cubic feet per second occur on a fairly regular basis (on average every 7 years) despite the operations of the upstream reservoirs. The Parkway has significant floodplain acreage along the channel that functions to dissipate and store flood waters, minimizing flood damage downstream in more urbanized and confined environments.

3.6 Cold-water Fisheries

A significant value of the Parkway is that it has the natural resources necessary to promote and support cold-water fisheries restoration in Coyote Creek. Most of the area designated as the "Cold Water and Fish Management Zone" by the FAHCE agreement is located within the Coyote Creek Parkway. This management zone extends from the Anderson Dam spillway to the entrance of the Coyote Valley Golf Course, just downstream from the Ogier Ponds. The management objective in the coldwater zone is to restore and maintain healthy salmonid populations. The Parkway will therefore be a focal point for potential cold-water fisheries restoration.

3.7 Wetlands and Seeps

One of the many values of the Coyote Creek corridor is the presence of wetlands and seeps along the floodplain. These features support wildlife by providing habitat along the floodplain corridor. The Parkway has multiple wetlands and seeps within the park boundaries that should be identified and protected as valuable natural resources. Ground water is an important source of water for many seasonal wetlands and all seeps. To maintain these features along the corridor of the Parkway, it will be important to consider how various projects, both located within the Parkway and on adjacent land, will affect the ground water table and thus the seasonal wetlands and seeps.

3.8 Sediment Transport

Sediment transport processes in Coyote Creek are impacted by the Anderson and Coyote Reservoirs located in the headwaters, which trap sediment behind the spillways and release "clean" water downstream. Sediment still enters the creek downstream from these reservoirs via channel bank erosion and the lateral migration of the channel and a lesser degree from tributaries, which is especially important at the edges of old alluvial fans that store gravels. Because Coyote Creek is not confined within the Parkway and can migrate laterally and thus naturally "mine" sediments during high-flow events, the Parkway plays an important role in potentially mitigating some of the impacts on sediment transport caused by the upstream reservoirs. However, such channel migration must be addressed in planning and siting park infrastructure.

4. SCVWD COYOTE CREEK OPERATIONS

The SCVWD implemented a SCVWD-wide, long-term program for stream maintenance. The objectives of the stream maintenance program include:

- Standardize practices and protocols for routine sediment removal, vegetation management, and bank protection,
- Identify cost-effective routine stream maintenance practices and protocols,
- Provide policies of environmental protection and stewardship,
- Avoid or minimize adverse environmental effects,
- Implement effective and economically practical compensatory mitigation for any adverse environmental impacts that might occur from stream maintenance,
- Conduct adaptive management.

4.1 SCVWD Current or Projected Operations

We describe current or projected stream maintenance as they apply to the reach within Coyote Creek Parkway.

4.1.1 Fisheries and Aquatic Habitat Collaborative Effort (FAHCE):

The FAHCE is an agreement by the SCVWD, with partnership with CDFG, to conduct a comprehensive assessment of SCVWD facilities and their impacts on salmon and steelhead populations. The agreement also requires identification of reasonable flow and non-flow measures that will improve habitat conditions. A description of flow requirements were previously described under Section 2.5.2 Coyote and Anderson Reservoir Operations.

4.1.2 Channel maintenance operations

The SCVWD is currently implementing a multi-year stream maintenance program. All channels are protected and maintained to convey the 100-year (1% probability) flood. The program includes routine bank repair, sediment and vegetation removal, and native plant re-vegetation. The SCVWD implement a wide range of mitigation procedures and bank protection techniques. Techniques may include bio-engineering or hard-structure river engineering (SCVWD, 2001).

4.2 Ongoing and Anticipated Creek Enhancement Projects in the Parkway

A number of projects, management changes, and monitoring programs exist or are planned for the Coyote Creek watershed. They involve on-the-ground work to improve, enhance or restore fish habitat and populations. The following is a list and brief description of ongoing and anticipated creek enhancement projects within the Parkway (summarized from Buchan and others, 2002):

- Invasive species removal: Between 1996 and 2000, San Jose Conservation Corps removed invasive giant cane (sp. *Arundo donax*) along a 3-mile stretch of Coyote Creek in Hellyer County Park. Reportedly, results are positive and monitoring continues.

- Hydromodification Management Plan (HMP): An HMP is a requirement in all watersheds of the Santa Clara Basin, under the National Pollution Discharge Elimination System (NPDES) permit. The plan addresses measures for mitigating effects urbanization has on stream hydrology and channel geomorphology.

- Coyote Parkway Lakes Freshwater Wetlands Project: Proposed 7+-acre wetland site to mitigate impacts by SCVWD channel maintenance activities. Channel maintenance activities include bank repair and sediment and vegetation removal to maintain flood conveyance.

- Coyote Watershed Stream Stewardship Plan (SSP): The SSP is collaboration between SCVWD staff and local stakeholders. The plan compiled projects affecting the watershed and grouped and prioritized projects benefiting flood protection, environment/habitat, operations and maintenance, water supply, and community participation. Implementation of the projects will depend on existing funding.

- Stream and Watershed Protection Program, Environmental Land Preservation Project: The SCVWD, with other partners, promote land acquisitions and land preservation to improve ecological conditions of the creek.

- Coyote Watershed Aesthetics Guidelines: guides the design of projects within the Coyote Creek watershed in order to achieve a unified appearance that is aesthetically pleasing and sensitive to the surrounding community.

- Natural Resource Management Program Plan: Includes guidelines for natural resource management, including water resources within the County parks.

- The Surface Water Quality Monitoring Program: The SCVWD developed a monitoring program that identifies projects that protect watershed and streams.

- Stream and Lake Stewardship Program: Hellyer and Anderson Parks along Coyote Creek are establishing a volunteer program that would include residents to assist in the protection and enhancement of streams and lakes within the parks. The program would include stream data collection and monitoring, litter collection, and reporting hazards.

4.3 Coyote Valley Specific Plan

Coyote Valley Specific Plan is an infrastructure framework system of public transit, residential, commercial and industrial facilities located within the Fisher Creek tributary watershed. The plan, if implemented, might require channel relocation of a middle reach. Fisher Creek and an instream 50-acre lake to minimize hydrologic impacts or increases to the 100-year peak runoff.

5. SUMMARY OF KEY POINTS

- One of the more important natural resource values of the Coyote Creek Parkway is the connectivity of floodplain, upland, and channel habitat it provides. This establishes a significant wildlife corridor.

- The Coyote Creek Parkway has a continuous, high value riparian corridor and floodplain enhancing flood storage and helping to minimize flood damage in downstream urbanized or confined areas.

- Within the Coyote Creek Parkway, there are relatively few large-scale fish passage barriers, with the exception of the Coyote Percolation Dam and Ogier Ponds. Multiple opportunities exist for the enhancement of channel connectivity within the Parkway.

- The Coyote Creek Parkway protects a water-resource function important for recharging the Santa Clara Valley and Coyote Valley ground-water basins

- Dam operations at the Coyote and Anderson Reservoirs have altered Coyote Creek flow regime. Reservoir operations have muted peak flows and reduced the variability of flows throughout the Parkway. However, historical hydrologic records indicate that the Parkway continues to receive flood flows in excess of 5,000 cubic feet per second. Resource planning within the Parkway needs to consider historical floods and their influence on channel enhancement, relocation and/or restoration projects, as well as the existing modified flow regime.

- The Santa Clara Valley Water District (SCVWD) has on-going or planned projects within the Coyote Creek Parkway. The SCVWD's mission is to enhance water quality, flood conveyance, and comply with proposed anadromous fisheries habitat (FAHCE Agreement). The FAHCE Agreement "Cold Water Management Zone" is almost entirely located within the Parkway boundary.

6. LIMITATIONS

This report was prepared in general accordance with the accepted standard of practice for initial evaluation of such sites in northern California for projects of similar scale at the time the investigations were performed. No other warranties, expressed or implied, are made.

As is customary, we note that readers should recognize that the interpretation and evaluation of factors affecting the geologic conditions and hydrologic context of any site are a difficult and inexact art. Judgments leading to conclusions and recommendations are generally made with an incomplete knowledge of the conditions present. More extensive or extended studies can reduce the inherent uncertainties, but may delay implementation of the project.

We have used standard environmental information -- such as wetland and topographic mapping -- in our analyses and approaches without verification or modification, in conformance with local custom. New information could influence the recommendations, perhaps fundamentally. As new and updated information becomes available, the interpretations and recommendations contained in this report may warrant change.

Recognizing that accurate information greatly aids the planning process, we ask that readers who note omissions or errors let us know at the earliest opportunity.

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Table 1. Properties of surficial soils near Coyote Creek, Santa Clara County

Map Symbol	Soil Series	Depths	Location	Land Division Description	Texture	Hydrologic Soil Group	Permeability	Reaction	Parent Materials
		(inches)					*(in/hr)*	*(pH)*	
Rg	Riverwash		Active channel width	River wash	mixture of sand, gravel, cobbles w/ little to no clay		high (unspecified)		
Co	Cortina	0-60	channel banks	River bank	very gravelly loam to sandy loam	A	6.3-20.0	6.1-6.5	sedimentary alluviu
Ga	Garretson	0-40 40	channel banks	River bank, floodplain	loam, sand and gravel	B	0.63-2.0 >20.0	6.6-7.3 6.6-8.4	
Po	Pleasanton	0-60	western floodplain under CA HWY 101	Old Alluvial Fans	loam, gravelly clay loam and gravelly sandy clay	B	0.20-0.63	6.1-7.3	sedimentary alluviu
Ye A	Yolo	0-67	Southern Pacific Railroad		silty clay loam	B	0.20-0.63	6.1-8.4	sedimentary alluviu
Ye C	Yolo	0-67	eastern floodplain and alluvial fans		silty clay loam	B	0.20-0.63	6.1-8.4	sedimentary alluviu
Mc	Maxwell	0-46 46-60	Coyote Creek Golf Course		clay gravelly clay loam	D	0.06-0.20	6.6-8.4 7.9-8.4	serpentine alluviur
Sb	San Benito	0.39 39	eastern alluvial plain	Alluvial fans	clay loam	B	0.20-0.63	6.6-8.4	shale

Notes:
Information taken from USDA soil survey for the eastern Santa Clara area; the western Santa Clara area soil survey is currently being mapped.
This soil survey generally does not distinguish areas smaller than about 20 to 40 acres, so that wetlands, alluvium, or swale fills smaller than 10 to 20 will not be mapped.
USCS = Unified Soils Classification System, commonly used in geotechnical or soil-foundation investigations, and in routine engineering geologic logging
Available water capacity is the held water available for use by most plants, usually defined as the difference between the amount of soil water at field capacity (one day of drainage after a rain or

Table 2. Historical hydrologic summary, Coyote Creek at Madrone: Peak flows for period of record (1903-2004)

	Water Year[1]	Rank	Peak Flow Information: Peak Flow (cfs)	Peak Stage[2] (ft)	Date
	USGS Coyote Creek Gage[3,4,5]				
Pre Coyote and Anderson Reservoirs	1903	2	15,000	--	March 31, 1903
	1911	**1**	**25,000**	**--**	**March 7, 1911**
	1917	4	10,100	14.50	February 21, 1917
	1922	5	9,760	14.00	February 10, 1922
	1923	6	9,200	--	January 24, 1923
	1932	3	10,600	14.48	December 28, 1931
	1938	7	6,670	12.20	February 11, 1938
	1943	11	5,450	11.42	January 21, 1943
	1945	8	6,580	12.15	February 2, 1945
Post-Coyote and Anderson Reservoirs	1958	10	5,750	9.65	April 3, 1958
	1969	14	3,570	8.16	February 25, 1969
	1982	13	3,630	8.80	April 1, 1982
	1983	12	4,720	9.58	March 1, 1983
	1997	9	6,280	10.84	January 26, 1997
	1998	12	3,750	8.76	February 8, 1998

Notes:

1. A hydrologic water year represents data from October 1-September 30
2. Peak stage represents water level on an arbitrary datum, and may not represent the actual depth of water in the creek.
3. USGS stream gage #11170000: Coyote Creek near Madrone, CA (37° 10' 06" N, 121° 38' 55" W)
4. Peak flow accuracy assumes 2 to 3-significant figures, actual peak flows may be approximated to nearest 1,000 cfs.
5. Peak flow and stage recorded after 1987 are managed by SCVWD. These data are preliminary and subject to change.