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Pacific Advanced Civil Engineering, Inc., "Newhall Ranch River Fluvial Study Phase 1, Final Draft" (March 2006; 2006a).

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Philip Williams and Associates, Ltd., "Memorandum Regarding Channel Geomorphic Assessment of Chiquito Canyon" (June 12, 2007; 2007a).

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Philip Williams and Associates, Ltd., "Memorandum Regarding Channel Geomorphic Assessment of Potrero Canyon" (June 12, 2007; 2007e).

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Philip Williams and Associates, Ltd., "Newhall Ranch Tributary Channel Design Guidelines" (November 20, 2008).

## 4.2.1 INTRODUCTION

This section provides an overview of the existing geomorphic conditions and riparian resources within the Project area. The section also evaluates the hydraulic impacts on sensitive aquatic/riparian resources in the Santa Clara River Corridor and tributaries due to implementation of the proposed Project and alternatives. For purposes of this analysis, geomorphic processes include sediment production, transport, and storage through the stream corridor. River geomorphology[1] includes the changes (natural or otherwise) to the landscape and within the floodplain that can cause a variety of adverse or beneficial outcomes. For example, changes to the existing hydraulics might change the course of a river, result in the river becoming deeper or wider, increase scour, or cause stream bank failures. An analysis of such changes is important in the evaluation of the effects on erosion and sedimentation, water quality, and the aquatic and riparian habitat in the vicinity of the Santa Clara River. Because the proposed Project and alternatives also may affect the amount of sediment transported to Ventura County beaches, issues related to beach replenishment are evaluated in this section. Species-specific impacts in riparian and aquatic habitats are described in **Section 4.5**, Biological Resources, of this EIS/EIR. Impacts to jurisdictional waters through direct removal, filling, hydrological interruption, or other means are described in **Section 4.6**, Jurisdictional Waters and Streams. Impacts to hydrology and flooding protection are included in **Section 4.1**, Surface Water Hydrology and Flood Control.

The proposed Project is comprised of two components, the RMDP and the SCP. In summary, the RMDP would implement resource conservation, mitigation, and management of sensitive biological resources within the RMDP study area, in conjunction with development of the Specific Plan. RMDP infrastructure includes, among others, bridges and road crossing culverts, bank stabilization, drainage facilities, water quality control facilities, tributary drainage modifications, storm drain installation, utility crossings, haul routes, the Newhall Ranch WRP outfall, maintenance, and other activities in the Santa Clara River and its tributaries located within the RMDP study area. The SCP is a conservation and mitigation strategy for the California endangered San Fernando Valley spineflower (spineflower), which identifies measures for the conservation, permitting, and management of spineflower on the applicant's land holdings with known populations, including the Specific Plan and the adjacent Entrada planning area. The SCP also would authorize take of the spineflower in areas outside of the designated preserve areas, including portions of the Specific Plan, the VCC planning area, and the Entrada planning area.

Implementation of the RMDP and SCP components would facilitate build-out of County-approved development within the Specific Plan, the VCC planning area, and a portion of the Entrada planning area; and, therefore, the resulting effects to the geomorphology of the Santa Clara River and its tributaries and the associated riparian resources within the Project area are evaluated as indirect impacts. Impacts to the geomorphology of the Santa Clara River and its tributaries and the associated riparian resources outside the footprint of the Project area are evaluated as secondary impacts in this EIS/EIR.

[1] Geomorphology is the study of landforms, including their origin and evolution, and the processes that shape them. Fluvial geomorphology is the study of landform evolution related to river systems, which are influenced by factors such as river flows, sediment load and particle size, erosion, geology, and valley shape and slope.

#### 4.2.1.1 Relationship of Proposed Project to Newhall Ranch Specific Plan Program EIR

This section (**Section 4.2**) provides a stand-alone assessment of the potentially significant geomorphology and riparian resource impacts associated with the proposed Project and alternatives; however, the previously certified Newhall Ranch environmental documentation provides important information and analysis for the RMDP and SCP components of the proposed Project and alternatives. The Project components would require federal and state permitting, consultation, and agreements that are needed to facilitate development of the approved land uses within the Specific Plan site and that would establish spineflower preserves within the Project area, also facilitating development in the Specific Plan, VCC, and a portion of the Entrada planning area. Due to this relationship, the Newhall Ranch environmental documentation, findings, and mitigation, as they relate to geomorphology and flood control resources, are summarized below to provide context for the proposed Project and alternatives.

Specifically, the Newhall Ranch Revised Draft EIR, Section 4.2 (March 1999) identified and analyzed the existing flood conditions and associated impacts of the entire Specific Plan area. Section 4.2 also called for implementation of Mitigation Measures SP-4.2-1 through SP-4.2-7 to reduce the significance of identified flood impacts.[2]

The Newhall Ranch Revised Additional Analysis (May 2003), Section 2.3, Floodplain Modifications, addressed the biological impacts to the Santa Clara River Corridor due to channelization, increased flow velocities, and bank hardening associated with build-out under the Specific Plan. The objective of this analysis was to determine whether the predicted change in the floodplain of the Santa Clara River would cause significant impacts to the nature, amount, and location of the aquatic/riparian habitats in the Santa Clara River Corridor, the Specific Plan site, and in the downstream reaches of Ventura County.

The Newhall Ranch Revised Additional Analysis (May 2003) found that the Specific Plan would modify the floodplain by placing bank stabilization along selected portions of the Santa Clara River, developing the floodplain areas behind the bank stabilization, and installing three bridges across the River. It was determined that these actions would alter flows in the Santa Clara River; however, it was further found that such effects would only be observed during infrequent flood events that reach the buried banks (*e.g.*, 50-year and 100-year flood events.) In addition, while the Specific Plan would increase or change the water flows, water velocities, water depth, sediment transport, and flooded areas, these hydraulic effects would be minor in both magnitude and extent. Therefore, the effects were determined to be insufficient to alter the amount, location, and nature of aquatic/riparian habitats in the Specific Plan area and downstream in Ventura County. Hence, the mosaic of habitats in the Santa Clara River that support various sensitive species would be maintained, and species' populations within and adjacent to the Santa Clara River Corridor would not be significantly affected by the Specific Plan.

As all biological impacts resulting from the floodplain modifications were determined to be less than significant, the Newhall Ranch Revised Additional Analysis (May 2003) did not recommend the adoption

[2] Reference to mitigation measures included in the Newhall Ranch environmental documentation are preceded by "SP" in this EIS/EIR to distinguish them from other mitigation measures discussed herein.

of additional mitigation measures and concluded that no significant unavoidable biological impacts were anticipated as a result of the floodplain modifications.

**Table 4.2-1** summarizes the Specific Plan's and the WRP's issues of concern regarding flood hazards and the applicable mitigation measures developed by federal, state, and local agencies to minimize flood hazards.

**Table 4.2-1**
**Flood Hazards Associated With Implementation of the Specific Plan**

| Impact Description | Mitigation Measures | Finding After Mitigation |
|---|---|---|
| **Specific Plan Flood Impacts** - The Specific Plan would not increase site runoff during a capital storm event and would not result in upstream or downstream flooding. In addition, the Specific Plan would not subject any on- or off-site improvements to flood hazards beyond applicable regulatory thresholds. | • SP-4.2-1 (flood control improvements must be to the satisfaction of the Los Angeles County Department of Public Works Flood Control Division);<br>• SP-4.2-2 (all necessary permits or letters of exemption must be obtained prior to construction of drainage improvements);<br>• SP-4.2-3 (all necessary streamed agreements must be obtained);<br>• SP-4.2-4 (Conditional Letters of Map Revision must be obtained after construction of the proposed drainage facilities);<br>• SP-4.2-5 (prepare and obtain approval of a Final Hydrology Plan, Final Drainage Plan, and Final Grading Plan); and<br>• SP-4.2-7 (satisfaction of all applicable requirements of DPW SUSMP and SWPPP and the requirements of NPDES Program in effect in Los Angeles County). | Not significant |
| **Specific Plan Erosion and Debris-Related Impacts -** During construction, the Specific Plan would have the potential to discharge sediment downstream during storm events, and this is a significant impact. Upon build-out, however, downstream sedimentation would be reduced. This sediment reduction in flood waters would reduce the amount of sediment available to replenish beaches down-current of the Santa Clara River mouth, but this is not considered significant. | • SP-4.2-6 (install permanent erosion control measures in order to prevent sediment and debris from entering storm drainage improvements). | Not significant |

**Table 4.2-1**
**Flood Hazards Associated With Implementation of the Specific Plan**

| Impact Description | Mitigation Measures | Finding After Mitigation |
|---|---|---|
| **Specific Plan Cumulative Flood Impacts** - Assuming that all development within the tributary watershed of the Santa Clara River complies with local regulatory requirements to ensure that upstream or downstream flooding does not occur and to ensure that downstream erosion and sedimentation do not occur, no unavoidably significant cumulative flooding, erosion, sedimentation, or beach sand replenishment impacts would be created. | • No further mitigation recommended. | Not significant |

Source: Newhall Ranch Revised Draft EIR (March 1999); Newhall Ranch Revised Additional Analysis (May 2003).

### 4.2.1.2 Relationship of Proposed Project to VCC and Entrada Planning Areas

#### 4.2.1.2.1 VCC Planning Area

The SCP component of the proposed Project, if approved, would facilitate development in the VCC planning area. The VCC is reliant on the SCP and associated take authorizations, and would not be developed without the take authorizations due to grading constraints. The VCC planning area is the remaining undeveloped portion of the VCC commercial/industrial complex currently under development by the applicant. The VCC was the subject of an EIR certified by Los Angeles County in April 1990 (SCH No. 1987-123005). The applicant has recently submitted to Los Angeles County the last tentative parcel map (TPM No. 18108) needed to complete build-out of the remaining undeveloped portion of the VCC planning area. The County will require preparation of an EIR in conjunction with the parcel map and related project approvals; however, the County has not yet issued a Notice of Preparation (NOP) of the EIR or released the EIR. The previously certified VCC EIR (April 1990) did not address impacts related to geomorphology and riparian resources.

#### 4.2.1.2.2 Entrada Planning Area

The applicant is seeking approval from Los Angeles County for planned residential and nonresidential development within the Entrada planning area. The SCP component of the proposed Project would designate an area within Entrada as a spineflower preserve. If approved, the SCP component would include take authorization of spineflower populations in Entrada that are located outside of the designated spineflower preserve area. Thus, the planned residential and nonresidential development within portions of the Entrada planning area is reliant on the SCP and associated take authorizations, and those portions would not be developed without the take authorizations. The applicant has submitted to Los Angeles County Entrada development applications, which cover the portion of the Entrada planning area facilitated by the SCP component of the proposed Project. However, as of this writing, the County has not

yet issued a NOP of an EIR or released an EIR for Entrada. As a result, there is no underlying local environmental documentation for the Entrada planning area at this time.

#### 4.2.1.3 Study Scope and Methods

The scope of this section includes an analysis of the existing and proposed changes to the geomorphology of the Santa Clara River and its tributaries and the associated riparian resources within both the Project area and any area outside of the Project site that may be impacted as a result of the proposed Project and alternatives.

Several studies have been conducted to evaluate geomorphic and riparian resource impacts resulting from the proposed Project and the alternatives, including the facilitated development within the Specific Plan, VCC, and Entrada. These studies were developed using information from existing literature as well as field surveys conducted for the proposed Project. The information includes stream flow data for the Santa Clara River between 1953 and 1996 (USGS Gage No. 11108500); aerial photographs of the Santa Clara River between 1927 and 2005 that were selected to characterize representative conditions at various points in time over this period; and field surveys conducted in 2003 (URS 2003), 2006 (PWA 2007a, 2007b, 2007c, 2007d, 2007e), and 2007 (PACE 2008A, 2008B) that were used to characterize the Santa Clara River and tributary watershed habitat and geomorphology. The studies used to prepare this section are summarized below.

In a report entitled, "Assessment of Potential Impacts Resulting from Cumulative Hydromodification Effects, Selected Reaches of the Santa Clara River, Los Angeles County, California" (October 2005), Balance Hydrologics used an empirical approach to assess the effects of urbanization on channel morphology associated with implementation of the Specific Plan, combined with other existing and future development in the upper watershed of the Santa Clara River as described in the adopted Los Angeles County General Plan (Balance Hydrologics, 2005). This report is found in **Appendix 4.2** of this EIS/EIR.

In addition, Pacific Advanced Civil Engineering, Inc. (PACE) prepared a detailed fluvial analysis of the effects of the proposed Specific Plan development on the Santa Clara River within the Project area for the Los Angeles County Department of Public Works (DPW), and DPW has approved the results of the PACE fluvial studies. One of the objectives of the fluvial analysis was to enhance understanding of the Santa Clara River fluvial mechanics, in order to support a description of the existing conditions, and to identify any potential impacts associated with development of the Specific Plan. The analysis included detailed modeling of the Santa Clara River and its tributaries within the Project area as described in **Subsection 4.2.1.3.1**, Modeling, below. The PACE Phase 1 Fluvial Study (2006a) and Phase 2 Fluvial Study (2008) are found in **Appendix 4.2** of this EIS/EIR.

ENTRIX also prepared an assessment of fish presence, aquatic habitat quality and quantity, and potential effects on threatened or endangered fish species inhabiting the Newhall Ranch reach of the Santa Clara River and its tributary drainages. (ENTRIX, 2009.) This report covered the mainstem Santa Clara River from Salt Creek Canyon upstream to the Middle Canyon confluence and included the Salt Creek and Potrero Creek tributaries. The ENTRIX report is found in **Appendix 4.5** of this EIS/EIR.

GSI Water Solutions, Inc. prepared a report entitled, "Assessment of Future Surface Water Conditions in the Dry Gap of the Santa Clara River" (April 2008). The GSI report evaluated the "Dry Gap" portion downstream of the Project area in Ventura County. The "Dry Gap" is an ephemeral reach of the Santa Clara River that extends from about 3.5 miles downstream of the Los Angeles County/Ventura County line (western limit of the Project boundary) to downstream of the Piru Creek confluence and lower Piru groundwater basin limits further downstream between the communities of Piru and Fillmore. The GSI report also described the historic, current, and future conditions of the "Dry Gap," focusing on historic trend analysis using aerial photography to determine whether surface flows and riparian resources downstream of the Project area have expanded, or may expand, due to increased base flows, particularly from the Newhall Ranch Water Reclamation Plant (WRP) and discharges upstream from two existing WRPs. In addition, GSI incorporated regional Santa Clarita Valley surface water and groundwater interaction modeling that was conducted as part of previous studies and Specific Plan-related environmental documentation. The GSI report is found in **Appendix 4.2** of this EIS/EIR.

In addition, GSI prepared a report entitled, "Middle Canyon Spring Hydrogeologic Assessment and Impact Evaluation Report" (September 2007). This report evaluated the existing hydrologic conditions that occur in the Middle Canyon spring, a unique slope wetland located on an upper terrace along the southern bank of the Santa Clara River, just downstream from the confluence with Middle Canyon. The spring is a unique physical and biological feature that includes snail and sunflower species, which are taxonomically undescribed and may only occur in this location regionally. The report also described the physical conditions that support the spring and evaluated the potential impacts on the spring, resulting from Project implementation and facilitated development. The report also incorporated data and analysis from past geologic and hydrologic studies related to pre- and post-development conditions, including analysis within the Middle Canyon watershed. The GSI Middle Canyon report is found in **Appendix 4.2** of this EIS/EIR.

Philip Williams and Associates (PWA) also prepared the "Newhall Ranch Tributary Channel Design Guidelines" (November 2008). This document developed design criteria for each of the five major RMDP tributary drainages (Chiquito, San Martinez Grande, Lion, Long, and Potrero canyons), evaluated current geomorphic conditions in each drainage, and developed drainage-specific design criterion in order to ensure that each drainage would have a "dynamically stable channel" in the post-development condition where neither long-term erosion and/or deposition would occur and where restored and/or enhanced vegetation communities would be supported. The basis of the design development process was to ensure hydromodification control within these drainages in the post-development condition. The PWA report is found in **Appendix 4.2** of this EIS/EIR.

Geosyntec Consultants, Inc. (Geosyntec) prepared a plan entitled, "Newhall Ranch Specific Plan Sub-Regional Stormwater Mitigation Plan (SWMP)" (April 2008). This plan sets forth the urban runoff management program that will be implemented for the Newhall Ranch Specific Plan subregion, consistent with the Los Angeles County Municipal Separate Storm Sewer System (MS4) National Pollutant Discharge Elimination System (NPDES) Permit, and the Standard Urban Stormwater Mitigation Plan (SUSMP). Stormwater management, including planning water quality and hydromodification control, is central to assuring the long-term viability of beneficial uses, including important habitat systems and species dependent upon those systems. The plan assessed potential water quality and hydromodification

impacts associated with the Specific Plan development, and proposes Best Management practices (BMPs) and other control measures to mitigate potential impacts and ensure beneficial uses. The Geosyntec plan is found in **Appendix 4.4** of this EIS/EIR.

All of the above-referenced reports were evaluated and used in preparing this section. Please refer to **Appendix 4.2** and **Appendix 4.4** for each report.

#### 4.2.1.3.1 Modeling

The PACE hydraulic analyses for the Santa Clara River (2008A) and major tributaries (Chiquito, San Martinez Grande, Potrero, Long, and Lion Canyons) (2008B) provide an evaluation of the existing hydraulic conditions. In addition, the model for the Santa Clara River and the PACE Phase 1 Fluvial Study (2006a) provide an evaluation of the proposed hydraulic conditions, fluvial characteristics, and the long-term stability of the Santa Clara River between I-5 and an area generally west of the Los Angeles County/Ventura County line in the vicinity of the Project area. The hydraulic conditions were evaluated using the U.S. Army Corps of Engineers (Corps) HEC-RAS (River Analysis System, Version 3.1.2) and BOSS-RMS (BOSS International River Modeling Software) models. The BOSS-RMS model is a proprietary version of the Corps HEC-RAS model and was used for its capability to digitally map the floodplain boundary, which cannot be provided by HEC-RAS. These models were used to develop detailed water surface profiles to analyze hydraulic conditions for Project alternatives and to establish the "baseline" geomorphic floodplain of the natural river system. The Santa Clara River report prepared by PACE (2008A) also studied existing and future riparian vegetation responses to several predicted flood conditions (aerial extent, velocities, and scour potential) for comparison of pre- and post-development and RMDP implementation conditions.

### 4.2.1.4 Study Area

The Project area consists of the RMDP and SCP study area. The RMDP boundary encompasses the Specific Plan's River Corridor SMA/SEA 23, the High Country SMA/SEA 20, the designated Open Areas, and the Salt Creek area located in Ventura County, adjacent to the Specific Plan's western boundary (see **Figure 2.0-3**). The SCP component encompasses the RMDP area and the VCC and Entrada planning areas (see **Figure 2.0-4**).

#### 4.2.1.4.1 Santa Clara River

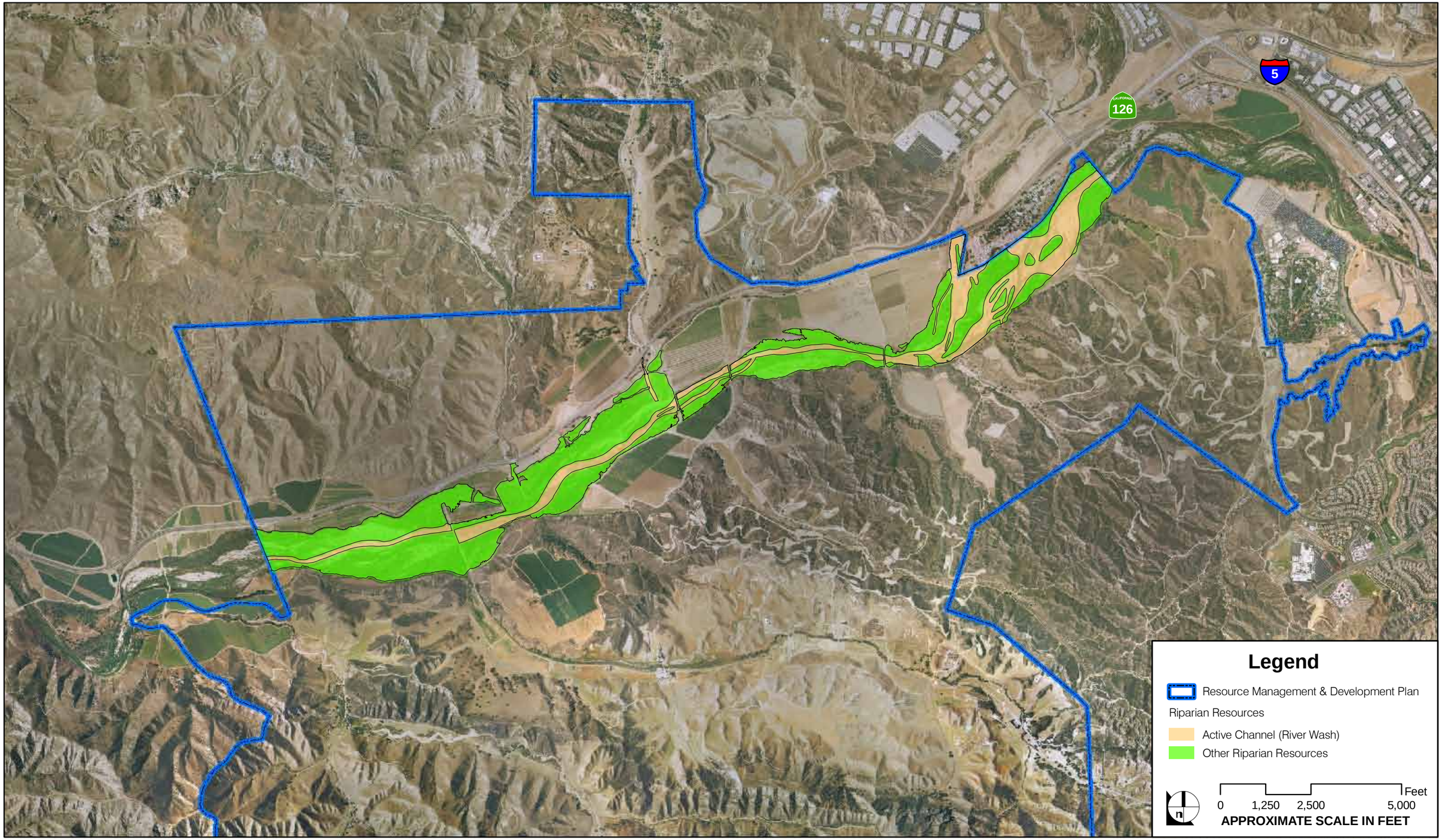
As described in **Section 4.1**, Surface Water Hydrology and Flood Control of this EIS/EIR, the Project area is located within the Santa Clara River watershed, which drains an area of approximately 1,624 square miles in the Transverse Mountain Ranges of Southern California. Elevations within the watershed range from sea level at the river mouth to 8,800 feet at the summit of Mount Pinos in the northwest corner of the watershed. The Santa Clara River flows generally from east to west from its headwaters near Acton to the Pacific Ocean near the City of Ventura, approximately 40 miles downstream of the Newhall Ranch Specific Plan subregion. The Santa Clara River transects the northern portion of the Project area from east to west (Geosyntec, 2008). **Figure 4.2-1**, Santa Clara River Riparian Resources, depicts the delineated riparian resource areas along and within the Santa Clara River in the Project area.

The Santa Clara River is perennial from the existing Valencia WRP, downstream to approximately 3.5 miles downstream of the Los Angeles County/Ventura County line (western limit of the Project boundary) near Rancho Camulos. Flows in the Santa Clara River also can be affected by groundwater dewatering operations or by diversions for agriculture or groundwater recharge. Throughout the Santa Clara River channel, complex surface water/groundwater interactions lead to areas of alternating gaining and losing river segments. In particular, downstream of the Los Angeles County/Ventura County line, the Santa Clara River flows through the Piru groundwater basin where surface flows in the river are lost to groundwater. This ephemeral reach of the river is referred to as the "Dry Gap."

As previously discussed, the Project area includes both the RMDP and SCP study areas. The RMDP study area is part of the Santa Clara River Hydrologic Basin and associated watershed and overlies 24 tributary drainage areas, all of which drain into the Santa Clara River. The drainages are located within an area that is generally delineated by SR-126 and lower portions of the San Martinez Grande and Chiquito Canyons on the north; Six Flags Magic Mountain Amusement Park on the east; the crest of the Santa Susana Mountains on the south; and the Los Angeles County/Ventura County line on the west. The SCP study area encompasses the RMDP area and the VCC and Entrada planning areas. The VCC planning area overlies two tributary drainages, Hasley Creek and Castaic Creek, both of which drain into the Santa Clara River. The Entrada area overlies Unnamed Canyon 1, Unnamed Canyon 2, Unnamed Canyon 3, and Magic Mountain Canyon tributary drainages.

#### 4.2.1.4.2 Tributaries

The existing drainages within the RMDP and SCP study areas consist of Castaic Creek, Hasley Creek, and the drainage courses of Chiquito Canyon, San Martinez Grande Canyon, Homestead Canyon, Off-Haul Canyon, Mid-Martinez Canyon, and Unnamed Canyon A to the north of the Santa Clara River; and Middle Canyon, Magic Mountain Canyon, Dead End Canyon, Exxon Canyon, Lion Canyon, Humble Canyon, Long Canyon, Ayers Canyon, Potrero Canyon, Salt Creek Canyon, Unnamed Canyon B, Unnamed Canyon C, Unnamed Canyon D, Unnamed Canyon 1, Unnamed Canyon 2, and Unnamed Canyon 3 to the south. **Figure 4.2-2**, Project Area Subwatersheds, shows the tributaries along with the total drainage area, length of the main stem, average slope of main stem, and primary hydrologic soil group for each of the tributaries. Some of the tributaries have been mapped as blue-line streams by the U.S. Geological Survey (USGS). While it is the intent of the USGS to indicate that blue-line streams are flowing perennial streams, in arid areas such as Southern California, this is not always the case. For example, the blue-line stream in upper Potrero Canyon is an ephemeral drainage. Aside from the lower portions of Salt and Potrero Canyons, each of the tributaries within the Specific Plan boundary is classified as an intermittent or ephemeral drainage (URS, 2008). For a detailed description of the tributaries, please see **Section 4.1**, Surface Water Hydrology and Flood Control, of this EIS/EIR.




**SOURCE: DUDEK, PACE 2008**

FIGURE 4.2-1

SANTA CLARA RIVER RIPARIAN RESOURCES

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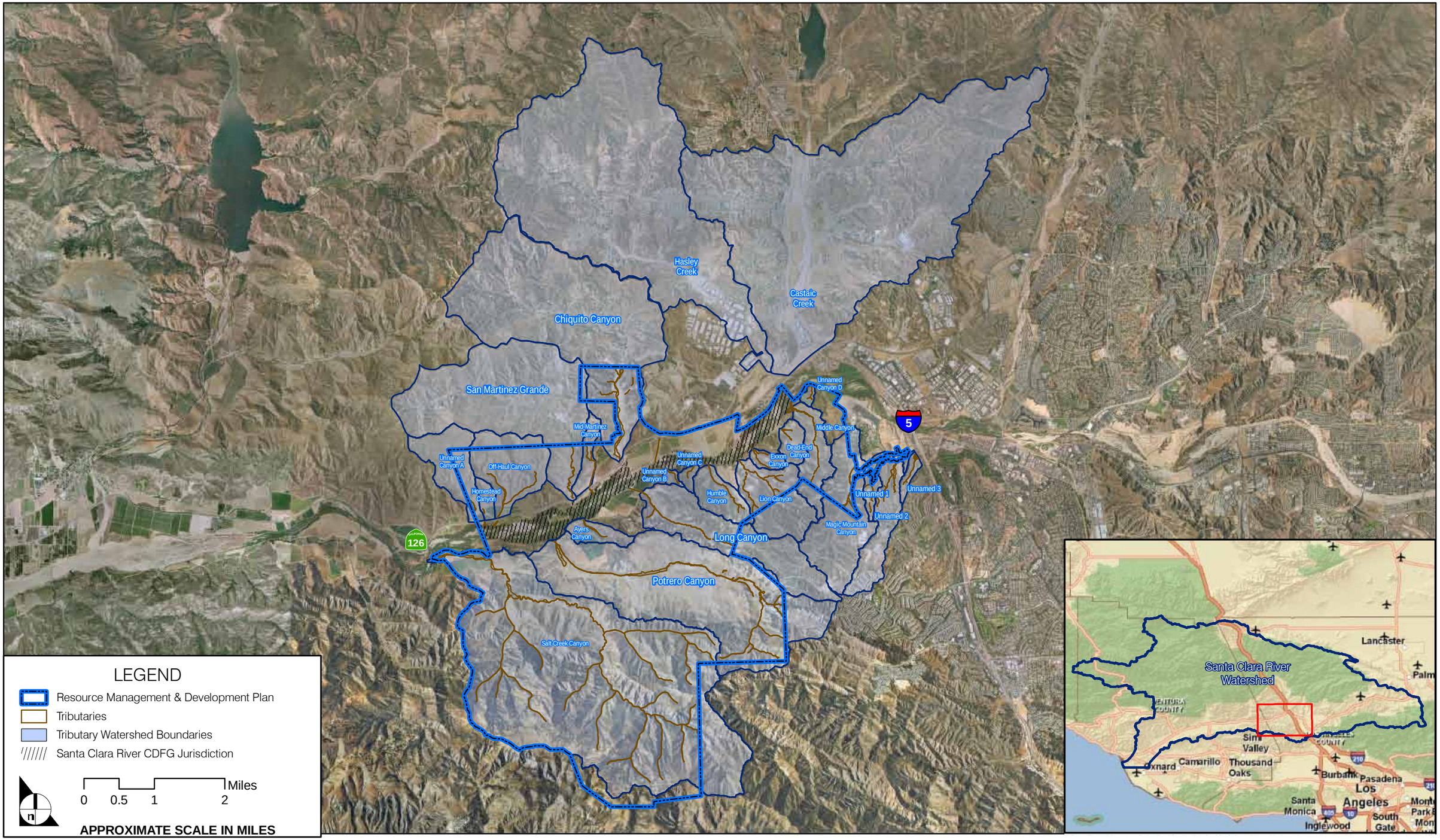


**SOURCE: PACE 2008**

FIGURE 4.2-2

PROJECT AREA SUBWATERSHEDS

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## 4.2.2 REGULATORY SETTING

Development that discharges stormwater runoff into and/or encroaches upon natural drainages, wetlands, or floodplains is subject to the requirements of the Corps, the State Water Resources Control Board (SWRCB) and the Los Angeles Regional Water Quality Control Board (RWQCB) pursuant to the Clean Water Act (CWA); the CDFG pursuant to Fish and Game Code sections 1600 *et seq*.; and the Flood Control Division of the Los Angeles County DPW. The proposed activities do not require permits from the County of Ventura, even though the lower portion of the Salt Creek corridor is situated within Ventura County. The Salt Creek area situated in Ventura County is part of an open space area that will be dedicated to the public in the same manner as the High Country SMA/SEA 20 in Los Angeles County. Because no development would occur on this portion of Salt Creek, there are no Ventura County regulations applicable to this area.

### 4.2.2.1 Federal

#### 4.2.2.1.1 Clean Water Act (33 U.S.C. §§ 1251 *et seq.*)

**Section 402 of the Clean Water Act.** The CWA prohibits the discharge of pollutants to "waters of the United States" from any point source unless the discharge is in compliance with a National Pollutant Discharge Elimination System (NPDES) Permit. The CWA, section 402, requires a NPDES Permit for the discharge of stormwater from municipal separate storm sewer systems (MS4) serving urban areas with a population greater than 100,000; construction sites that disturb one acre or more; and industrial facilities. The RWQCB administers these permits with oversight provided by the SWRCB and USEPA Region IX. Compliance with CWA section 404 is discussed in **Section 4.4**, Water Quality, of this EIS/EIR.

**Section 401 of the Clean Water Act.** Under CWA section 401, every applicant for a federal permit or license for any activity that may result in a discharge of dredge or fill material to a water body must obtain a State Water Quality Certification that the proposed activity will comply with state water quality standards (*i.e.*, beneficial uses, water quality objectives, and anti-degradation policy). Compliance with CWA section 401 is discussed in **Section 4.4**, Water Quality, of this EIS/EIR.

**Section 404 of the Clean Water Act.** Under CWA section 404, the Corps is authorized to permit the discharge of dredged or fill materials to "waters of the United States," which includes both wetland and non-wetland aquatic habitats within the jurisdictional extent of rivers and streams defined by the ordinary high-water mark (OHWM) and wetlands adjacent to waters of the United States. Section 404 permits can be issued as individual or general. A section 404(b)(1) alternatives analysis and section 401 certification is required for all individual permits. Compliance with CWA section 404 is discussed in **Section 4.6**, Jurisdictional Waters and Streams, of this EIS/EIR.

#### 4.2.2.2 State

##### 4.2.2.2.1 Porter-Cologne Water Quality Control Act; California Water Code §§ 13000-14957

This Act establishes the SWRCB and the Regional Boards as the principal state agencies with primary responsibility for the coordination and control of water quality. The RWQCB has jurisdiction over water quality within the region of the proposed Project. The RWQCB developed the Water Quality Control Plan (Basin Plan) for the Los Angeles Region,[3] which guides conservation and enhancement of water resources and establishes beneficial uses for surface waters within the region. Beneficial uses, and the water quality objectives necessary to sustain those beneficial uses, are designated for receiving waters (groundwater and surface waters). Compliance with the Porter-Cologne Water Quality Control Act is discussed in **Section 4.4**, Water Quality, of this EIS/EIR.

##### 4.2.2.2.2 Stormwater Permit

In 2001, the RWQCB issued a NPDES Permit and Waste Discharge Requirements (Order No. 01-182) under the CWA and the Porter-Cologne Act for discharges of urban runoff in public storm drains in Los Angeles County. The Permittees are the Los Angeles County cities and the County. This permit regulates stormwater discharges from MS4s in the Project area. The NPDES Permit details requirements for new development and significant redevelopment, including specific sizing criteria for treatment BMPs and hydromodification control requirements. Hydromodification is defined by EPA as the "alteration of the hydrologic characteristics of surface waters, which, in turn, could cause degradation of water resources." Stormwater permitting and compliance is discussed in more detail in **Section 4.4**, Water Quality, of this EIS/EIR.

The MS4 Permit, part 4, section D.1, notes that increased volume, velocity, and discharge duration of stormwater runoff from developed areas may potentially accelerate downstream erosion and impair habitat-related beneficial uses in "Natural Drainage Systems." Natural Drainage Systems are defined by the MS4 Permit to include the Santa Clara River. Section D.1 of the MS4 Permit stipulates that Permittees must control post-development peak stormwater runoff discharge rates, velocities, and durations in Natural Drainage Systems to prevent accelerated stream erosion and protect stream habitat.

##### 4.2.2.2.3 Fish and Game Code, §§ 1601-1605

Under sections 1601 through 1605 of the Fish & Game Code, the CDFG must be notified prior to any project that would divert, obstruct, or change the natural flow, bed, channel, or bank of any river, stream, or lake. The term "stream" can include intermittent and ephemeral streams, rivers, creeks, dry washes, sloughs, blueline streams, and watercourses with subsurface flows. Compliance with sections 1601 through 1605 of the Fish and Game Code is described in **Section 4.6**, Jurisdictional Waters and Streams, of this EIS/EIR.

[3] California Regional Water Quality Control Board, Los Angeles Region 4, Water Quality Control Plan for the Los Angeles Region, February 23, 1995. The Basin Plan is available for public inspection and review at the County of Los Angeles Public Library, Valencia Branch, 23743 West Valencia Boulevard, Santa Clarita, California 91355-2191, and incorporated by reference.

### 4.2.2.3 Local

#### 4.2.2.3.1 County of Los Angeles Department of Public Works (DPW)

The DPW was formed on January 1, 1985, consolidating the former County Road Department, a portion of the County Engineer-Facilities, and the County Flood Control District. In 1995, DPW assumed the responsibility for capital projects from the County Internal Services Department. The DPW is responsible for the design, construction, operation, maintenance, and repair of roads, bridges, airports, sewers, water supply, flood control, water quality, and water conservation facilities, and for the design and construction of capital projects. Additional responsibilities include regulatory and ministerial programs for the County of Los Angeles, Los Angeles County Flood Control District, other special districts, and contract cities that request services.

The DPW has developed specific design, operation, and maintenance criteria for stormwater management facilities. The Project Preparation Instruction Manual for Drainage Facilities (DPW, 1988) states that the criteria for stormwater management facility design shall be contained in the following Los Angeles County Flood Control District and Department Manuals:

- Project Preparation Instruction Manual (February, 1988);
- Hydraulic Design Manual (March, 1982);
- Structural Design Manual (April, 1982);
- Pump Station Design Manual; and
- Debris Dams and Basins Design Manual (January, 1983).

The Project Preparation Manual states that deviations from DPW design criteria as provided in the above manuals shall be submitted to the DPW for approval prior to use.

The DPW subsequently developed requirements for hydrologic design of flood control and stormwater management facilities. The following manuals were last updated in January 2006:

- Hydrology Manual (December, 1991);
- Sedimentation Manual (June, 1993); and
- Addendum to the 1991 Hydrology/Sedimentation Manual (June, 2002).

**Santa Clara River and Major Tributaries Drainage Policy.** The DPW has determined that the Santa Clara River Basin is a major source of sediment for coastal beaches. In addition, groundwater recharge provides a significant amount of water for the Santa Clarita Valley and should be maintained. Based on these needs, the DPW developed a drainage policy for the Santa Clara River as follows (DPW, 1993):

- The design of flood protection facilities for the Santa Clara River shall be based on:

  - DPW Capital Flood flow rates (50-year rainfall discharge, bulked only);
  - Soft bottom waterways with levees; and
  - Protective levees and additional facilities, such as drop structures or stabilizers as required, shall be designed using DPW criteria.

- The design of flood protection facilities for tributary streams to the Santa Clara River that have existing flood control improvements shall be compatible with these existing facilities.
- The soft bottom waterways shall be designed to maintain an equilibrium between sediment supply to the waterway and sediment transport through the waterway. In cases where a soft bottom waterway is subject to significant deposition due to high sediment supply or significant erosion due to lack of sediment supply, then the drainage concept shall be discussed with DPW prior to submitting plans.

**Debris Production Zones.** The Project area is located within debris production zones designated by DPW's Hydraulic/Conservation Division. Debris production zones are designated by the DPW for use in determining the bulking process and the sediment production rates in a drainage. The debris production zones are designated based on geologic, topographic, vegetative, and rainfall features. Specific debris production maps are provided in Appendix A of the DPW 1991 Hydrology Manual. The DPW has constructed and maintained several debris control and storm structures to minimize the chance of channels clogging with debris. Debris control structures, volumes, and transportation rates are provided in the DPW Sedimentation Manual.

**Los Angeles Department of Public Works, Flood Control Division.** The Flood Control Division within DPW is responsible for collecting and analyzing hydrologic data to support the design, operation, and maintenance of flood control facilities within Los Angeles County. Among other duties, the Flood Control Division performs hydrology and sedimentation studies; collects stream flow, precipitation, and evaporation data; forecasts rainfall runoff; and analyzes flood flows.

**Hydromodification Control.** Under part 4, section D.1 of the MS4 Permit, Los Angeles County was required to develop and implement numeric criteria for peak flow control in accordance with the findings of the Peak Discharge Impact Study analyzing the potential impacts on natural streams due to impervious development. On January 31, 2005, the County adopted and submitted to the RWQCB an Interim Peak Flow Standard to be in effect until such time as a final standard could be adopted based on a completed study.

The intent of the Interim Standard, as described by the County in a letter, dated January 31, 2005, is to provide protection for natural streams to the extent supported by findings from the ongoing study, and consistent with practical construction practices. The Interim Peak Flow Standard adopted by the County is as follows:

> The Peak Flow Standard shall require that all post development runoff from a 2-year, 24-hour storm shall not exceed the predevelopment peak flow rate, burned, from a 2-year, 24-hour storm when the predevelopment peak flow rate equals or exceeds five cubic feet

> per second. Discharge flow rates shall be calculated using the County of Los Angeles Modified Rational Method. The Peak Flow Standard shall also require that post development runoff from the 50-year capital storm shall not exceed the predevelopment peak flow rate, burned and bulked, from the 50-year capital storm.

Proposed projects in Los Angeles County are required to meet the Interim Peak Flow Control Standard as a part of the development plan approval process for building and grading permits.

In addition to the Interim Peak Flow Standard, the Newhall Ranch Specific Plan Subregional Stormwater Mitigation Plan (SWMP; Geosyntec, 2008) that was approved by Los Angeles County provides an alternative performance standard for the Specific Plan projects (NRSP projects) that was developed to ensure the stability of drainages by maintaining sediment transport characteristics rather than relying solely on a "flow based" standard. The NRSP projects will be conditioned to require, as a project design feature, sizing and design of hydraulic features as necessary to control hydromodification impacts in accordance with this Newhall Ranch Specific Plan Subregional Stormwater Management Plan. The NRSP projects will comply with the following performance standard:

> *The erosion potential (Ep) of stormwater discharges from the Project shall be maintained within 20% of the target value in the tributary drainages that will receive post-development flows. The target erosion potential (Ep) will consider changes in sediment supply.*

The erosion potential (Ep) is a metric that measures the potential impact of modified flows on stream stability and substantial erosion, and has been developed as a means to define an in-stream performance standard and a "significance test" of the effectiveness of proposed hydromodification control strategies. An equivalently effective, similarly geomorphically-referenced approach may be developed and applied in the future in place of the erosion potential approach.

The hydromodification performance standard will be met for all of the NRSP projects from the point of discharge to the tributary drainage channel downstream to the confluence of the tributary drainage with the Santa Clara River, and shall be achieved through on-site or in-stream controls, or a combination thereof. Compliance with local hydrologic and flood control regulations is discussed in more detail in **Section 4.1**, Surface Water Hydrology and Flood Control, of this EIS/EIR.

### 4.2.3 EXISTING CONDITIONS

This section describes the existing conditions with respect to geomorphology and riparian resources. **Subsection 4.2.3.1** describes the Santa Clara River and **Subsection 4.2.3.2** describes the tributaries to the Santa Clara River within the Project area. The subsections include discussions of the hydrology, erosion and sedimentation characteristics, water quality, beach replenishment, and riparian habitat. The descriptions are based on information obtained from existing literature as well as field surveys that were conducted for the proposed Project. The information includes stream flow data for the Santa Clara River between 1953 and 1996 (USGS Gage No. 11108500); aerial photographs of the Santa Clara River between 1927 and 2005 that were selected to characterize representative conditions at various points in time over this period; and field surveys conducted in 2003 (URS 2003), 2006 (PWA 2006), and 2007

(PACE 2008A, 2008B) that were used to characterize the Santa Clara River and tributary watershed habitat and geomorphology. This information is used to characterize the dynamic and episodic nature of the existing physical conditions.

#### 4.2.3.1 Santa Clara River

The Project reach of the Santa Clara River extends approximately 5 miles, from the location of the Commerce Center Bridge at the furthest upstream (eastern end) to the Salt Creek confluence at the downstream (western end). The Santa Clara River meanders through the Project reach between bedrock bluffs to the south, and agricultural fields and mature riparian areas along the northern bank. **Figure 4.2-1** depicts the Project reach of the Santa Clara River.

The Santa Clara River is perennial within the boundary of the Project area. Downstream of the existing Valencia WRP, the Santa Clara River is perennial to approximately 3.5 miles downstream of the Los Angeles County/Ventura County line (western limit of the Project boundary) near Rancho Camulos. Throughout the Santa Clara River channel, complex surface water/groundwater interactions lead to areas of alternating gaining and losing river segments. In particular, downstream of the Los Angeles County/Ventura County line, the Santa Clara River flows through the Piru groundwater basin, which forms a "Dry Gap" where dry-season streamflow is lost to groundwater.

As with most southern California streams, flows in the Santa Clara River are highly episodic. For the gauged period between 1953 and 1996, annual flow at the Los Angeles County/Ventura County line gage ranged between 253,000 acre-feet (1969) and 561 acre-feet (1961). Annual peak flows at the County line between 1953 and 1996 ranged from 68,800 cfs (1969) to 109 cfs (1960). The second highest annual peak, 32,000 cfs in 1966, was less than half of the highest peak (68,800 cfs in 1969).

The average discharges or flows (*i.e.*, volume of water over time) for storm events of different recurrence intervals (2-year, 5-year, 10-year, 20-year, 50-year,[4] 100-year recurrence intervals) at the upstream and downstream ends of the Project area under existing conditions are shown in **Table 4.2-2.** A 2-year storm event has a probability of occurring once every two years on average, while a 50-year storm event has a probability of occurring once every 50 years on average, and is much larger than the 2-year event because it is less frequent.

[4] Note this is not the 50-year capital flood, which is based on a theoretical four-day storm event occurring right after the watershed has been burned with the resulting flow rate being increased again by a bulking factor. For purposes of comparison, the predicted flow during the 100-year FEMA flood event at the Los Angeles County/Ventura County line is 60,000 cfs, while the County 50-year capital flood discharge at this same location is 168,000 cfs.

**Table 4.2-2**
**Existing Santa Clara River Flows Through the RMDP/SCP Area**

| Location | Discharge for Different Return Events (cfs) | | | | | |
|---|---|---|---|---|---|---|
| | 2-yr | 5-yr | 10-yr | 20-yr | 50-yr | 100-yr |
| Upper end of the RMDP/SCP area, but downstream of Castaic Creek | 2,527 | 8,232 | 14,942 | 24,157 | 41,141 | 58,207 |
| Downstream end of the RMDP/SCP area at County line | 2,600 | 8,480 | 15,400 | 24,900 | 42,400 | 60,000 |

Source: Newhall Ranch Revised Additional Analysis (May 2003)

As shown on **Table 4.2-2**, the 50- to 100-year storm events are quite large (over 40,000 cfs). **Table 4.2-2** also shows that flows do not increase substantially as the River traverses the Project area, because peak flow contributions from on-site tributaries (*e.g.*, San Martinez Grande, Chiquito Canyon, Potrero Canyon) are minor compared to the contributions from upstream reaches of the Santa Clara River. Flow from Castaic Creek, a tributary that enters from the northeast end of the Project area, also provides a substantial contribution to the flows that traverse the Project Area.

#### 4.2.3.1.1 Erosion and Sedimentation

The Santa Clara River flows through a complex, tectonically-active trough formed by the Ventura anticline and San Gabriel Mountains, located to the northwest and southwest of the River, respectively. (Balance Hydrologics, 2005.) The northeastern and southeastern corners of the watershed are underlain by deeply-weathered granitic and schistose rocks, which produce sands that are coarser than those of other rock units when they weather and erode. The San Gabriel fault crosses the valley, bringing slightly more resistant rock to the surface and creating a local base level reflected as a slight rise or "bump" on the River's longitudinal profile.

The existing floodplain generally consists of a natural alluvial river system and has multiple channels (braided channels) within and adjacent to the Newhall Ranch Specific Plan area. Bed material in the Santa Clara River is mostly composed of non-cohesive sands and gravels. Bank erosion is due to flow impinging upon the banks. This kind of system is characterized by high sediment loads, high bank erodibility, and intense and intermittent runoff conditions. Combined with the relatively flat gradient of the River through the Project Area (average slopes range from five to 0.5 percent), it has a high potential to aggrade (deposit sediment) at low velocities..

Based on study of the response of the Santa Clara River to several different anthropogenic and natural disturbances, Balance Hydrologics (2005) concluded that the sediment delivery within the River is highly episodic. Concepts of "normal" or "average" sediment-supply and flow conditions have limited value in this "flashy" environment, where episodic storm and wildfire events have enormous influence on

sediment and storm flow conditions. In such streams, a large portion of the sediment movement events can occur in a matter of hours or days.

The PACE Fluvial Study (2006a) also provides an evaluation of the existing fluvial characteristics and long-term stability of the Santa Clara River between I-5 and an area generally west of the Los Angeles County/Ventura County line. The long-term riverbed adjustment analysis indicates that riverbed degradation is more prevalent in the upstream one-half of the study reach, while the downstream one-half appears to be stable or fluctuating around a mean elevation. This result is likely due to the relatively steep, narrow, winding upstream reaches versus the relatively flat, wide, braided channel in the downstream portion of the study reach.

Understanding how the River has responded to perturbation in the past is a useful tool for predicting its potential response to Specific Plan build-out within the watershed. Based upon information in the PACE Fluvial Study (2006a), several historic events since 1928 have had an impact on the riverbed and fluvial mechanics, but the system has since recovered. The failure of the St. Francis Dam in 1928 was the most significant historical event in the formation of the present bed condition. Within the Project reach, failure of the dam appears to have resulted in significant scour. Based on long-term topographical analysis, however, the riverbed appears to have mostly recovered from the dam flood scour (PACE, 2006a). The construction of Castaic Dam in 1974, which regulated approximately 25 percent of the watershed at the Los Angeles County/Ventura County line, cut-off a significant supply of sediment to the Santa Clara River. This change, however, does not appear to have had a measurable effect on the channel dimensions of the Santa Clara River mainstem. The width of the active corridor, as well as the general form of the channel, is generally consistent both before and after construction of the dam. It appears that the Santa Clara River adjusted without morphological expression to absorb this change. One factor contributing to the lack of change is the seemingly large volume of sediment stored in the tectonic basin above the County line, a result of bedrock control associated with movement along the San Gabriel fault, which supports the large extent of semi-consolidated and alluvial deposits adjoining the drainage net. Small perturbations, which can potentially affect channel geometry, appear to have transitory or minor effects. For example, the effects on Santa Clara River channel width due to the construction of levees upstream of the Project area in the 1980s was barely discernible by 2005, probably mostly due to morphologic compensation associated with the storm events in the mid- to late-1990s. As a result, the River's channel morphology, stability, and character is almost entirely determined by the "reset" events from large, El Niño-driven precipitation events that occur within the watershed every five to 15 years. (Balance Hydrologics, 2005.) Specifically, a reset flood event refers to the effect that large storm events have on the stability of local channel geomorphology and riparian vegetation. This reset condition occurred in 2005 following the 2004 through 2005 floods related to a pattern of heavy rainfall.

Evidence of episodic channel changes can be seen in the reach of the Santa Clara River within the RMDP study area. Based on interpretation of a near-yearly sequence of aerial photographs from the last decade, the channel appears to maintain a consistent planform during average rainfall years (such as between 2000 and 2004). Large events (such as the 1998 and 2004 through 2005 stormflow events), however, can significantly modify the channel form. Specifically, extensive bank scour from the flood events in 2004 through 2005 has resulted in extensive fine sediment deposition within the existing Newhall Ranch reach of the Santa Clara River. Some of this bed material (fine sediment) is currently being transported through

stream load downstream through the lower Santa Clara River. Hydraulic action from stream flow will eventually create various habitat structures (pools, riffles, backwater habitats) through this newly deposited substrate that will benefit aquatic species by providing in-stream cover and velocity refugia.

Existing Newhall Ranch site runoff conditions were calculated for each drainage area based on a Capital Flood design storm (clear and burned and bulked) by Sikand Engineering Associates (1996). According to Sikand Engineering Associates (1996), clear flows for 20,724 acres of the Santa Clara River watershed, including drainages contributing to the Project reach, total 34,031 cubic feet per second (cfs), and burned and bulked flows total 52,729 cfs for a 50-year Capital storm. As such, the estimated total debris volume during a 50-year Capital storm was estimated to be 1,203,790 cubic yards (cy).

#### 4.2.3.1.2 Water Quality

Alteration of natural sediment dynamics can increase sediment load, with consequent impacts on turbidity and geomorphology. Geomorphic change can change aquatic habitat, including burying gravel used for spawning, altering fish migration triggers, and filling pools used for rearing and feeding. Accordingly, this section includes a discussion of the existing water quality of the Santa Clara River with respect to total suspended solids (TSS). An analysis of chemical water quality parameters is included in **Section 4.4**, Water Quality, of this EIS/EIR.

**Wet Weather Monitoring Data Sources.** In the Newhall Ranch Specific Plan Sub-Regional Stormwater Mitigation Plan (Geosyntec, 2008), the existing wet and dry weather surface water quality in the Project area was characterized from available water quality monitoring data obtained from the following four sources (see also **Section 4.4**, Water Quality):

1. Newhall Ranch Tributary Stormwater monitoring;

2. Pre start-up monitoring for proposed Newhall Water Reclamation Plant (WRP);

3. Los Angeles County monitoring; and

4. USGS monitoring.

**Wet Weather Monitoring Data Summary.** The wet weather water quality data were grouped into two categories depending on the depth of two-day antecedent rainfall measured at the Newhall rain gauge:

1. 0.1 to 1 inch. Rainfall depths that would likely produce runoff volumes characteristic of more frequent, smaller storm events; and

2. Greater than 1 inch. Rainfall depths that would likely produce runoff volumes characteristic of larger, less frequent storm events.

**Table 4.2-3** summarizes the average TSS values from wet weather monitoring data for all Santa Clara River monitoring locations within the Newhall Ranch area (see also **Figure 4.2-3**, Monitoring Station Locations).

**Table 4.2-3**
**Average Wet Weather TSS Monitoring Data For Two-Day Precedent Rainfall -- Santa Clara River**

| Monitoring Location | TSS for Two Day Precedent Rainfall Between 0.1 and 1.0 Inch (mg/L) | TSS for Two Day Precedent Rainfall >1.0 Inch (mg/L) |
|---|---|---|
| **DPW Mass Emission Station** | | |
| S29 | 245 | 1,635 |
| **Newhall WRP Startup Monitoring** | | |
| Station NR1 | 58 | Not Available |
| Station NR3 | 112 | 43,360 |
| **USGS Wet Weather Monitoring** | | |
| 11108500 | 2,291 | 10,711 |

Source: Geosyntec, 2008.

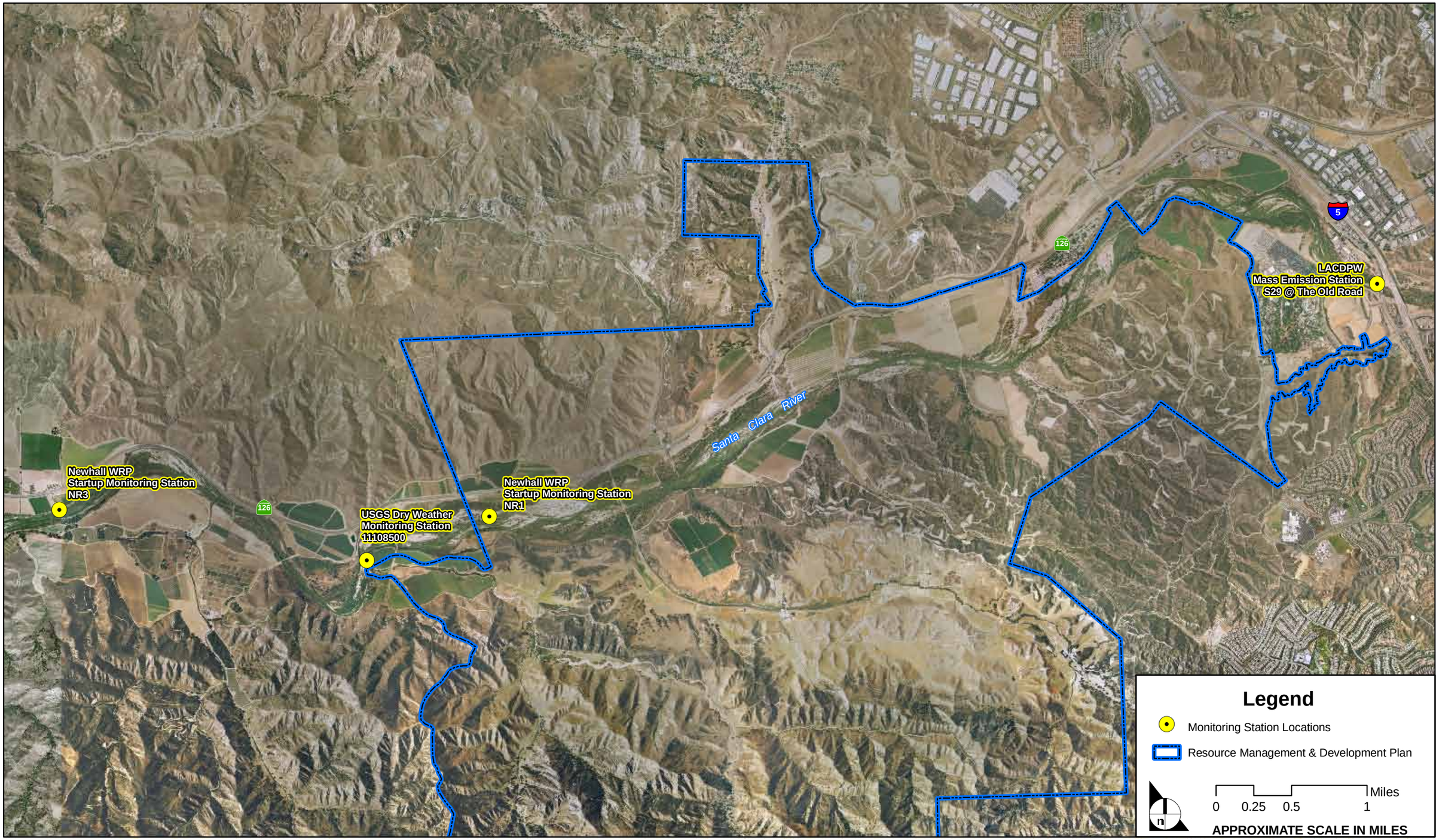
TSS concentrations in alluvial streams are expected to be greatly elevated during storm runoff because of the combination of high sediment supply and a high capacity for in-stream transport and erosion. Observed TSS concentrations were sometimes very high, due to the highly erodible, easily transportable, sandy alluvial soils and sediments. The high TSS concentrations observed in the Santa Clara River show the capacity of high flows in the Santa Clara River for sediment transport and support the conclusion that large rainfall events result in a "reset" of the main channel.

**Table 4.2-4** summarizes the average TSS values from dry weather monitoring data for Santa Clara River monitoring locations within the RMDP area tributaries.

**Table 4.2-4**
**Average Dry Weather TSS Monitoring Data -- Santa Clara River**

| Monitoring Location | TSS (mg/L) |
|---|---|
| **DPW Mass Emission Station** | |
| S29 | 200 |
| **Newhall WRP Startup Monitoring** | |
| Station NR1 | 66 |
| Station NR3 | 128 |
| **USGS Dry Weather Monitoring** | |
| 11108500 | 349 |

Source: Geosyntec, 2008.




**SOURCE: GEOSYNTEC, PACE 2008**

FIGURE 4.2-3

MONITORING STATION LOCATIONS

P:\8238E\GIS\mxds\EIR_2008\Section4_2\8238E_FIGURE-4-2-3_MonitoringStationLocations_PC1_072308.mxd

The average TSS concentrations appear highly variable between the monitoring stations; however, only 10 samples were collected at the DPW Mass Emission Station[5] (compared with 49 samples collected at the Newhall WRP and 73 samples collected at the USGS Station), and the lower concentrations may reflect that limitation. The two larger datasets showed relatively high average concentrations, especially the historical data from the USGS Station, which may have included samples taken during times of higher erosion or larger dry weather flows. Differences may also be due to physical factors, such as substrate material, local flow regime, and tributary influences.

#### 4.2.3.1.3 Beach Replenishment

Ventura County has three major sources of beach sand: the Santa Clara River (contributing 60 percent), the other rivers and streams (*e.g.*, Ventura River) (10 percent), and beaches upcoast of the Ventura River (30 percent). The Santa Clara River exports an estimated 4.08 million tons per year from its mouth into the Santa Barbara Channel. The addition of new sand to the beaches is seasonal, occurring during rainy periods when the rivers flow and sediments are washed into the ocean. The Santa Clara River is capable of depositing large quantities of sand during floods, but very little during dry years. For example, 52.4 million tons of sediment were discharged during the 1969 floods; floods that ended 30 years of relative drought when very little new sand was added to the beaches. This sand becomes part of the Santa Barbara littoral cell, in which the north to south littoral sediment transport terminates in the Mugu and Hueneme submarine canyons.

Sandy beaches are nourished largely by the weathering of coastal bluffs and dunes, and by fluvial transport of material to the sea. The maintenance of sandy beaches is critical because beaches serve as natural buffers between wave action and erodible uplands. Sandy beaches tend to dissipate wave energy, yet incur very little damage. Over the past 50 years the supply of new sand to Southern California beaches has been greatly reduced by human activity. In Ventura County, beaches are eroding at the rate of 0.7 feet per year. Specifically, river sand has been restricted by dams in the watershed areas and mining of floodplain gravels by private industry. Approximately 37 percent of the Santa Clara River watershed is dammed. These dams trap river sediments and affect the natural supply of sediment to beaches. Dams are estimated to have reduced suspended sediment delivery by 21 percent. In the Santa Clara River, morphologic effects of dams may be the greatest in the reach downstream of both the Castaic and Piru Creeks; these effects presumably decrease near Fillmore, following significant sediment contributions from the unregulated Sespe Creek watershed. Sespe Creek provides the largest individual contribution of sediment through the Santa Clara River watershed.

Sediment loading from tributaries is difficult to precisely predict. This is because it depends on numerous factors besides the rate of supply of sediment from hill slope erosion. Prediction of sediment loading is further complicated by the fact that sediment delivery is episodic, depending on the frequency, magnitude, and timing of events such as storms, fires, landslides, and earthquakes. However, regional

[5] The DPW mass emission stations are used to estimate mass emissions in runoff from the Municipal Separate Storm Sewer System (MS4), assess trends in mass emissions over time, and determine if MS4 is contributing to exceedances of water quality standards. At the Santa Clara River station, composite runoff samples are manually collected at selected times during both the wet and dry seasons. The samples are analyzed for several constituents including total suspended solids.

erosion rate data are available from the Los Angeles County debris detention basins, located on the southern side of the San Gabriel Mountains. For the past 30 years, the Ventura County Watershed Protection District has published regular updates on its monitoring and maintenance of debris basins and detention dams. The sediment data has recently been used to quantify how sand retention by the dams affects the supply of sand for beach formation and maintenance. According to this study, roughly 1,170 tons per square mile per year of suspended sediment originates from the area upstream of the Los Angeles County/Ventura County line[6]. Given this estimate, **Table 4.2-5** includes the approximate sediment currently supplied by the tributary watersheds in the Project area. The primary sediment source for beach sand at the Santa Clara River mouth is Sespe Creek, which is undammed and its sub-basin (Topa Topa) yields the highest water and sediment contribution of the entire Santa Clara River watershed. The confluence of Sespe Creek with the Santa Clara River is located approximately 15 miles downstream of the Project Area. Of the total, 4.08 million tons of sediment delivered to the Santa Clara River mouth each year, less than one percent (0.87 percent) originates from the RMDP tributary watersheds.

#### 4.2.3.1.4 Riparian Habitat

The diversity of habitat conditions in the Santa Clara River at any one time supports a variety of aquatic invertebrates, aquatic plants, and fishes. The density, biomass, and location of vegetation in relation to the channel bottom are directly dependent upon the frequency of disturbance by flood flows. Successional mule fat scrub occupies the active channel and is disturbed annually by flows. Channel-bottom habitat also includes all aquatic features, such as pools and flowing water, as well as most of the emergent wetlands in the River Corridor because of the presence of water. In contrast, mature riparian forests are located above the active River channel and are only flooded during infrequent storm events, which allows large trees to become established between events.

Stands of vegetation are eroded by high flows, and newly vegetated areas are created where vegetation becomes established by seeds or buried stems. Often during high flows, new sandbars are formed and old ones are destroyed. High flows can also change the alignment of the low-flow channel as well as the number and location of aquatic habitats of the River. In high-flow years, wetland vegetation along the margins of the low-flow channel and pools may increase. In high-flow years, this vegetation would be removed, but would likely become re-established during the spring and summer by natural colonization processes.

[6] Sediment delivery upstream of the Los Angeles County/Ventura County line is reduced by dams located on Castaic Creek and Bouquet Creek and is less than the sediment delivery to downstream reaches following significant sediment contributions from the unregulated Sespe Creek watershed and the lower Santa Clara River subwatershed where weak Plio-Pleistocene siltstones predominate and presumably contribute to enhanced erosion.

**Table 4.2-5**
**Estimated Annual Sediment Supply From**
**Tributaries Located Within the Project Area**

| Tributary | Tributary Drainage Area (sq. mi)* | Approximate Sediment Supply (tons/year)** |
|---|---|---|
| Ayers Canyon | 0.23 | 269 |
| Chiquito Canyon | 4.85 | 5,980 |
| Dead-End Canyon | 0.19 | 222 |
| Exxon Canyon | 0.03 | 35 |
| Homestead Canyon | 0.12 | 140 |
| Humble Canyon | 0.41 | 480 |
| Lion Canyon | 0.84 | 983 |
| Long Canyon | 1.99 | 2,328 |
| Magic Mountain Canyon | 1.32 | 1,544 |
| Middle Canyon | 0.53 | 620 |
| Mid-Martinez Canyon | 0.16 | 187 |
| Off-Haul Canyon | 0.92 | 1,076 |
| Potrero Canyon | 4.73 | 5,534 |
| Salt Creek Canyon | 9.2 | 10,706 |
| San Martinez Grande Canyon | 3.63 | 4,247 |
| Unnamed Canyon A | 0.70 | 819 |
| Unnamed Canyon B | 0.05 | 59 |
| Unnamed Canyon C | 0.07 | 82 |
| Unnamed Canyon D | 0.04 | 47 |
| Unnamed Canyon 1 (Entrada) | 0.16 | 188 |
| Unnamed Canyon 2 (Entrada) | 0.6 | 705 |
| Unnamed Canyon 3 (Entrada) | 0.13 | 152 |
| Hasley Creek*** | 89.7 | 104,949 |
| Castaic Creek**** | 50 | 58,500 |
| **TOTAL** | **170.6** | **199,852** |

Notes:

* Tributary drainage areas from PACE 2008B.

** The sediment supply from each tributary drainage was calculated by multiplying the drainage area by the sediment product rate of 1,170 tons per square mile that was specified in Stillwater 2005 for the Santa Clara River watershed.

*** Approximately 1.5 square miles of the Hasley Creek watershed is located in the Project area.

**** The total watershed area for Castaic Creek is approximately 203 square miles. Approximately 153 square miles of the watershed is situated upstream of Castaic Dam. Accordingly, sediment contribution from Castaic Creek is primarily limited to the 50 square miles located downstream of the dam. Approximately 0.2 square miles of the Castaic Creek watershed is located within the Project area.

The aquatic habitats of the River are in a dynamic state of creation, development, disturbance, and destruction. The amount of vegetation within the Santa Clara River Corridor appears to have increased since the 1960s, likely due to the increased summer return flows from agricultural water and to year-round augmentation of base flows due to treated effluent discharge to the River from the Valencia and Saugus WRPs. However, this vegetation does not seem to provide enough erosion resistance to maintain a "stable" channel capable of withstanding regular "resets," which occur at intervals averaging about a decade, or much less than the expected lifetime of the riparian woodlands which do get established.

Despite heavy vegetation on the active channel banks within the Project area and in areas of shallow groundwater, the stream still responds to large events by a general widening and/or shifting of the channel. The role of vegetation in large-channel stability and morphology in southern and central California does fundamentally differ from that of smaller streams and streams elsewhere in the country. The geomorphic and historical record shows that resets have been occurring throughout the recent geologic past in basins exceeding a certain size. (Balance Hydrologics, 2005.) One partial explanation may be that reset flood events in these larger channels exert stresses beneath or around the riparian vegetation exceeding the vegetation's threshold of stability.

#### 4.2.3.1.5 Middle Canyon Spring

The Middle Canyon spring is a slope wetland located on an upper terrace along the southern bank of the Santa Clara River, just downstream from the confluence with Middle Canyon. The spring is a unique physical and biological feature, which includes snail and sunflower species that are taxonomically undescribed and may only occur in this location regionally. Discharge from the spring supports riparian habitat, including southern cottonwood–willow riparian, that surrounds the core spring area. Mature Fremont cottonwoods with heights of 30 to 45 feet and mature arroyo willow trees with heights of 20 feet are present. The habitat supported by the spring is described in more detail in **Section 4.5**, Biological Resources, and **Section 4.6**, Jurisdictional Waters and Streams, of this EIS/EIR.

The primary factors contributing to the presence of the spring and its source of water are as follows:

1. The presence of fine-grained alluvium at the mouth of Middle Canyon. This material restricts groundwater movement from Middle Canyon to the Santa Clara River alluvium.
2. The presence of permeable beds at the top of the Saugus Formation in the lower end of Middle Canyon. These localized permeable beds connect the shallow alluvial groundwater system in lower Middle Canyon to the spring, and thereby act as the primary conduit directing groundwater flow to the spring. Observed water quality markers (geochemical signatures) indicate that alluvial groundwater makes up the predominant contribution to the spring outflow, along with lesser, comingled contributions from the deeper Saugus aquifer.
3. The presence of fine-grained beds in the Saugus Formation, directly beneath the uppermost permeable Saugus beds. These fine-grained beds limit the amount of downward groundwater migration, thereby allowing the permeable Saugus beds to be the primary source of water to the spring.

4. The presence of faulted synclinal structure. The Saddle Lineament, which traverses the lower end of Middle Canyon, blocks downward migration of groundwater along Saugus Formation bedding planes. The Saddle Lineament converges with the upper permeable Saugus source bed at the spring area.

5. The presence of the buried landslide/debris flow at the lower end of Middle Canyon. This feature contains soils that are of lower permeability than upgradient areas. This reduced permeability limits the amount of subsurface groundwater discharge that otherwise would discharge to the Santa Clara River alluvium.

#### 4.2.3.1.6 Dry Gap

The Dry Gap is an ephemeral reach of the Santa Clara River that extends from about 3.5 miles downstream of the Los Angeles County/Ventura County line (western limit of the Project boundary) to downstream of the Piru Creek confluence and lower Piru groundwater basin limits further downstream between the communities of Piru and Fillmore. This portion of the Santa Clara River is dry most of the year, with water present only when rainfall events create sufficient stormwater runoff into the river. A detailed description of the habitat conditions in the Dry Gap is provided in **Section 4.5**, Biological Resources, and **Section 4.6**, Jurisdictional Waters and Streams, of this EIS/EIR

### 4.2.3.2 Tributaries

The existing drainages within the Project area consist of Castaic Creek and several major and minor tributary drainages to the Santa Clara River. Major tributaries are those drainages that are regulated by the DPW Santa Clara River and Major Tributaries Drainage Policy and that have capital flood discharges (*i.e.*, discharge resulting from a hypothetical four-day storm with a 50-year return period falling on a saturated watershed with debris from a wildfire) greater than 2,000 cfs (includes bulking factors). The major tributaries consist of the drainage courses of Chiquito Canyon and San Martinez Grande Canyon to the north of the Santa Clara River, and Long Canyon, Lion Canyon, Potrero Canyon, and Salt Canyon to the south of the Santa Clara River. An assessment of existing geomorphic conditions was conducted to characterize channel conditions of five primary tributary basins within the Project area. Aerial survey data was obtained to provide elevation contour information and create topographic maps for each basin. These morphological data were transferred to aerial photos to create base maps for field assessment of the systems. Detailed geomorphic reconnaissance assessments were conducted on each tributary channel to map the current conditions of channel morphology, channel erosion, bank erosion, channel material and other physical process characteristics. (See **Appendix 4.2** for PWA memoranda regarding the sediment characteristics and geomorphic conditions of the five canyons.) Overall, the three tributaries on the south side of the Santa Clara have certain common characteristics, as do those on the north side:

- South side tributaries (Lion, Long and Potrero) are characterized by small watershed areas (1.5 to 5 square miles); steep channel slopes (2-5%); very high watershed sediment supply (resulting in channel aggradation, even with steep slopes); and unstable channels (with actively migrating headcuts). The proposed Project would impact most of the watershed areas in these tributaries.

- The north side tributaries (Chiquito and San Martinez Grande) have somewhat larger watersheds (3- to 5-square miles) with a majority being upstream of the Project area boundary. They are more deeply incised in the lower reaches, convey large amounts of sand, and discharge as alluvial fans on the Santa Clara River floodplain. Flows from these drainages are conveyed under SR-126 to confluence with the Santa Clara River immediately downstream. The proposed Project would impact only the lower reaches and a smaller percentage of the total watershed area in these tributary drainages.

In general, the tributaries are ephemeral or highly intermittent in nature and do not support perennial flows. Perennial tributary drainages include lower Potrero Canyon and portions of Salt Canyon. Discharge from the Middle Canyon spring is also perennial and supports riparian habitat along the southern bank of the Santa Clara River, just downstream from the confluence with Middle Canyon. Since this habitat is adjacent to the Santa Clara River, it is discussed above in **Subsection 4.2.3.1.5**, rather than in this tributary section. In addition, the Middle Canyon Spring is classified as a unique landscape feature due to its vegetative diversity and hydrology that supports special-status plant and wildlife species (undescribed sunflower and undescribed freshwater snail), described and discussed in greater detail in **Section 4.5**, Biological Resources, and **Section 4.6**, Jurisdictional Waters and Streams, of this EIS/EIR.

An additional seep area has been documented in lower Potrero Canyon, nearly adjacent to the existing perennial channel but hydrologically separated from the active floodplain. This spring area supports a small freshwater marsh surrounded by cismontane alkalai marsh, dominated by salt grass. The area historically has been grazed by livestock, and has invasive thistle and tamarisk scattered throughout. Because this seep area does not support any special-status plants or wildlife, and has been somewhat degraded by historic agricultural practices, it is not described, classified, and analyzed as a unique landscape feature. This seep area is further described and analyzed in **Section 4.6**, Jurisdictional Waters and Streams, of this EIS/EIR.

#### 4.2.3.2.1 Erosion and Sedimentation

As discussed above, sandy beaches are nourished by fluvial transport of sediment towards the ocean. The tributaries to the Santa Clara River export a large percentage of the total sediment load to the River, which is then transported to the Santa Barbara Channel and area beaches.

The geomorphology of the active tributaries to the Santa Clara River within the Project area are generally characterized as highly variable and sinuous alignments reflective of the influence of the physical and topographic features. There is also a high degree of variation of the active channel geometry (*i.e.*, width and depth) along these relatively short channel reaches. In general, the active portions of the creeks are more deeply incised below the canyon valley floors. The floodplains are generally entirely contained within the active creek banks and there is little over-bank flow. The changes in creek geometry and form may indicate influences from the upper watersheds that affect the sediment delivery. The change in channel geometry is also reflected in coincidental variations of the streambed slopes, *i.e.*, the slope variations are generally higher in the contractions of the channel geometry and flatter in the expansion areas, upstream and downstream.

Generally, the soils in the tributary watersheds are characterized as silty clay loams from both the Castaic and Saugus Formations. Also, the soils within the watersheds are predominately classified as hydrologic soil Type C (higher runoff potential) with the exception of areas adjacent to the main stem creek that are soil Type A (lower runoff potential) and soil Type B in the lower reaches (Geosyntec, 2008). The associated vegetative cover within the watersheds varies, but primarily consists of native grasses, chaparral, scrub oak, and sage brush.

The majority of post-development stormwater runoff will flow to five of the tributary drainages within the RMDP study area: Chiquito Canyon, San Martinez Grande Canyon, Lion Canyon, Long Canyon, and Potrero Canyon. A description of each of the primary tributaries follows.

**Chiquito Canyon.** Chiquito Canyon has a watershed area of 4.9 sq miles at the downstream project limit and drains south into the north bank of the Santa Clara River. The watershed is currently used for a combination of cattle grazing, and residential and commercial land uses within the community of Val Verde located immediately upstream of the Project area. Chiquito Canyon enters the project area in a confined reach with very high, unstable banks[7]. Further downstream it exits its confined canyon and enters a long reach that is dominated by a series of large alluvial fans on the east bank. These fans are supplying abundant sand to the creek and the channel has formed low banks in the toe of the fan that have little erosion resistance, in part due to the arable land use and lack of woody vegetation. As a result this reach is aggrading and widening. Further downstream the channel becomes slightly incised as it cuts through the alluvial fans, leaving abandoned terraces on the banks that are actively eroded on outside bends. Towards the downstream end of the canyon, the channel remains slightly confined and has been modified by a series of bridges and culverts. In places these appear to cause local backwaters and sediment deposition (**Appendix 4.2**).

The portion of the Chiquito Canyon drainage within the RMDP site follows a mildly sinuous pattern within long, linear meanders reflecting the influences of the physiographic features along the valley floor. The active channel is incised in the lower 2,500 feet upstream from the SR-126 roadway crossing, while the remainder has developed a shallower active channel and wider drainage area. The hydraulics along this portion of the stream area also are influenced by two different existing roadway crossing locations within the RMDP area that include SR-126, a local access roadway arch crossing, and the Chiquito Canyon Road crossing. Detailed hydraulic modeling of the existing floodplain was performed by PACE (2008B). The modeling indicated that a major portion of the Chiquito Canyon floodplain was hydraulically "steep" (Froude numbers greater than a value of 1.0 which indicates supercritical flow conditions) with an average streambed slope of the channel of approximately 2.39 percent. (PACE, 2008B; see **Appendix 4.1**.) **Figure 4.2-4** depicts the existing geomorphic conditions within Chiquito Canyon.

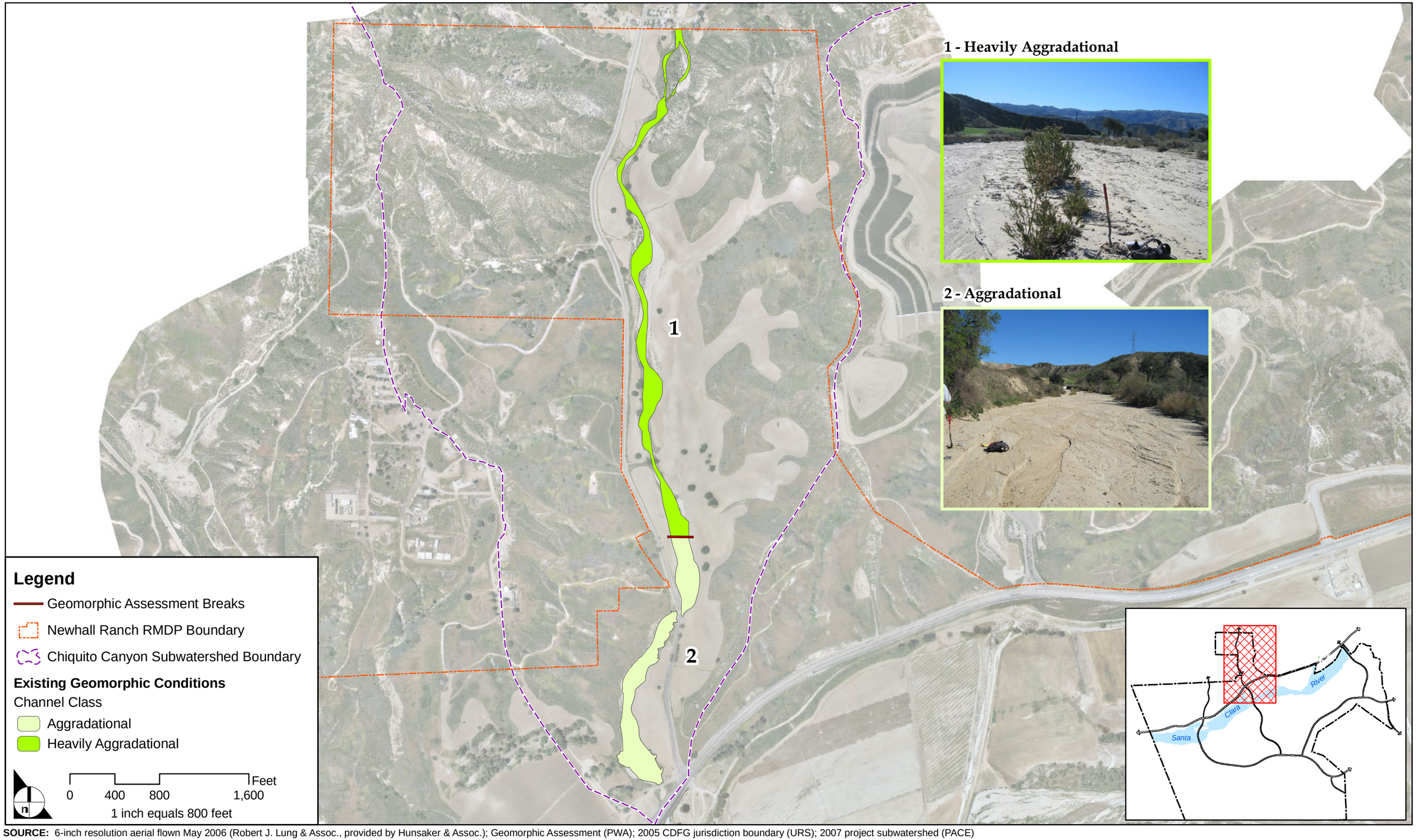
[7] Confinement refers to the valley/canyon width. If the valley width is narrow (confined), then lateral migration of the channel is limited and the channels are typically less-sinuous with limited floodplain area. If the valleys are wide (unconfined), then there is typically greater lateral migration, sinuousity, and potentially braiding.

**San Martinez Grande Canyon.** San Martinez Grande Canyon has a watershed area of 3.6 sq miles and drains south into the north bank of the Santa Clara River. The watershed is currently used for a combination of cattle grazing, rural residential, and industrial (oil and gas) land uses. San Martinez Grande Canyon combines a series of reaches alternating between unconfined stable reaches with small inset floodplains and aggradational conditions with actively eroding outside bends. The upper reach has a well defined and relatively stable bankfull channel that contains the 5-year flow adjacent to a small inset floodplain. Downstream the channel is wider and many outside bends are actively eroding into relict raised floodplain terraces, creating failing banks. Downstream of this reach the valley widens and the channel becomes more stable with small floodplains[8] that persist towards the downstream end of the channel.

Detailed hydraulic modeling of the existing floodplain was performed by PACE (2008B). The modeling indicated that approximately 50 percent of the lower reach of the San Martinez Grande Canyon floodplain was hydraulically "steep," (Froude numbers greater than a value of 1.0 which indicates supercritical flow conditions) while the remainder of the canyon, primarily the upper portion to the RMDP boundary, was hydraulically a "mild" channel (Froude numbers less than a value of 1.0 which indicates subcritical flow conditions). The channel bed slopes range from eight percent in the in narrower areas to 0.5 percent in wider, depositional areas. (PACE, 2008B; see **Appendix 4.1**.) **Figure 4.2-5** depicts the existing geomorphic conditions within San Martinez Grande Canyon.

**Lion Canyon.** Lion Canyon has a watershed area of 0.8 sq miles and drains westerly into the bank of the Santa Clara River. The watershed is currently used for a combination of cattle grazing and oil production. Lion Canyon has steep headwaters (above the project boundary) that supply large amounts of sediment into the aggrading upper reach, producing an undersized, transport-limited channel. Aggradation continues downstream producing a well-connected and vegetated floodplain. There is a short stable reach with mature oaks upstream of another aggradational reach which terminates at an existing culverted road crossing. There is a very sharp transition from aggrading to eroding conditions downstream of the road crossing, which acts as a grade control protecting the upper reaches from headcutting and incision. Downstream of the grade control is a 12-foot high knickpoint (bedrock outcrop) and a reach of deeply incised channel with some failing banks. This reach opens up into a wider section that historically incised material derived from the right hillside (identified by the geotechnical assessment as a former quarry spoil deposit). This material constrained the channel and deflected it to the left bank where it is actively eroding and causing slab failures. Despite the longer-term appearance of incision, the bed shows recent signs of aggradation. Downstream the channel remains historically incised with erosion on the outside bends, local bed aggradation, and the formation of a small new floodplain on the inner bends. The right valley side looking downstream is undercut by the creek, creating a high unstable slope. This reach terminates in an 8 foot high knickpoint suggesting that the channel is currently eroding the bed sediment deposited in the 2004-05 floods (**Appendix 4.2**).

[8] A floodplain is the area adjacent to a stream channel that consists of sediments deposited during the present hydrologic regime and is inundated with water when the stream overflows its banks. Floodplain connection describes the relationship between the stream and the adjacent floodplain that influences the ability of water to flow into or out of the wetland or to inundate adjacent uplands during high-water periods.




**SOURCE:** 6-inch resolution aerial flown May 2006 (Robert J. Lung & Assoc., provided by Hunsaker & Assoc.); Geomorphic Assessment (PWA); 2005 CDFG jurisdiction boundary (URS); 2007 project subwatershed (PACE)

**FIGURE 4.2-4**

Existing Geomorphic Conditions within Chiquito Canyon



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**SOURCE:** 6-inch resolution aerial flown May 2006 (Robert J. Lung & Assoc., provided by Hunsaker & Assoc.); Geomorphic Assessment (PWA); 2005 CDFG jurisdiction boundary (URS); 2007 project subwatershed (PACE)

**FIGURE 4.2-5**

Existing Geomorphic Conditions within San Martinez Grande Canyon



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The lower portion of the Lion Canyon channel is heavily eroded and the floodplain is disconnected and eroded. Upstream, the channel is relatively stable and well vegetated. The channel is maintaining a relatively steep gradient for a watershed of this size and with a sand bed. One reason for this is the high sediment delivery rate. The principal sediment source appears to be bed and bank erosion of the channel in the lower reaches, and a combination of channel and headwall erosion in the upper reaches. The eroding gullies that extend up into the canyon walls in many locations are an additional source of sediment. Generally, the existing geomorphic conditions in Lion Canyon are unstable and channel degradation is ongoing due to excessive erosion and headcutting below existing road crossings.

The modeling of the existing floodplain performed by PACE (2008B) indicated that approximately 50 percent of the lower reach of the Lion Canyon floodplain was hydraulically "steep," (Froude numbers greater than a value of 1.0 which indicates supercritical flow conditions) while the remainder of the canyon, primarily the upper portion of the RMDP area boundary, was a hydraulically "mild" channel (Froude numbers less than a value of 1.0 which indicates subcritical flow conditions). The average overall mean slope of the channel from the upper head waters to the canyon mouth is 4.6 percent. (PACE, 2007.)

**Figure 4.2-6** depicts the existing geomorphic conditions within Lion Canyon.

**Long Canyon.** Long Canyon has a watershed area of 2.0 sq miles at the downstream project limit and drains westerly into the south bank of the Santa Clara River. The watershed is currently used for a combination of cattle grazing and oil production. Long Canyon is characterized by a very steep, unstable headwaters reach (outside the Project area) that becomes aggradational downstream. Most of the canyon is then moderately aggradational to moderately stable with some sections of wide floodplain, before passing though a culvert and into a constructed earth channel (agricultural ditch) that conveys it to the Santa Clara River. The upstream headwaters reaches are deeply incised and highly unstable, with actively eroding channels and very high rates of sediment delivery. Downstream the channel gradient flattens and the excess sediment (presumed to be from the 2004-05 winter flows) has partially filled the channel. As the channel moves downstream, there are longer reaches of incision, but the most recent events filled in the low-flow channel and bed. The channel passes through a slightly incised reach with recent aggradation before entering a highly aggrading section. The channel then enters a confined reach indicating long-term channel incision but again with local bed aggradation and actively eroding relict terraces on the outside bend before emerging into another aggrading, unconfined reach with an extensive active floodplain. Downstream the channel is aggrading causing lateral migration into the dirt road creating access to a low floodplain on the opposite side. Further downstream the channel continues to aggrade with eroding outside bends adjacent to relict terraces. The channel passes through a short, relatively stable reach before widening and aggrading. Downstream the channel becomes slightly confined with a higher floodplain on one bank but evidence of aggradation from the proximity to the other floodplain level. Below this point the channel enters a constructed trapezoidal flood channel that conveys it to the Santa Clara River (**Appendix 4.2**). Generally, the existing geomorphic conditions in Long Canyon are unstable due to active erosion downstream of road crossings and lateral scour caused by inadequate channel capacity to transport heavy sediment loads.

The modeling of the existing floodplain performed by PACE (2008B) indicated that approximately 80 percent of the lower reach of the Long Canyon floodplain was hydraulically "steep," (Froude numbers

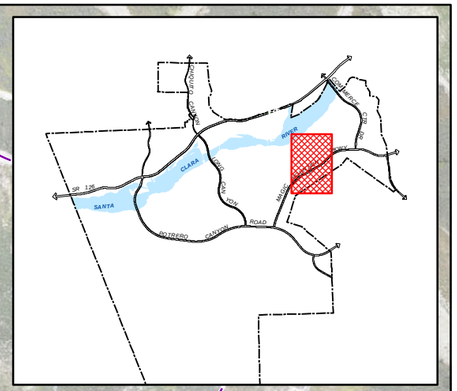
greater than a value of 1.0 which indicates supercritical flow conditions) while the remainder of the canyon, primarily the upper portion of the Newhall Ranch boundary, was a hydraulically "mild" channel (Froude numbers less than a value of 1.0 which indicates subcritical flow conditions). The average overall slope of the channel from the upper headwaters to the canyon mouth is 3.0 percent. (PACE, 2008B; see **Appendix 4.1**.) **Figure 4.2-7** depicts the existing geomorphic conditions within Long Canyon.

**Potrero Canyon.** Potrero Canyon has a watershed area of 4.7 sq miles and drains westerly into the south bank of the Santa Clara River. The watershed is currently used for a combination of cultivated agriculture, cattle grazing and oil production. Potrero Canyon has steep headwaters with incised, erosive channels that deliver an abundance of relatively coarse sediment to a downstream braided reach. The upper canyon immediately downstream of the steep headwaters appears to be aggradational, as sediment delivery exceeds transport capacity and the surplus sediment is stored in the channel. Downstream there is a short reach where the channel is confined against the valley side and is deeply incised with highly unstable banks. The channel downstream shows signs of previous incision, but there are indications of recent aggradation, partially filling the low flow channel with sediment, which is now being re-eroded and reworked; overall, this creates a highly complex pattern. Downstream, the channel has a long and unusual reach of cismontane alkali marsh much of which takes the form of a swale rather than a well-defined channel. Towards the downstream end, the channel becomes increasingly well defined, culminating in an unstable knickpoint that is migrating upstream. The channel transitions sharply into a steep, incised section with several knickpoints before emptying into the Santa Clara River. (**Appendix 4.2**). Generally, geomorphic conditions with Potrero Canyon are relatively unstable due to historic activities (channel re-alignment for agriculture, road crossings). In particular, the channel in the lower canyon is actively eroding and has become deeply incised. Heavy sediment loads in the upper reaches have resulted in lateral channel migration and bank scour. The active channel has limited hydraulic capacity, particularly in the lower portion of the canyon, which results in overtopping and the creation of a secondary sheet flow on the southern side of the canyon, supporting a large meadow area. The engineered portions of the active channel follow the canyon floor. The canyon floor is characterized by a very large and flat width in the valley compared to the other tributary canyon watersheds. The drainage characteristics and trends also reflect a wide, stable valley system, with little tendency to deeply incise beyond the minor active channel.

The modeling performed by PACE (2008B) indicated that approximately 40 percent of the lower reach of the existing Potrero Canyon floodplain was hydraulically "steep," (Froude numbers less than a value of 1.0 which indicates subcritical flow conditions) while the remainder of the canyon, primarily the upper portion of the RMDP area boundary was a hydraulically "mild" channel (Froude numbers less than a value of 1.0 which indicates subcritical flow conditions). The average overall slope of the channel from the upper headwaters to the canyon mouth is approximately 3.1 percent. (PACE, 2008B; see **Appendix 4.1**.) **Figure 4.2-8** depicts the existing geomorphic conditions within Potrero Canyon.

1 - Entrenched

2 - Deeply Incised



4 - Stable

3, 5 - Aggradational

6 - Incised

1

2

3

4

5

6

## Legend

Geomorphic Assessment Breaks

Newhall Ranch RMDP Boundary

Lion Canyon Subwatershed Boundary

**Existing Geomorphic Conditions**

Channel Class

- Aggradational
- Incised
- Deeply Incised
- Entrenched
- Stable

0 200 400 800 Feet

1 inch equals 400 feet

**SOURCE:** 6-inch resolution aerial flown May 2006 (Robert J. Lung & Assoc., provided by Hunsaker & Assoc.); Geomorphic Assessment (PWA); 2005 CDFG jurisdiction boundary (URS); 2007 project subwatershed (PACE)

**FIGURE 4.2-6**

Existing Geomorphic Conditions within Lion Canyon


**SOURCE:** 6-inch resolution aerial flown May 2006 (Robert J. Lung & Assoc., provided by Hunsaker & Assoc.); Geomorphic Assessment (PWA); 2005 CDFG jurisdiction boundary (URS); 2007 project subwatershed (PACE)

**FIGURE 4.2-7**

Existing Geomorphic Conditions within Long Canyon



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1, 3 - Stable

4, 8, 10 - Heavily Aggradational

7 - Deeply Incised

2, 5 - Incised

6, 9 - Aggradational

1

2

3

4

5

6

7

8

9

10

## Legend

- Geomorphic Assessment Breaks
- Newhall Ranch RMDP Boundary
- Potrero Canyon Subwatershed Boundary

**Existing Geomorphic Conditions**

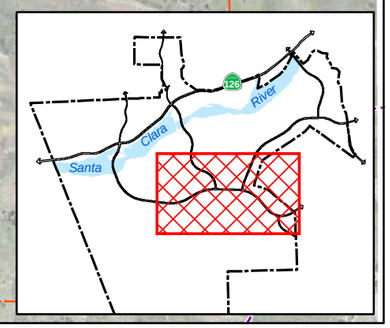
Channel Class

- Aggradational
- Heavily Aggradational
- Incised
- Deeply Incised
- Stable

n

0 650 1,300 2,600 Feet

1 inch equals 1,300 feet




**SOURCE:** 6-inch resolution aerial flown May 2006 (Robert J. Lung & Assoc., provided by Hunsaker & Assoc.); Geomorphic Assessment (PWA); 2005 CDFG jurisdiction boundary (URS); 2007 project subwatershed (PACE)

**FIGURE 4.2-8**

Existing Geomorphic Conditions within Potrero Canyon



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#### 4.2.3.2.2 Water Quality

As discussed in **Subsection 4.2.3.2.1**, Erosion and Sedimentation above, sediment is a common component of stormwater, and can be a pollutant. As described above, **Table 4.2-5** includes an approximation of sediment supplied by the tributary watersheds in the Project area based on an estimate of sediment supplied per square mile of watershed area upstream of the Los Angeles/Ventura County line. Average TSS data is also available from five wet-weather monitoring stations located within the RMDP area tributaries (see **Table 4.2-6**).

**Table 4.2-6**
**Average Wet Weather TSS Monitoring Data For**
**Two-Day Precedent Rainfall Between 0.1 and 1.0 Inch**

| Monitoring Location | TSS (mg/L) |
|---|---|
| Site A (Mouth of Potrero) | 7,380 |
| Site B (Mouth of San Martinez Grande) | 2,825 |
| Site C (Long Canyon Upstream of Onion Field) | 190 |
| Site D (Mouth of Middle Canyon) | 160 |
| Site E (Middle of Chiquito Canyon) | 205 |

Source: Geosyntec, 2008.

At the tributary monitoring stations, observed TSS concentrations were sometimes very high, due to the highly erodible, easily transportable, sandy alluvial soils and sediments. Compared with TSS concentrations observed in the Santa Clara River and other tributaries, the highest TSS concentrations were measured in Potrero and San Martinez Grande Canyons.

The monitoring sites are located in ephemeral segments of Potrero, San Martinez Grande, Long, Middle, and Chiquito Canyons. Accordingly, no dry weather monitoring data is available for tributary monitoring locations within the RMDP area tributaries.

#### 4.2.3.2.3 Riparian Habitat

This section provides a summary of the riparian habitat found in tributary drainages within the RMDP area. For detailed information on these resources, please refer to **Section 4.5**, Biological Resources, of this EIS/EIR. The descriptions below are excerpted from "Biological Resources Technical Report for the Newhall Ranch Specific Plan Area, Los Angeles County, California" (Dudek 2006C), which is found in **Appendix 4.5** of this EIS/EIR.

This section provides a summary of the riparian habitat found in tributary drainages within the RMDP area. For detailed information on these resources, please refer to **Section 4.5**, Biological Resources, of this EIS/EIR.

**Chiquito Canyon.** The area surrounding the Chiquito Canyon within the RMDP Project area is primarily comprised of agricultural land. In contrast to the vegetation found in the upper portion of the drainage within the Project area, the vegetation found in the downstream portion of the drainage within the Project area is relatively diverse, supporting scalebroom scrub, coast live oak woodland, California sagebrush scrub, big sagebrush scrub, California sagebrush scrub - California buckwheat , and southern cottonwood-willow riparian forest (Dudek 2006C).

**San Martinez Grande Canyon.** The San Martinez Grande watershed contains a diverse variety of habitats including big sagebrush scrub and California sagebrush scrub, mulefat scrub, coastal scrub, California annual grasslands, and southern cottonwood-willow riparian forest The area just upstream of the Santa Clara River confluence is dominated by arrow weed scrub and southern cottonwood-willow riparian forest. The northern, upstream reaches of the drainage are dominated by coastal scrub, mulefat scrub, southern cottonwood-willow riparian forest, and California annual grasslands. The channel then flows through areas of alluvial scrub, coastal scrub, elderberry scrub, mulefat scrub, river wash, and through agricultural fields to the Santa Clara River (Dudek 2006C).

**Lion Canyon.** The upper reaches of the Lion Canyon watershed, which contains several branches, contains mostly undifferentiated chaparral, coastal sage, and California sagebrush scrub - California buckwheat. Along the channel, alluvial scrub, coast live oak woodland, grassland, scalebroom scrub, and chamise chaparral are present. The two easternmost branches of this drainage also contain big sagebrush scrub, which is absent from the watershed of the western branch (Dudek 2006C).

**Long Canyon.** Both sides of the Long Canyon watershed contain vegetation communities comprised primarily of coastal scrub, with small pockets of chamise chaparral and California annual grassland. Within the stream channel, there is a mixture of California annual grasslands, elderberry scrub, coast live oak woodlands, scalebroom scrub, alluvial scrub, agricultural areas, big sagebrush scrub and California sagebrush scrub - California buckwheat, and undifferentiated chaparral (Dudek 2006C).

**Potrero Canyon.** The lower reach of Potrero Canyon is relatively unstable and deeply incised with dense riparian vegetation, including willows and cottonwoods. Flow observed was less than one cfs during the survey. A 10-acre cismontane alkali marsh area is located adjacent to the lower Potrero channel reach; however, it is not connected to the creek floodplain. Approximately 1,500 feet upstream of the Potrero Creek and Santa Clara River confluence, the channel becomes lower gradient and less incised and lacks dense riparian vegetation compared to the lower reach. The watershed contains southern cottonwood-willow riparian forest, mulefat scrub, big sagebrush scrub, California sagebrush scrub, elderberry scrub, and coyote brush (Dudek 2006C).

**Homestead Canyon.** This watershed is dominated by California sagebrush scrub, California sagebrush scrub - black sage, and California sagebrush scrub - California buckwheat. One thin strip of big sagebrush scrub is present lining the stream channel near the lower end, and the watershed contains patches of dispersed California annual grassland and agricultural areas (URS 2003; Dudek 2006C).

**Middle Canyon.** This watershed is dominated by California sagebrush scrub and California sagebrush scrub - California buckwheat, with small pockets of undifferentiated chaparral and California annual grassland. The stream channel flows through California annual grassland, agricultural areas, alluvial

scrub, big sagebrush scrub, and coast live oak woodland. Freshwater marsh and southern cottonwood-willow riparian forest is present at the Santa Clara River confluence (Dudek 2006C). Additionally, the Middle Canyon Spring, a unique slope wetland, is located on an upper terrace along the southern bank of the Santa Clara River, just downstream from the confluence with Middle Canyon. Discharge from the spring supports riparian habitat including a dense, mature southern cottonwood–willow riparian forest that surrounds the core spring area.

**Humble Canyon.** The habitat types found in the upper reaches of the 0.4-mile Humble Canyon watershed consist primarily of California sagebrush scrub, California sagebrush scrub - California buckwheat, California annual grasslands, undifferentiated chaparral, coast live oak woodlands, and alluvial scrub. The lower portions of the watershed contain a mixture of alluvial scrub, coast live oak woodland, California sagebrush scrub, big sagebrush scrub, herbaceous wetlands, river wash, southern willow scrub and, in the area directly adjacent to the Santa Clara River, southern willow scrub (Dudek 2006C).

**Salt Creek Canyon.** The vast majority of the Salt Creek watershed is covered by California sagebrush scrub, agricultural areas, big sagebrush scrub, river wash, and California annual grassland habitat. Surrounding areas contain valley oak grass and woodland, mixed oak woodland, undifferentiated chaparral, mulefat scrub, alluvial scrub, bulrush-cattail wetland, cismontane alkali marsh, and coast live oak woodland are present in small patches (Dudek 2006C).

**Off-Haul Canyon.** The upper reaches of the Off-Haul Canyon drainage contain a mixture of California sagebrush scrub, alluvial scrub, and California annual grassland. Lower areas, in the vicinity of SR-126, are dominated by agricultural areas (Dudek 2006C).

**Magic Mountain Canyon.** The small segment of this stream that passes through the RMDP site is surrounded by California sagebrush scrub, California sagebrush scrub - California buckwheat, California sagebrush scrub - purple sage, and big sagebrush scrub, with undifferentiated chaparral, California annual grasslands, agricultural areas (Dudek 2006C).

**Dead-End Canyon.** This watershed consists almost exclusively of California sagebrush scrub, California sagebrush scrub - purple sage, California sagebrush scrub - California buckwheat, undifferentiated chaparral, big sagebrush scrub, although isolated pockets of California annual grassland, elderberry scrub, river wash, southern cottonwood-willow riparian forest, and coast live oak woodland are present as well (Dudek 2006C).

**Exxon Canyon.** This drainage is dominated by California sagebrush scrub, California sagebrush scrub - purple sage, California buckwheat, big sagebrush scrub, coast live oak woodland, and undifferentiated chaparral. On branches, alluvial scrub and California annual grasslands is also present along the stream channel. Herbaceous wetlands and river wash can be found at the confluence of the Exxon Canyon drainage and the Santa Clara River (Dudek 2006C).

**Ayers Canyon.** This stream is lined with southern cottonwood-willow riparian forest and alluvial scrub, with some coast live oak woodland present along the south bank. Habitat types within the Ayers Canyon watershed are dominated by California sagebrush scrub, herbaceous wetlands, arrow weed scrub,

California sagebrush scrub - black sage, agricultural areas, and California annual grasslands (Dudek 2006C).

**Unnamed Canyon A.** This drainage runs through California annual grasslands, California sagebrush scrub, and big sagebrush scrub. The drainage also includes agricultural areas on the downstream end (Dudek 2006C).

**Unnamed Canyon B.** The Unnamed Canyon B drainage is dominated by California sagebrush scrub with pockets of undifferentiated chaparral sparsely interspersed. At the canyon mouth, along the south bank of the Santa Clara River, coast live oak woodlands, herbaceous wetlands, and agricultural areas are also present (Dudek 2006C).

**Unnamed Canyon C.** The Unnamed Canyon C drainage is dominated by California sagebrush scrub and California sagebrush scrub - purple sage with pockets of undifferentiated chaparral sparsely interspersed. At the canyon mouth, along the south bank of the Santa Clara River, coast live oak woodlands, southern cottonwood-willow riparian forest, and herbaceous wetlands are also present (Dudek 2006C).

**Unnamed Canyon D.** The associated vegetative cover within the Unnamed Canyon D watershed consists of California sagebrush scrub, valley oak woodlands, southern cottonwood-willow riparian forest, California annual grasslands, and agriculture areas (Dudek 2006C).

**Unnamed Canyon 1.** The associated vegetative cover within the Unnamed Canyon 1 watershed consists of California sagebrush scrub, California sagebrush scrub - California buckwheat, undifferentiated chaparral, and California annual grasslands (Dudek 2006C).

**Unnamed Canyon 2.** The associated vegetative cover within the Unnamed Canyon 2 watershed consists of big sagebrush scrub, alluvial scrub, California sagebrush scrub, California sagebrush scrub - California buckwheat, and California annual grasslands (Dudek 2006C).

**Unnamed Canyon 3.** The associated vegetative cover within the Unnamed Canyon 3 watershed consists of big sagebrush scrub, alluvial scrub, California sagebrush scrub, California sagebrush scrub - California buckwheat, and California annual grasslands (Dudek 2006C).

**Mid-Martinez Canyon.** The associated vegetative cover within the Mid-Martinez watershed consists of California sagebrush scrub, big sagebrush scrub, California annual grassland, and agriculture areas (Dudek 2006C).

**Castaic Creek.** The associated vegetative cover within the Castaic Creek watershed consists of California sagebrush scrub, river wash, southern cottonwood-willow riparian forest, California annual grassland, and agricultural areas (Dudek 2006C).

**Hasley Creek.** The associated vegetative cover within the Hasley Creek watershed consists of chamise chaparral, California sagebrush scrub, California sagebrush scrub - California buckwheat, southern cottonwood-willow riparian forest, river wash, and California annual grassland (Dudek 2006C).

### 4.2.4 IMPACT SIGNIFICANCE CRITERIA

The significance criteria listed below are derived from Appendix G of the State CEQA Guidelines, and were used by the lead agencies to determine the significance of impacts related to geomorphology and riparian resources. The Corps has agreed to use the CEQA criteria presented below for purposes of this EIS/EIR, although significance conclusions are not expressly required under NEPA. The Corps also has applied additional federal requirements as appropriate in this EIS/EIR. Geomorphic impacts would be significant if implementation of the proposed Project or its alternatives would:

- Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner that would result in substantial erosion or siltation on- or off-site.

In order to evaluate the impacts relative to the above significance criterion, the following sub-categories for direct and indirect impacts are used in the analysis:

**Significance Criterion 1:** Project would result in short-term impacts from construction activities that would temporarily change the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner that would result in substantial erosion or siltation on- or off-site;

**Significance Criterion 2:** Project would result in substantial long-term erosion and/or downstream deposition following Project implementation;

**Significance Criterion 3:** Project would result in a substantial reduction in geomorphic function (*i.e.*, channel stability);

**Significance Criterion 4:** Project would result in scouring of the riverbed and floodplain to the point of causing a substantial increase in the frequency and magnitude of scouring of riparian vegetation; and

**Significance Criterion 5:** Project would result in decreased flow (short term or long term) from the Middle Canyon Spring and adversely impact riparian resources supported by the spring.

In addition, the following sub-categories are used for the analysis of secondary impacts resulting from the implementation of the Project:

**Significance Criterion 6:** Project would substantially lengthen the duration of seasonal flow in the "Dry Gap," and,

**Significance Criterion 7:** Project would result in an average annual reduction of greater than 1 percent of sediment delivered from the Santa Clara River to Ventura County beaches.

### 4.2.5 IMPACTS OF THE PROPOSED PROJECT AND ALTERNATIVES

The following impact analysis for the proposed Project and alternatives takes into consideration the components of the RMDP and SCP that address the Newhall Ranch Specific Plan, VCC, and Entrada planning areas. For the Santa Clara River and tributaries within the Project area, the following analysis addresses the following direct, indirect, and secondary impacts relative to Significance Criteria 1 through 7:

- Short-Term Impacts from Construction Activities;
- Erosion and Downstream Deposition;
- Impacts to Geomorphic Function;
- Construction and Scour Impacts to Riparian Vegetation;
- Impacts to Riparian Resources Supported by Middle Canyon Spring;
- Impacts to the Santa Clara River "Dry Gap;" and
- Impacts to Ventura County Beaches.

For purposes of analyzing impacts to geomorphology and with few exceptions (*i.e.*, short-term impacts from construction and impacts of human activities), both the direct and indirect impacts of the permitted improvements and the development of the Newhall Ranch Specific Plan site, with all proposed land uses, have been considered together in the hydraulic modeling. This is because the permitted improvements would not be installed without development of the Newhall Ranch Specific Plan land uses. Presenting an impact analysis of the effects of the installation of the improvements alone would yield primarily beneficial geomorphic impacts because their intent, in part, is mitigation of geomorphic impacts from the Newhall Ranch Specific Plan.

#### 4.2.5.1 Impact Assessment Methods

**Subsection 4.2.6**, Mitigation Measures, identifies the applicable regulatory compliance measures that would apply to the proposed Project, its alternatives, and all subsequent facilitated development. These compliance measures are found in the previously certified Newhall Ranch Specific Plan Revised Draft EIR (March 1999) and the adopted Mitigation Monitoring Plan for the Specific Plan (May 2003). The Project applicant has committed to implementing these Specific Plan compliance measures to ensure that future development of the Specific Plan site would not result in significant erosion, siltation, or debris flow impacts. The EIS/EIR also has developed new Project-specific mitigation to minimize the geomorphology- and riparian-related impacts from implementation of the RMDP component of the proposed Project.

The focus of the impact analysis is on the consequences of the Project-related post-development changes in geomorphic conditions along the Santa Clara River and its tributaries within the Project area. Key

geomorphic impacts that may occur include effects on floodplain boundary and areas, discharge (*i.e.*, river flow amount), flow velocities, and sediment transport and deposition patterns. Changes in these conditions can affect the nature, location, and amount of aquatic, wetland, and riparian habitats along the River, and the sensitive species that use these habitats. The focus of this impact assessment is on the physical conditions resulting from the proposed Project and alternatives, including impact assessment on aquatic and riparian habitats. Species-specific impacts are provided in **Section 4.5**, Biological Resources. The following summarizes the methodology used to develop the analysis of such impacts.

#### 4.2.5.1.1 Temporary Impacts from Construction Activities

The analysis of impacts resulting from construction activities was based on the potential for the proposed Project and the alternatives to result in temporary changes to the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner that would result in substantial erosion or siltation on- or off-site. In areas where existing channels would be substantially modified as a result of build-out of the Newhall Ranch Specific Plan area, Valencia Commerce Center, and Entrada, the impacts of the loss of channel function is evaluated from a wildlife habitat perspective in **Section 4.5**, Biological Resources.

The hydraulic models for the Santa Clara River were created by modifying existing cross-section geometries of the River to simulate the hydraulic effects of the proposed RMDP soil cement, erosion protection, the Potrero Canyon Road Bridge, and Long Canyon Road Bridge abutments and piers. Although the Commerce Center Drive Bridge is already permitted, this bridge has been included in the hydraulic model to assess the overall hydraulic regime of the Project reach. For modeling and impact analysis consideration, the conservative bridge configurations would have the greatest impact on river hydraulics. It should be noted that the present analysis is based on the Project-specific design details, not assumptions from the previous Newhall Ranch Specific Plan evaluation.

#### 4.2.5.1.2 Erosion and Downstream Deposition

The impacts from erosion and sediment deposition are associated with the streambed modifications proposed by the RMDP improvements and associated facilities. The potential for erosion can be evaluated by reviewing changes to hydraulic shear stress or flow velocities, in conjunction with potentially erodible materials. In Los Angeles County, velocities are the preferred indicator for potential streambed erosion. Because the riverbed is composed of alluvial materials, the non-erodible velocities (velocities below which no erosion would occur) range from 2.5 fps (fine gravels under clear flow conditions) to 5.0 fps (alluvial silts transporting colloidal materials) for Manning's roughness coefficient values in the range of 0.025 to 0.035. (Chow, 1959.) This range is modified by the presence of plants. For grass-lined channels, the non-erodible velocities for different species, soil types, and slopes ranges from 3.5 to 8.0 fps. In the case of the Santa Clara River and its tributaries, several of these factors would require an adjustment. Specifically, the Manning's values are a function of bed material, degree of irregularity of the channel, variations of the channel section, the relative effect of obstructions, the quantity of vegetation, and the degree of channel meandering. All of these factors combine to produce a Manning's value greater than 0.035 within the system. Since the channel roughness is higher, a greater velocity threshold would be required to erode the bed. In addition, the Santa Clara River and its tributaries carry a great deal of sediment during flow events large enough to produce scouring velocities. However, the assumption in

Chow (1959) is that flows are clear. Clear flows in most cases are able to carry greater volumes of sediment because they are unsaturated with respect to sediment grains. Sediment-laden flows, in contrast, have less carrying capacity than clear flows and need grater velocities to entrain sediment. These factors indicate that greater velocities would be required to initiate scour from the bed in the Santa Clara River and its tributaries. Therefore, a representative velocity of 4.0 fps was determined to be the appropriate indicator for potential erosion.

Due to the difference in the level of physical modification to the channel and floodplain area, the potential impacts associated with erosion and deposition along the Santa Clara River and the tributaries are analyzed using two separate approaches. Along the Santa Clara River, the primary impacts would occur due to post-Project changes in the hydrology and hydraulics since the Project involves limited physical modification to the channel and floodplain. In-stream velocities, as they increase, are indicators for potential riverbed scouring. The impact analysis along the Santa Clara River uses the results of the velocity analysis from the River Floodplain Hydraulics Impacts Assessment Technical Report (PACE, 2008A) to analyze erosion and/or deposition impacts associated with the Project and alternatives. The analysis was developed using selected results from the floodplain hydraulic analyses for the existing floodplain of the Santa Clara River, the detailed water surface information along the Santa Clara River for each of the Project alternatives, and other hydraulic parameter results for each of the model cross-sections along the Santa Clara River.

For the tributaries, the proposed Project and alternatives involve significant physical modification to all or portions of the drainage channels and floodplain areas for the major tributaries (Chiquito, San Martinez Grande, Long, Lion, and Potrero Canyons). Accordingly, the proposed Project has the potential to have significant impacts with respect to erosion and deposition in these drainages. The re-engineered channels in these drainages would be designed to minimize erosion and depositional impacts under the post-Project conditions in accordance with DPW regulations as described in **Section 4.4**, Water Quality, of this EIS/EIR. The impact analysis for these drainages recognizes the potential for significant impacts and presents a description of the design approach and criteria that would be used for the channels and mitigation measures that would be incorporated into the Project to ensure compliance with these criteria.

#### 4.2.5.1.3 Impacts to Geomorphic Function

Urbanization modifies natural watershed and stream hydrologic and geomorphic function/processes by introducing increased volumes and duration of flow *via* increased runoff from impervious surfaces and drainage infrastructure. Several studies have evaluated affects of increased runoff associated with the introduction of impervious surfaces and drainage facilities on geomorphic processes. (Geosyntec, 2008.) Potential changes to the hydrologic regime may include increased runoff volumes, frequency of runoff events, long-term cumulative duration, as well as increased peak flows. Urbanization may also introduce dry weather flows where only wet weather flows existed prior to development. These changes are referred to as "hydromodification."

Hydromodification intensifies sediment transport and often leads to stream channel enlargement and loss of habitat and associated riparian species. (Geosyntec, 2008.) Under certain circumstances, development can also cause a reduction in the amount of sediment supplied to the stream system, which can lead to stream channel incision and widening. These changes also have the potential to impact downstream

channels and riparian vegetation (*e.g.*, habitat integrity). A project that increases runoff due to impervious surfaces and traps sediment from upland watershed sources creates compounding effects.

The PACE Fluvial Study (2006a) provides an evaluation of the existing and proposed fluvial characteristics and long-term stability of the Santa Clara River between I-5 and an area generally west of the Los Angeles County/Ventura County line in the vicinity of the RMDP area. The report evaluates impacts from fluvial modifications of the riverbed from the Capital Flood event, and changes in the floodplain fluvial operation over the long term.

Stream stability can be examined based on the change in potential transport between channel sub-reaches. Subreaches are readily determined from changes in hydraulic parameters, and frequently the most significant hydraulic parameter in terms of impact on stream stability is discharge (volume per unit time). If a channel subreach has equal potential transport, both entering and exiting the reach, then the subreach is said to be in equilibrium. Frequently, however, channel sub-reaches are either in an aggrading or degrading condition. For the purposes of the study, aggrading reaches are those whereby the potential transport entering the reach (the potential transport of the subreach upstream of that under immediate consideration) is higher than the potential transport leaving the subreach (the potential transport of the subreach under immediate consideration). In degrading sub-reaches, the opposite is true and potential transport entering the reach is lower than that leaving the sub-reach. Minor scour components analyzed in the Fluvial Study include local scour (piers and abutments), bend scour, low-flow incision (thalweg movement), and bed form height (dunes and anti-dunes).

As described in **Section 4.6**, Jurisdictional Waters and Streams, a Hybrid Assessment of Riparian Condition (HARC) was performed to evaluate the extent to which wetland or riparian reaches perform various physical, chemical, and biological functions. Specifically, the HARC identifies five metrics (of the 15) that can be used to evaluate the impacts to the geomorphic function of the River and tributary systems as follows:

- **Source** -- Source of water describes the primary origin of water input to the stream or wetland, and the degree to which water input has been affected or is controlled by anthropogenic activities or land use changes. Presence of septic tanks, culverts, riprap, *etc.*, would cause a reach to score lower than a similar reach in an undisturbed area.

- **Hydroperiod --** Hydroperiod is the seasonal, and in some wetlands, daily pattern of water level fluctuation. Hydroperiod defines regular changes in the duration, frequency, timing, and extent or depth of inundation or saturation in a wetland. A reach subject to a natural flow regime would score higher than one in which flow is artificially augmented or diverted.

- **Floodplain Connection** -- Floodplain connection describes the relationship between riverine and the adjacent floodplain that influences the ability of water to flow into or out of the wetland or to inundate adjacent uplands during high-water periods. Presence of bank stabilization and channel incision inhibit floodplain connection.

- **Surface Water Persistence** -- Surface water persistence refers to the duration of flow/ponding or surface saturation in a stream or wetland. Perennial streams and wetlands that store ponded water for

more than one day would score higher than ephemeral/intermittent streams and wetlands with no features allowing ponding/storage to occur.

- **Flood Prone Area** -- This metric assesses the extent to which overbank flooding is constrained. Presence of bank stabilization, channel incision, or other obstacles constraining flood flows would cause a reach to score lower than a similar reach with an unrestricted floodplain.

To determine the score for the above metrics, several assessment methods may be used to rate the quality of wetland habitats on a project site as described in detail in **Section 4.6**, Jurisdictional Waters and Streams, of this EIS/EIR. As functions are difficult to measure directly, methods have been developed to assess whether functions are occurring based on various indicators. The current condition of an assessment area would be assigned a metric score based on pre-determined scoring criteria. **Table 4.2-7** includes a summary of the functions and benefits of the hydrologic process used as a basis for development of the metric scores.

**Table 4.2-7**
**Hydrologic Process Functions and Values**

| Functions Related To Hydrologic Processes | | Benefits, Products, and Services Resulting From the Wetland Function |
|---|---|---|
| Short-Term Storage of Surface Water: The temporary storage of surface water for short periods. | On-site: | Replenish soil moisture, import/export materials, conduit for organisms. |
| | Off-site: | Reduce downstream peak discharge and volume and help maintain and improve water quality. |
| Long-Term Storage of Surface Water: The temporary storage of surface water for long periods. | On-site: | Provide habitat and maintain physical and biogeochemical processes. |
| | Off-site: | Reduce dissolved and particulate loading and help maintain and improve surface water quality. |
| Storage of Subsurface Water: The storage of subsurface water. | On-site: | Maintain biogeochemical processes. |
| | Off-site: | Recharge surficial aquifers and maintain baseflow and seasonal flow in streams. |
| Moderation of Groundwater Flow or Discharge: The moderation of groundwater flow or groundwater discharge. | On-site: | Maintain habitat. |
| | Off-site: | Maintain groundwater storage, baseflow, seasonal flows, and surface water temperatures. |
| Dissipation of Energy: The reduction of energy in moving water at the land/water interface. | On-site: | Contribute to nutrient capital of ecosystem. |
| | Off-site: | Reduced downstream particulate loading helps to maintain or improve surface water quality. |
| | Off-site: | Maintain corridors between habitat islands and landscape/regional biodiversity. |

The HARC metric scores were evaluated on a scale of zero (degraded condition) to one (optimal condition). Although the HARC score provides a means for comparing the quality of different stream

reaches with respect to certain wetland functions, it does not take into consideration the differing size of the reaches. In order to incorporate this variable, each HARC score was multiplied by the assessment area of the reach. The resulting product is termed the number of HARC Area Weighted-Score Units (AW-Score Units). It is this number that ultimately describes the value of a particular reach, and the number of AW-Score Units impacted versus preserved will show the impacts of the proposed Project and alternatives on wetland and riparian resources. Conceptually, the alternative with the fewest lost AW-Score Units would be the least damaging alternative. An alternative with a greater loss of HARC AW-Score Units, though, may be mitigated by producing AW-Score Units in another location within the Project area through wetland/riparian restoration or creation (see **Section 4.6**, Jurisdictional Waters and Streams, for further discussion on the HARC assessment methods).

The impact analysis for the Santa Clara River and tributaries uses the pre- and post-Project HARC AW scores for the four HARC metrics that represent geomorphic indicators (hydroperiod, floodplain connection, surface water persistence, and flood prone area). Since these parameters characterize geomorphic function, an impact would be considered significant if it resulted in a substantial change in the hydraulic or sediment transport regime or a substantial decrease in the HARC AW scores. The impact analysis for the tributaries uses the combined HARC AW score for all of the tributaries rather than the individual HARC AW scores for each tributary in order to evaluate the overall impacts of the proposed Project and alternatives on geomorphic function. In some cases, a reduction in geomorphic function may occur in one tributary but is offset by an increase in geomorphic function in another tributary. Accordingly, for the tributaries, the overall net HARC AW score for all of the tributaries is used to determine impacts for the proposed Project and each alternative. In regards to the Santa Clara River, the analysis uses the HARC AW scores for the specified parameters as well as the pre- and post-Project hydraulic and sediment transport modeling results, which are used as an additional indicator of impacts within the River Corridor.

#### 4.2.5.1.4 Construction and Scour Impacts to Riparian Vegetation

Vegetation exerts a significant influence on fluvial geomorphology by affecting resistance to flow, bank strength, sediment storage, bed stability, and stream morphology, and is important for aquatic ecosystem function. Riparian vegetation also provides habitat for riparian-associated species including many special status species in the area. Changes in riparian vegetation communities can result from alteration in the flow regime (*e.g.*, velocity and water depth), erosion, sedimentation, and direct removal (*e.g.*, grading, re-engineered channel area, installation of bank stabilization, conversion of the existing channels to buried storm drain, and road crossings). Impacts to riparian-associated wildlife are discussed in **Section 4.5**, Biological Resources, of this EIS/EIR.

Project activities that would impact existing riparian resources include reengineering and regrading existing drainage channels, constructing bank stabilization, converting existing channels to buried storm drain, and installing road crossings. These Project activities would significantly impact riparian vegetation along the River and the tributary drainages. Due to the difference in the level of physical modification to the channel and floodplain area, the potential impacts to riparian vegetation along the Santa Clara River and the tributaries are analyzed using two separate approaches.

Along the Santa Clara River, the foremost impacts to riparian vegetation would occur due to post-Project changes in the hydrology and hydraulics since the proposed Project involves limited physical modification to the channel and floodplain (whereas some of the existing tributary drainages would be substantially reengineered and regraded). Accordingly, the impact analysis for the River uses the hydraulic model results from the PACE Fluvial Study (2006a) to evaluate impacts to riparian resources along the Santa Clara River. The Fluvial Study estimates the floodplain area subject to a range of velocities as well as increased water depth for the proposed Project and alternatives. An increase in flow velocities or water depth in the Santa Clara River would result in significant impacts to riparian vegetation if the increase causes: (1) widespread and chronic scouring of the channel bed that removes a significant amount of aquatic wetland and riparian habitats from the River channel; and/or (2) substantial modification of the relative amounts of these different habitats in the River, essentially altering the quality of the riverine environment. As discussed in **Subsection 4.2.5.1.2**, Erosion and Downstream Deposition, a representative velocity of 4 fps was determined to be the appropriate indicator for potential erosion. Along the Santa Clara River, changes to the area subject to velocities greater than 4 fps are evaluated to determine impacts to riparian vegetation. In addition, increases in water depth are also evaluated since such changes could result in significant impacts to riparian habitat if the additional water depth causes greater "shear forces" (*i.e.*, friction caused by the weight of water) on the Santa Clara River bottom, and thereby increasing scouring of the channel bed and removal of vegetation. This effect could reduce the extent of aquatic, wetland, and riparian habitats in the Santa Clara River. Impacts are considered significant if the proposed Project or alternatives result in a substantial increase in the frequency and magnitude of areas subject to velocities greater than 4 fps or significant increases in water depth (and thereby increasing scouring of channel bed and removal of vegetation).

For the tributaries, the proposed Project and alternatives involve significant physical modification to all or portions of the drainage channels and floodplain areas. Therefore, the impact analysis for the tributaries uses the HARC hydrologic function metrics (source, hydroperiod, floodplain connection, surface water persistence, and flood prone area) for the pre- and post-Project conditions as a surrogate for potential scour (*i.e.*, post-Project HARC scores serve as a surrogate indicator of potential increases in the frequency and magnitude of scour of riparian vegetation) impacts to riparian resources. Although the post-Project HARC scores do not directly indicate changes in the frequency and magnitude of scour, such impacts would result in a decrease in HARC AW scores. For this analysis, an impact would be considered significant if it resulted in a substantial decrease in the HARC AW scores. The impact analysis for the tributaries uses the combined HARC AW score for all of the tributaries rather than the individual HARC AW scores for each tributary in order to evaluate the overall impacts of the proposed Project and alternatives. In some cases, a reduction in geomorphic function may occur in one tributary but is offset by an increase in geomorphic function in another tributary. Accordingly, for the tributaries, the overall net HARC AW score for all of the tributaries is used to determine impacts for the proposed Project and each alternative.

#### 4.2.5.1.5 Impacts to Riparian Resources Supported by Middle Canyon Spring

Middle Canyon Spring is a unique natural freshwater spring complex that includes riparian habitat. The spring is supported by groundwater. Development in the Middle Canyon watershed could affect groundwater hydrology in the canyon and discharge from the spring. Changes in the volume of discharge

from the spring and/or the water quality could impact riparian resources that are supported by the spring. These impacts would be considered significant indirect impacts of the proposed Project or alternatives if they result in decreased flow (short or long term) from the Middle Canyon Spring and adversely impact riparian resources supported by the spring.

#### 4.2.5.1.6 Impacts to Santa Clara River "Dry Gap"

The Santa Clara River is perennial from the existing Valencia WRP to approximately 3.5 miles downstream of the Los Angeles County/Ventura County line (western limit of the Project boundary) near Rancho Camulos. Further downstream, the Santa Clara River flows through the Piru groundwater basin where surface water flow in the River is lost to groundwater. This ephemeral portion of the River is dry most of the year and is referred to as the "Dry Gap". The Newhall Ranch WRP will be a near-zero discharge facility; however, discharge from the WRP to the Santa Clara River will occur during the winter months. If this discharge would substantially lengthen the duration of seasonal flow in the "Dry Gap," it would be considered a significant secondary impact of the proposed Project and/or alternatives.

#### 4.2.5.1.7 Impacts to Ventura County Beaches

The impacts to beaches are associated with a reduction in sediment supplied to the mouth of the Santa Clara River at the Pacific Ocean. Since beaches are located miles beyond the Project reach, the reduction of sediment to Ventura County beaches is considered a secondary impact of Project activities. Reduction of sediment supply can result from construction of non-erodible surfaces, reduction from the existing erosion regime, and increases in upstream deposition. Impacts would be considered significant if the Project would result in an average annual reduction of greater than 1 percent of sediment delivered from the Santa Clara River to Ventura County beaches.

### 4.2.5.2 Impacts of Alternative 1 (No Action/No Project)

#### 4.2.5.2.1 Direct Impacts

**RMDP Direct Impacts.** Under this alternative, none of the proposed RMDP infrastructure required to implement the previously approved Newhall Ranch Specific Plan would be developed. Alternative 1 would not result in significant direct impacts to the existing geomorphology or riparian resources because there would not be any RMDP-related facilities constructed. However, the existing unstable geomorphic conditions in the four southern tributary drainages (Salt, Lion, Long, and Potrero) would not be remedied as described in **Section 2.0**, Project Description, of this EIS/EIR. Furthermore, existing land uses (agriculture and oil production) would persist and geomorphic conditions would continue to degrade these existing tributaries. Under Alternative 1, there would not be any direct RMDP impacts to the Santa Clara River; therefore, its geomorphology and riparian resources would be unaffected. However, several tributaries are geomorphically unstable due to past land use activities and would further destabilize over time because of continuing, existing land use activities. Therefore, impacts of Alternative 1 are significant specific to the unstable tributaries that are being affected by existing land uses including Salt, Potrero, Long, and Lion canyons.

**SCP Direct Impacts.** Under this alternative, none of the proposed spineflower preserves required to implement the approved Specific Plan and a portion of the Entrada planning area would be established. However, the creation of spineflower preserves in these areas would not result in any land alteration or modification; and, thus, Alternative 1 would not result in significant direct impacts to geomorphology or riparian resources.

#### 4.2.5.2.2 Indirect Impacts

**RMDP Indirect Impacts.** Under this alternative, none of the RMDP proposed infrastructure required to implement the approved Specific Plan would be developed. Alternative 1 would not result in significant indirect impacts to geomorphology or riparian resources that would otherwise occur from Specific Plan-related build-out (*e.g.*, conversion of ephemeral tributary drainages to buried storm drains).

**SCP Indirect Impacts.** Under this alternative, none of the proposed spineflower preserves required to implement the Specific Plan and Entrada would be established. Thus, Alternative 1 would not result in significant indirect impacts to geomorphology or riparian resources, because there would be non-facilitated development in such areas.

#### 4.2.5.2.3 Secondary Impacts

**RMDP Secondary Impacts.** Under this alternative, none of the proposed RMDP infrastructure required to implement the previously approved Newhall Ranch Specific Plan would be developed, and the proposed spineflower preserves required to implement the previously approved Specific Plan would not be established. Alternative 1 would not result in significant secondary impacts to geomorphology or riparian resources.

**SCP Secondary Impacts.** Under this alternative, none of the proposed spineflower preserves required to implement the previously approved Specific Plan and Entrada would be established; and, thus, Alternative 1 would not result in significant secondary impacts to geomorphology or riparian resources, because there would be no facilitated development in such areas.

### 4.2.5.3 Impacts of Alternative 2 (Proposed Project)

Under the proposed RMDP, infrastructure would be constructed in the Santa Clara River and tributary drainages within the Project area, which is needed to implement the approved Specific Plan. The proposed RMDP infrastructure is described in detail in **Section 2.0**, Project Description, of this EIS/EIR.

**Santa Clara River. Figure 3.0-3** (**Section 3.0**, Description of Alternatives) depicts the locations of the Alternative 2 RMDP Santa Clara River features relative to river jurisdictional areas. As shown, two proposed bridges, Potrero Canyon Road Bridge and Long Canyon Road Bridge, and one previously approved bridge, Commerce Center Drive Bridge, would be located across the main stem of the Santa Clara River, resulting in permanent impacts due to bridge crossings.[9] As shown, buried bank stabilization

[9] The Commerce Center Drive Bridge was previously analyzed in the Final EIS/EIR prepared and approved by the Corps and CDFG in connection with previously adopted NRMP (SCH No. 1997061090, August 1998).

would be installed on the north side of the Santa Clara River from Castaic Creek to the western Project boundary. The WRP outfall to the Santa Clara River also would be installed as part of the approved Newhall Ranch WRP. In addition, as shown, geofabric utility corridor bank protection is proposed on the north side of the Santa Clara River between San Martinez Grande Canyon and Chiquito Canyon. Buried bank stabilization also would be installed on the south side of the Santa Clara River from the vicinity of the proposed Long Canyon Road Bridge to the vicinity of the proposed Potrero Canyon Road Bridge. As shown, permanent bank stabilization impact areas exist on the north and south banks of the Santa Clara River. Finally, this alternative would include the construction of five nature viewing platforms and associated walkways along the northern portion of the Santa Clara River between Lion Canyon to the east and Potrero Canyon to the west.

While some permanent impact areas exist along the Santa Clara River, **Figure 3.0-3** (**Section 3.0**, Description of Alternatives) shows that the Santa Clara River remains in a largely preserved condition, and it depicts the proposed RMDP riparian/upland revegetation zones in green and the newly created River channel in blue. **Table 3.0-6** (**Section 3.0**, Description of Alternatives) summarizes the characteristics of the major RMDP infrastructure along the Santa Clara River, including bank stabilization on the north side (20,016 lf) and south side (9,763 lf), for a total of 29,779 lf of buried bank stabilization along the Santa Clara River. This table also shows 22 storm drain outlets along the north bank and 3 such outlets on the south bank of the Santa Clara River (25 storm drain outlets). In addition, the table documents the length, width, and vertical clearance of the three bridges, as well as the number of piers supporting each of the bridges.

A summary of the RMDP infrastructure that would be authorized under the RMDP component of the proposed Project is presented in **Table 4.2-8a**. The proposed RMDP components within the Santa Clara River are described and illustrated in **Section 3.0**, Description of Alternatives, Alternative 2 -- RMDP Santa Clara River Features.

**Table 4.2-8a**
**Alternative 2 Santa Clara River RMDP Infrastructure**

| Santa Clara River Location | Bank Stabilization (lf) | Outlets (No.) | Bridges | | | |
|---|---|---|---|---|---|---|
| | | | Length (ft) | Width (ft) | Piers (qty) | Vertical Clearance (ft) |
| **Bridges** | | | | | | |
| Commerce Center Drive Bridge | - | - | 1,200 | 100 | 9 | 22 |
| Long Canyon Road Bridge | - | - | 980 | 100 | 9 | 31-40 |
| Potrero Canyon Road Bridge | - | - | 1,550 | 84 | 21 | 20-24 |
| **Banks** | | | - | - | - | - |
| North River Bank | 20,016 | 22 | - | - | - | - |
| South River Bank | 9,763 | 3 | - | - | - | - |
| **Total** | 29,779 | 25 | - | - | - | - |

Source: PACE, 2008A.

**Tributary Drainages:** Within the tributary drainages in the Project area, certain drainages would not be graded and would remain undisturbed, while other drainage areas would be graded, reconstructed to a soft-bottom drainage channel with buried bank stabilization along each side of the drainage, or converted to buried storm drain (see **Table 4.2-8b**). Grading may involve excavation or placement of fill to support the proposed channel design and surrounding land uses. Where necessary, fill materials (ranging between five and 25 feet in thickness) would be comprised of excess excavated materials from the surrounding Project area. Reconstructed drainage areas would integrate flood control and grade stabilizing measures (*i.e.*, a combination of drop structures/grade stabilizers and bank protection) to maintain sediment equilibrium and protect the channel bed and banks from hydromodification impacts. This design methodology is intended to create stable drainage channels that would support the in-channel habitat following project implementation. The approach focuses on developing channel width, depth, slope, and other parameters based on the future flow and sediment regime of each drainage, using an integrated approach that predicts stable characteristics, and that uses structures and other measures only in those drainage locations where erosional forces would exceed the natural stability of the drainage channel. All such structures (*i.e.*, bank and channel bed protection) are designed to mimic natural features and use a combination of structural and vegetative methods to provide drainage channels that are stable, visually aesthetic, and maintain the desired habitat (*e.g.*, riparian, wetland, and upland habitat) after Project implementation. Road crossing culverts and bridges would cross various drainages, but only where necessary to accommodate the approved Specific Plan circulation system. While the exact design within each drainage would be determined at the final design stage of Project implementation and submitted to the Corps and CDFG for final verification and approval as described in **Subsection 2.3.1** (Overview of the Applicant's Proposed Permitting Process). The existing characteristics of each drainage within the RMDP boundary and their associated proposed modifications are described below.

**Modified Tributary Drainages**

**Modified Tributary Drainages - Existing Channels Stabilized.** In order to accommodate the Specific Plan development, some of the existing major tributary drainages within the RMDP site (Chiquito Canyon and San Martinez Grande Canyon, and portions of Lion Canyon) would require stabilizing treatments to protect the channel and surrounding development from impacts due to vertical scour and lateral channel migration. The existing drainages would remain intact, but would sustain temporary and permanent impacts from construction of stabilization elements, including buried bank stabilization and grade stabilization structures.

**Modified Tributary Drainages - Regraded Channels**. Due to the existing conditions within portions of some drainages in Project Area (most of Long and Potrero Canyons and portions of Lion Canyon), stabilization of the existing drainages is not feasible; and, therefore, in order to meet the County's flood protection objectives, these drainages would be either partially or fully graded and filled and a new drainage would be constructed in the same or similar location. The new drainages would be designed to incorporate buried bank stabilization and grade stabilization, and would have sufficient hydrologic capacity to pass the Los Angeles County Capital Flood without the need for clearing vegetation from the channels. The new channel banks would be planted with riparian vegetation following construction.

**Table 4.2-8b**
**Alternative 2 Tributary Drainage RMDP Infrastructure**

| Drainage Location | Drainage Modified (lf) | Drainage Converted to Buried Storm Drain (lf) | Bank Stabilization[1] (lf) | | Preserved Drainage (lf) | Road Crossings | |
|---|---|---|---|---|---|---|---|
| | | | West Bank | East Bank | | Bridges | Culverts |
| **Modified Drainages** | | | | | | | |
| Chiquito Canyon | 8,612 | 2,549 | 7,411 | 7,280 | 898 | 0 | 3 |
| Lion Canyon | 5,614 | 6,316 | - | - | 0 | 0 | 1 |
| Long Canyon | 9,618 | 961 | 8,833 | 8,815 | 0 | 0 | 3 |
| Potrero Canyon | 19,095 | 10,918 | 16,354 | 16,176 | 9,679 | 0 | 5 |
| San Martinez Grande Canyon | 5,048 | 0 | 4,279 | 4,287 | 122 | 0 | 2 |
| Subtotal | 47,987 | 20,744 | 36,877 | 36,559 | 10,699 | 0 | 14 |
| **Unimproved/Converted Drainages** | | | | | | | |
| Agricultural Ditch | 317 | 1,479 | - | - | - | 0 | 0 |
| Ayers Canyon[2] | 154 | 0 | 0 | 0 | 2,311 | 0 | 1 |
| Dead-End Canyon | 0 | 1,931 | - | - | 0 | 0 | 0 |
| Exxon Canyon | 0 | 1,276 | - | - | 2,265 | 0 | 0 |
| Homestead Canyon | 0 | 609 | - | - | 0 | 0 | 0 |
| Humble Canyon | 0 | 421 | - | - | 5,116 | 0 | 0 |
| Middle Canyon | 0 | 7,439 | - | - | 148 | 0 | 0 |
| Mid-Martinez Canyon | 22 | 4,541 | - | - | 250 | 0 | 0 |
| Off-Haul Canyon | 0 | 7,593 | - | - | 1,185 | 0 | 0 |
| Salt Canyon | 7,290 | 0 | | 1,992 | 101,470 | 0 | 0 |
| Magic Mountain Canyon | 0 | 6,111 | - | - | 0 | 0 | 0 |
| Unnamed Canyon 1 | 0 | 4,647 | - | - | 0 | 0 | 0 |
| Unnamed Canyon 2 | 0 | 416 | - | - | 0 | 0 | 0 |
| Unnamed Canyon A | 0 | 0 | - | - | 1,293 | 0 | 0 |
| Unnamed Canyon B | 0 | 1,004 | - | - | 568 | 0 | 0 |
| Unnamed Canyon C | 0 | 402 | - | - | 869 | 0 | 0 |
| Unnamed Canyon D | 0 | 1,232 | - | - | 260 | 0 | 0 |
| Subtotal | 7,782 | 39,101 | 0 | 1,992 | 115,735 | 0 | 1 |
| **Totals** | **55,770** | **59,845** | **36,877** | **38,551** | **126,434** | **0** | **15** |

Notes:

[1] The lf of bank stabilization does not necessarily reflect impacts to jurisdictional areas; it only provides the linear feet of bank protection to be installed along various tributary drainages.

Source: RMDP, 2008.

**Unmodified (Preserved) Drainages.** Among the minor tributary drainages within the Project area, some are located in areas where no impacts would occur, and are distant enough from surrounding development that bank stabilization is not required. These drainages would remain in their existing condition; the RMDP and SCP would not impact these drainages. In most situations, unmodified drainages would be located within future open space areas and maintain their current hydrologic functions, as well as providing linkages for wildlife movement to and from the Santa Clara River.

**Tributary Drainages Converted to Buried Storm Drain.** Some of the drainages within the Project area, including many of the smaller, ephemeral streams, would be graded as part of the grading operations required to facilitate build-out of the Specific Plan. The DPW capital flood discharges in these smaller drainages are less than 2,000 cfs and, as such, these drainages can be converted to storm drains per the DPW Santa Clara River and Major Tributary Drainage Policy. Accordingly, the RMDP proposes to convey the wet-weather flows that currently occupy the drainages through the development's storm drain system. The storm drain systems would then be discharged to the Santa Clara River via the proposed storm drain outlets.

There are five major tributary drainages that would be modified or re-engineered (as previously described) but remain in a soft-bottom channel condition: Chiquito Canyon, San Martinez Grande Canyon, Potrero Canyon, Long Canyon, and Lion Canyon. Significant portions of several small, tributary drainages would be graded and replaced with buried storm drains or other appropriate conveyance facilities, including: Magic Mountain Canyon, Middle Canyon, Dead-End Canyon, Exxon Canyon, Mid-Martinez Canyon, Off-Haul Canyon, Homestead Canyon, the Chiquita Canyon agricultural ditch, Unnamed Canyon B, Unnamed Canyon C, Unnamed Canyon D, Unnamed Canyon 1 and Unnamed Canyon 2. **Figure 3.0-4** (**Section 3.0**, Description of Alternatives) illustrates the modified, converted, and preserved tributary drainages under the proposed Project (Alternative 2).

Generally, the five modified tributary drainages (Chiquito, San Martinez Grande, Potrero, Long, and Lion Canyons) would be designed for geomorphic equilibrium in terms of channel stability, sediment transport, and flow conveyance under future conditions. The channel and floodplain would be designed to meet the following criteria:

- Geomorphic stability -- the channel would not aggrade with sediment or erode its banks or bed substantially. The bankfull channel would be sized for the dominant (channel forming) discharge.

- Flood conveyance -- the floodplain would convey the Capital Flood (Qcap) with a minimum of three feet of freeboard, and meet Los Angeles County standards for flood channels.

- Ecological function -- The channel and floodplain would support a combination of riparian habitat, coastal sage scrub, oak woodland, *etc*., as appropriate (see **Section 4.5**, Biological Resources of this EIS/EIR for details on riparian habitat types and locations). Grade stabilizer structures, culverts, and other hydraulic structures would be designed to accommodate wildlife requirements.

- Hydromodification -- The combined urban runoff management program, in conjunction with the channel design, will address potential "hydromodification" impacts resulting from development of the RMDP and SCP areas. The channel would not aggrade or generate excess sediment from erosion

or create a larger than natural downstream impact from sedimentation associated with hydrograph modification.

- Low maintenance -- The channel and associated structures would require minimum maintenance. The channel and floodplain would not require sediment removal or vegetation clearance. Following construction, a monitoring and management plan would be implemented to evaluate compliance with the basis of design criteria to ensure that the engineered channels function as intended (see Mitigation Measure GRR-7).

The preliminary Project designs for each tributary are described in the following paragraphs.

**Chiquito Canyon.** In order to accommodate Specific Plan development, Chiquito Canyon within the RMDP site would be modified to require stabilizing treatments to protect the channel and surrounding development from excessive vertical scour and lateral channel migration. The existing drainage would remain intact, but would sustain permanent and temporary impacts from construction of stabilization elements, including buried bank stabilization and grade stabilization structures. Approximately 7,411 lf of buried bank stabilization would be installed along the west bank and 7,280 lf of buried bank stabilization would be installed along the east bank of Chiquito Canyon. In addition, approximately 2,549 lf of drainage would be converted to buried storm drain. Three culverted road crossings would be installed along Chiquito Canyon to accommodate Specific Plan traffic circulation, plus a culverted road extension would be installed for the Caltrans SR-126 road widening project.[10] **Table 4.2-8b** describes the proposed Project (Alternative 2) tributary drainage RMDP infrastructure characteristics, including the Chiquito Canyon modified drainage. The proposed RMDP components are illustrated in **Figure 3.0-5**, Chiquito Canyon Detail Alternative 2 & 4 Proposed RMDP Tributary Treatments (**Section 3.0**, Description of Alternatives).

**San Martinez Grande Canyon.** In order to accommodate Specific Plan development, the proposed Project (Alternative 2) proposes that a soft-bottom channel be constructed adjacent to the existing alignment of San Martinez Grande Canyon Road between SR-126 and the northern Project boundary as shown on **Figure 3.0-6** (**Section 3.0**, Description of Alternatives). The existing drainage channel would be graded and the drainage would be relocated westward into the soft-bottom channel. The existing drainage would sustain permanent and temporary impacts from construction of the modified tributary drainage, including buried bank stabilization and grade stabilizing structures. Approximately 4,279 lf of buried bank stabilization would be installed along the west bank and 4,287 lf of buried bank stabilization would be installed along the east bank of San Martinez Grande Canyon. As shown, two culverted road crossings would be installed along San Martinez Grande Canyon to accommodate Specific Plan traffic circulation, plus a culverted road extension would be installed for the Caltrans SR-126 road widening project. **Table 4.2-8b**, above, describes the proposed Project (Alternative 2) tributary drainage RMDP infrastructure characteristics, including the San Martinez Grande Canyon modified drainage. The proposed RMDP components are described and illustrated in **Section 3.0**, Description of Alternatives, Proposed San Martinez Grande Tributary Treatments -- Alternatives 2 & 4.

[10] In addition, as part of the Caltrans SR-126 road widening project, the existing six-lane bridge allowing SR-126 to cross the Castaic Creek drainage would be expanded to eight lanes.

**Long Canyon.** In Long Canyon, the RMDP proposes that a soft-bottom channel be constructed between the eastern Project boundary and the confluence with the Santa Clara River as shown on **Figure 3.0-7** (**Section 3.0**, Description of Alternatives). Less than 10 percent of this modified channel would fall within the existing drainage; the remaining portion would require the channel to be relocated as shown on **Figure 3.0-7** (**Section 3.0**, Description of Alternatives). Two culverted road crossings would cross the drainage within approximately 500 feet and 2,000 feet upstream of the Santa Clara River confluence, respectively. A third earthen-fill culverted road crossing for Magic Mountain Parkway is proposed across the Long Canyon drainage approximately 1,000 feet downstream of the eastern Project boundary as shown on **Figure 3.0-7** (**Section 3.0**, Description of Alternatives). The drainage would sustain permanent and temporary impacts from construction of stabilization elements, including buried bank stabilization and grade stabilization structures. Approximately 8,833 lf of buried bank stabilization would be installed along the west bank and 8,815 lf of buried bank stabilization would be installed along the east bank of Long Canyon. In addition, approximately 961 lf of drainage would be converted to buried storm drain. **Table 4.2-8b**, above, describes the proposed Project (Alternative 2) tributary drainage RMDP infrastructure characteristics, including the Long Canyon modified drainage. The proposed RMDP components are described and illustrated in **Section 3.0**, Description of Alternatives, Proposed Long Canyon Tributary Treatments -- Alternatives 2 & 3.

**Potrero Canyon.** In Potrero Canyon, the RMDP proposes that a soft-bottom channel be constructed between the Santa Clara River confluence and a point approximately four-fifths of the way up the drainage near the eastern Project boundary as shown on **Figure 3.0-8** (**Section 3.0**, Description of Alternatives). The existing channel would be graded and relocated mostly westward into the soft-bottom channel. The existing drainage would sustain permanent and temporary impacts from construction of stabilization elements, including buried bank stabilization and grade stabilization structures. Approximately 16,354 lf of buried bank stabilization would be installed along the west bank and 16,176 lf of buried bank stabilization would be installed along the east bank of Potrero Canyon. In addition, approximately 10,918 lf of drainage would be converted to buried storm drain. Five culverted road crossings would be constructed to allow Specific Plan roadways to cross the Potrero Canyon drainage at the locations shown on **Figure 3.0-8** (**Section 3.0**, Description of Alternatives). **Table 4.2-8b**, above, describes the proposed Project (Alternative 2) tributary drainage RMDP infrastructure characteristics, including the Potrero Canyon modified drainage. The proposed RMDP components are illustrated in **Figure 3.0-8**, Proposed Potrero Tributary Treatments -- Alternative 2 (**Section 3.0**, Description of Alternatives).

Specifically, the geomorphic basis of design is such that Potrero Canyon would be designed to convey sediment under future conditions with a "dynamically stable channel" (neither long-term erosion nor deposition) and to support the proposed native re-vegetation program. **Table 4.2-9** summarizes the recommended conceptual approach to channel design according to whether the channel floodplain is to be regraded.

**Table 4.2-9**
**Potrero Canyon Geomorphic Description By Reach With Design Recommendations**

| Reach Number | Location Along Channel Centerline* (ft) | Channel Condition | Proposed Treatment |
|---|---|---|---|
| 1 | 0-1,900 | Incised | Create new stable channel and stabilize with steps (size depending on grading plan). |
| 2 | 1,00-4,100 | Stable channel in mesic meadow | Create new stable channel and stabilize with steps (size depending on grading plan). |
| 3 | 4,100-7,200 | Swale in mesic meadow | Create new stable swale and stabilize with buried structures. |
| 4 | 7,200-14,400 | Aggrading | Create new stable channel and stabilize with steps (size depending on grading plan). |
| 5 | 14,400-18,000 | Deeply incised | Create new stable channel and stabilize with steps (size depending on grading plan). |
| 6 | Upstream of 18,000 feet | Aggrading | Realign and enlarge channel and stabilize with 3 ft drop structures. |

Source: PWA, 2007f.

**Lion Canyon.** In Lion Canyon, drainage modifications include a soft-bottom channel from the Santa Clara River confluence and upstream in areas to the Project eastern boundary as shown on **Figure 3.0-9** (**Section 3.0**, Description of Alternatives). In addition, approximately 6,316 lf of drainage would be converted to buried storm drain in the western, central, and eastern portions of Lion Canyon, as shown on **Figure 3.0-9** (**Section 3.0**, Description of Alternatives). One culverted road crossing would be constructed to allow Specific Plan roadways to cross the Lion Canyon drainage at the locations shown on **Figure 3.0-9** (**Section 3.0**, Description of Alternatives). **Table 4.2-8b**, above, describes the proposed Project (Alternative 2) tributary drainage RMDP infrastructure characteristics, including the Lion Canyon modified drainage. The proposed RMDP components are described and illustrated in **Section 3.0**, Description of Alternatives, Lion Canyon Detail Alternative 2 -- 6 Proposed RMDP Tributary Treatments.

To maximize vegetation, aquatic, and wildlife habitat and maintain a natural channel appearance, the design also proposes using a range of types of step-pool structures and armored riffles to accommodate the drops in channel elevation. Construction of these structures would likely include large boulders, soil cement, or concrete, and would mimic natural step-pool function and morphology in appearance and function. The final design will be developed according to the geomorphic basis of design.

**Table 4.2-10** summarizes the recommended treatments along Lion Canyon to meet the design criteria.

**Table 4.2-10**
**Lion Canyon Geomorphic Description By Reach With Design Recommendations**

| Reach Number | Location Along Channel Centerline* (ft) | Description | Recommended Treatment |
|---|---|---|---|
| 1 | 1,050 -- 1,750 | Heavily incised, confined channel with steep banks. | -Relocate channel away from steep right bank.<br>-Re-grade and stabilize banks.<br>-Toe protection at bottom of mesa slope. |
| 2 | 1,750 -- 2,470 | Moderately incised channel with steep left bank. | -Re-grade and stabilize left bank.<br>-Potential Habitat Enhancement Area (oak woodland/mule fat scrub). |
| 3 | 2,470 -- 3,060 | Heavily incised, confined channel with coarse bed material and steep banks. | -Preserve existing oak woodland habitat where feasible. |
| 4 | 3,060 -- 3,490 | Heavily incised, confined channel. | -Re-grade and stabilize banks.<br>-Potential Habitat Enhancement Area (oak woodland/mule fat scrub). |
| 5 | 3,490 -- 4,400 | Stable, well-defined channel. | Preserve existing oak woodland habitat. |
| 6 | 4,400 -- 5,030 | Slightly incised, well-defined channel.<br>Proposed Magic Mountain Parkway Crossing. | -Preserve existing oak woodland habitat.<br>-Maintain existing grade or steeper using drop structure. |
| 7 | 5,030 -- 7,770 | Stable, well-defined channel. | -Preserve existing oak woodland habitat.<br>-Re-grade and stabilize banks. |

* Centerline starts at 1,050 feet and proceeds upstream

Source: PWA, 2007g.

**Minor Tributaries and Drainage.** Implementation of the proposed RMDP would involve the placement of one new culverted road crossing in Ayers Canyon, a minor drainage on the south side of the River. Approximately 39,101 linear feet of drainage would be converted to buried storm drain within the several minor tributaries.

In addition to the drainages identified above, the RMDP proposes that several other drainages on the Newhall Ranch Specific Plan site be graded to accommodate pads for residential and commercial buildings and that the drainage flows be conveyed by buried storm drains varying in diameter from 30 to 144 inches. Drainages to be converted in their entirety to underground storm drains include two drainages in Homestead Canyon, two within Off-Haul Canyon, and one in Mid-Martinez Canyon. Portions of an additional 15 drainages are proposed to be converted to underground storm drains, including one in Humble Canyon, three in Lion Canyon, two in Exxon Canyon, one in Unnamed Canyon B, one in Unnamed Canyon C, two in Dead-End Canyon, one in Unnamed Canyon D, one in Middle Canyon, one in Magic Mountain Canyon, one in Unnamed Canyon 1 and one in Unnamed Canyon 2. The proposed

RMDP components are described and illustrated in **Section 3.0**, Description of Alternatives, Modified, Converted, and Preserved Tributary Drainages.

#### 4.2.5.3.1 Direct Impacts

**RMDP Direct Impacts**

**Santa Clara River -- Significance Criterion 1: Short-Term Impacts from Construction of Bridges, Bank Stabilization, and Turf Reinforcement Mats (Significant but Mitigable).** Installation of bank stabilization features and bridge piers and abutments would directly impact Santa Clara River geomorphology including alteration of the River in a way that would cause substantial erosion, resulting in significant impacts. The three bridges included in the proposed Project are the Long Canyon Road Bridge and Potrero Canyon Road Bridge. In addition, the Commerce Center Drive Bridge was previously permitted in 1998 under the Valencia Natural River Management Plan; however, it influences channel conditions downstream within the Specific Plan/RMDP reach of the Santa Clara River.

Bridges are proposed to be conventional concrete girders placed over concrete filled piers. Construction of this type of bridge usually involves the temporary disturbance of a 60-foot-wide corridor on each side of the bridge. Following completion of construction activities, the temporary impact zone would be restored to channel grade and revegetated with native riparian and upland species as appropriate. An alternative construction method would include the use of columns supported by poured in-place decking. The RMDP also proposes to widen three widened roadway decks that presently cross SR-126 to increase traffic flow along the highway. Widenings are proposed along SR-126 at Castaic Creek (six lanes expanded to eight), Chiquito Canyon (four lanes expanded to six), and San Martinez Grande Canyon (two lanes expanded to four). The temporary area of disturbance for the widening of roadway decks would be approximately 50 percent the area currently occupied by the existing roadways.

Construction of bank stabilization and turf reinforcement mats would require grading of river embankments and excavation of terrace areas along the edge of the riverbed. Typically, the bank lining must be buried to a depth equal to the height of the lining to resist scouring. Burying the toe of the lining requires temporary excavation and backfilling. A temporary construction zone width of 85 feet is required during construction of the bank protection. Following completion of construction activities, the temporary impact zone would be restored to channel grade and revegetated with native riparian and upland species as appropriate.

Excavation depths required for bank protection would be below the river bottom; groundwater would be frequently encountered and would need to be removed during the construction period. The dewatering activity would place shallow wells close to the excavation, drawing down the groundwater in the construction zone. Typically, soil composition within the dry streambed is such that the discharged dewatering flows would percolate quickly back into the ground from which they came. However, in some instances, the amount of discharged water may create sufficient flow during dewatering operations to form a continuous wetted channel from the work site to the Santa Clara River or a tributary.

To protect water quality in flows back to the Santa Clara River or a tributary, the water generated would be treated in conformance with RWQCB conditions. The dewatering discharge would be conveyed

through an engineered system designed to remove particulates, such as a weir tank, which allows sediment to settle out of suspension before the water is discharged. To minimize impacts to receiving waters from the dewatering discharge, each groundwater well would be connected either to a larger manifold or individually piped to a specific discharge point. Each discharge point would consist of a weir tank and energy dissipater. Discharged water would be allowed to "sheet-flow" from energy dissipaters soaking into the dry soils, or the discharge would be routed through a sprinkler field and sprayed over a large upland area adjacent to the river/streambed with the intent to percolate the entire discharge. Compliance with effluent limitations pursuant to NPDES requirements will include use of BMPs to minimize erosion of the streambed.

Construction of the RMDP components would be subject to CWA section 402(p), which regulates construction, municipal, and industrial stormwater discharges under the NPDES program. The Project proposes to implement a regional stormwater mitigation plan (**Appendix 4.4**, Geosyntec, 2008) to comply with NPDES permit requirements. Pursuant to NPDES regulations for permitting of stormwater discharges, SWRCB has issued a statewide general Permit and Waste Discharge Requirements for stormwater discharges from construction sites. Under this Construction General Permit, discharges of stormwater from construction sites with a disturbed area of one or more acres are required to either obtain individual NPDES permits for stormwater discharges or be covered by the Construction General Permit. Coverage under the Construction General Permit is accomplished by completing and filing a Notice of Intent with SWRCB and implementing a Stormwater Pollution Prevention Plan (SWPPP). This plan requires the implementation of BMPs to reduce or eliminate pollutants in stormwater discharges.

Absent mitigation, there would be significant short-term sedimentation impacts during construction with respect to Significance Criterion 1. However, the previously incorporated Specific Plan Mitigation Measures SP-4.2-2 (acquire state and federal permits), SP-4.2-3 (CDFG streambed agreements), SP-4.2-5 (DPW plan and map approvals), and SP-4.2-7 (DPW SUSMP and SWPPP requirements) would ensure that regulatory requirements are implemented and short-term impacts related to construction of RMDP components are less than significant through proper application of sediment controls and other BMPs required by existing local, state, and federal regulations.

**Santa Clara River -- Significance Criterion 2: Erosion and Downstream Deposition (Significant but Mitigable).** Implementation of the RMDP improvements and facilities, which are subject to the Corps and CDFG permitting requirements (particularly site clearing and grading operations), would have the potential to increase sediment flows downstream during storm events, which may result in substantial erosion and deposition and could result in significant impacts downstream.

As discussed in **Subsection 4.2.5.1**, Impact Assessment Methods, a representative velocity of 4.0 fps was determined to be the appropriate indicator for potential erosion. Direct impacts associated with erosion could result if the RMDP improvements resulted in an increase of the two- to 100-year and capital flood floodplain area subject to velocities greater than four fps. **Table 4.2-11** includes the change in the total area of floodplain, delineated by vegetation type, where velocities exceed four fps for each return interval of the proposed Project from existing conditions.

**Table 4.2-11**
**Change in Vegetation Area Susceptible to Scour Where Velocity > 4 fps**
**Alternative 2 -- Santa Clara River**

| Vegetation Type | Change in Area (Acres) | | | | | | |
|---|---|---|---|---|---|---|---|
| | 2-Year | 5-Year | 10-Year | 20-Year | 50-Year | 100-Year | CAP |
| Agriculture | 0.0 | -0.1 | 0.1 | -4.7 | -71.4 | -111 | -159.4 |
| Alluvial Scrub | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Arroweed Scrub | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -0.1 | 0.4 |
| Big Sagebrush Scrub | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| California Annual Grassland | 0.0 | 0.0 | 0.0 | 0.0 | 0.3 | 0.0 | -0.1 |
| Undifferentiated Chaparral | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| California Sagebrush | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -0.1 |
| California Sagebrush-California Buckwheat | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| California Sagebrush-Undifferentiated Chaparral | 0.0 | 0.0 | 0.0 | -0.1 | 0.0 | 0.0 | -0.1 |
| California Sagebrush-Purple Sage | 0.0 | 0.0 | 0.0 | 0.1 | 0.0 | 0.1 | 0.1 |
| Cottonwood Willow Riparian Forest | -0.3 | 0.1 | -0.1 | -0.7 | 0.5 | -2.3 | -1.3 |
| Burned California Sagebrush | 0.0 | 0.0 | 0.0 | 0.0 | -0.1 | 0.0 | 0.0 |
| Disturbed Cottonwood Willow Riparian Forest | 0.1 | 0.0 | 0.0 | 0.0 | 0.1 | 0.0 | 0.0 |
| Developed | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Disturbed Land | 0.0 | 0.1 | 0.1 | -0.3 | -3.7 | -8.7 | 0.0 |
| Disturbed Riparian Scrub | 0.0 | 0.1 | 0.0 | -0.1 | -0.2 | 0.0 | -15.9 |
| Disturbed Southern Willow Scrub | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Giant Reed | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 0.0 | 0.0 |
| Herbaceous Wetlands | -0.7 | 0.1 | -7.0 | -6.5 | -0.8 | -1.1 | 0.2 |
| Live Oak Woodland | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Mulefat Scrub | 0.0 | 0.0 | 0.0 | -0.4 | -0.6 | -2.5 | -4.6 |
| Open Channel | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Southern Coast Live Oak Riparian Forest | -0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Ornamental | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| River Wash | -0.1 | 0.2 | 0.3 | 0.5 | 1.0 | -1.2 | -1.0 |
| Southern Willow Scrub | 0.0 | 0.0 | -0.3 | -0.1 | -1.3 | -1.7 | 0.2 |
| Tamarisk Scrub | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 |
| Valley Oak Woodland | 0.0 | 0.1 | 0.1 | 0.1 | 0.1 | 0.0 | 0.0 |
| **Total Change** | **-1.1** | **+0.6** | **-6.8** | **-12.2** | **-76.0** | **-129.0** | **-181.7** |

Source: PACE, 2008A.

The total floodplain area subject to potentially erosive velocities would be decreased as a result of the proposed Project for all return intervals with the exception of the 5-year return period. However, the additional 0.6 acres subject to velocities greater than four fps during the 5-year return interval is not considered to be significant relative to the substantial decrease in area subject to erosive velocities during

two-, 10-, 20-, 50-, 100-year, and capital flood events as a result of the RMDP components. In some areas, velocities greater than four fps correspond with outlet structures, access ramps, or bridge abutments, which could result in a significant localized erosion impact. (PACE, 2008A.) In addition, the pier footings associated with the nature viewing platforms and associated walkways also could result in localized scour impacts. Localized scour impacts from viewing platform footings would be reduced to a less-than-significant level by implementing mitigation measure BIO-73, which provides location requirements for the viewing platforms.

Where necessary to minimize erosion and structural damage, structures such as grouted riprap or reinforced concrete would be used according to the standards, criteria, and specifications developed by the DPW. (Mitigation Measure GRR-3) No changes to velocity would be realized upstream or downstream of the Project area.

The proposed Project would result in a pattern of localized variations in scour and sedimentation that reflect previously described changes in flow velocity. The precise location and extent of material removal and deposition would shift with the installation of the various Project components, much as it does in the existing condition over time. The overall pattern would remain fundamentally unchanged. The modeling results indicate that there would be no significant changes in local patterns of sediment deposition and erosion. In some areas, velocities greater than four fps correspond with outlet structures, access ramps, or bridge abutments, which could result in a significant localized erosion impact. **Appendix 4.1**, Newhall Ranch Resource Management & Development Plan: River & Tributaries Drainage Analysis, Santa Clara River (PACE, 2008A), identifies locations of potential erosion within Santa Clara River riparian areas. To minimize erosion and structural damage to such structures, erosion resistant materials such as concrete, soil cement or secured rip-rap would be used according to the standards, criteria, and specifications developed by the DPW to ensure long-term stability (Mitigation Measure GRR-3). The specific improvements for each drainage area would be designed as part of the final drainage plans prepared to DPW standards during the subdivision process. (Mitigation Measures SP-4.2-5 [DPW plan and map approvals] and SP-4.2-6 [DPW-approved permanent erosion control measures].) Incorporation and implementation of proper design, regulatory compliance, facility maintenance, and specified mitigation measures will reduce the impact of erosion and/or downstream deposition to a less-than-significant level in relation to Significance Criterion 2.

**Santa Clara River - Significance Criterion 3: Impacts to Geomorphic Function (Less than Significant).** The proposed RMDP infrastructure would have limited and localized hydromodification impacts to the Santa Clara River. Under moderate storm runoff events, localized increases in flow quantity and velocity would be present at drainage outlet facilities along the banks of the Santa Clara River. These events, however, are of short duration (temporary) and limited in comparison to periodic channel disturbances caused by Santa Clara River flows from upstream as described by Balance Hydrologics (2005).

**Table 4.2-12** provides the general hydrologic characteristics of the River channel for the two-, five-, 10-, 20-, 50-, and 100-year events, both with and without the proposed Project. Included in these characteristics are: maximum river flow depth measured in feet, average flow velocity measured in fps, friction slope (a measure of flow erodibility), flow area measured in square feet (sf), channel top width

measured in feet, and total shear (a measure of friction caused by the weight of water on the River bottom, and an indicator of scour/erosion potential) measured in pounds per square foot.

**Table 4.2-12**
**Summary of Average Channel Hydraulic Parameters**
**Existing vs. Alternative 2 -- Santa Clara River**

| Condition | Return Interval (years) | Max. Flow Depth (ft) | Average Velocity (fps) | Friction Slope -- | Flow Area (sq. ft.) | Top Width (ft) | Total Shear (psf) |
|---|---|---|---|---|---|---|---|
| Existing | 2 | 3.34 | 4.46 | 0.0053 | 774.2 | 404.2 | 0.72 |
| Existing | 5 | 5.11 | 5.82 | 0.0053 | 1585.2 | 520.3 | 1.16 |
| Existing | 10 | 6.50 | 6.65 | 0.0052 | 2423.6 | 614.0 | 1.48 |
| Existing | 20 | 7.99 | 6.89 | 0.0052 | 3658.7 | 887.0 | 1.60 |
| Existing | 50 | 9.84 | 7.48 | 0.0051 | 5581.5 | 1131.1 | 1.85 |
| Existing | 100 | 11.27 | 8.00 | 0.0051 | 7283.6 | 1236.1 | 2.13 |
| Project | 2 | 3.29 | 4.5 | 0.0053 | 774.1 | 403.9 | 0.72 |
| Project | 5 | 5.1 | 5.81 | 0.0053 | 1574.8 | 520.0 | 1.14 |
| Project | 10 | 6.46 | 6.65 | 0.0052 | 2414.1 | 610.2 | 1.47 |
| Project | 20 | 7.95 | 7.11 | 0.0052 | 3581.5 | 799.3 | 1.68 |
| Project | 50 | 10.18 | 7.4 | 0.0051 | 5668.2 | 985.2 | 2.09 |
| Project | 100 | 11.87 | 7.8 | 0.0051 | 7489.4 | 1093.4 | 2.43 |

Source: PACE, 2008A.

As shown, with the proposed Project most of these characteristics increase in magnitude with an increase in storm intensity (return interval). Relative to existing conditions, the proposed Project results in an increase in the maximum flow depth of less than one foot during the 50- and 100-year storm events. During the 20-year return interval, the proposed Project would result in a minor increase in average velocity, with no change or a decrease in velocities for the two-, five-, 10-, 50-, and 100-year events. Average friction slopes remain unchanged as a result of the proposed Project. The proposed Project would generally result in a decrease in the top width due primarily to channel constrictions at bridge crossings. Lastly, the total shear (an indicator of erosion potential) decreases during each event other than the 20-, 50-, and 100-year events. The estimated change in hydraulic characteristics of the River channel under the proposed RMDP would not result in a substantial change from existing conditions. For the high frequency floods (two- and five-year), the proposed floodplain modifications would not increase erosion potential (as indicated by shear stress), hinder flows, or reduce the floodplain area. Instead, these flows would spread across the River channel, unaffected by the bank protection because the River would have sufficient width to allow these flows to meander and spread out as under pre-Project conditions. During more infrequent floods (*e.g.*, 10-, 20-, 50, and 100-year storm events), river flows would be impacted by proposed improvements as wide as the buried soil cement. This would limit the area of the floodplain during these infrequent flood events, causing inundation over a smaller area because the bank protection would be developed under the Newhall Ranch Specific Plan for various land uses, including residential,

commercial, industrial, and parks. Due to the low frequency and duration of the lower frequency events, the potential effects to geomorphic function in the Santa Clara River are not considered to be significant.

As described in **Section 4.6**, Jurisdictional Waters and Streams, a HARC analysis was performed to evaluate the extent to which wetland or riparian reaches perform various physical, chemical, and biological functions. Several of the results of this analysis can be used to assess the impacts to geomorphic function within the Santa Clara River. The five hydrology metrics used in the HARC also can be used to assess the impacts to the geomorphic function of the River (see **Subsection 4.2.5.1**, Impact Assessment Methods). Specifically, **Table 4.2-13** compares the sum of the hydrology metrics for the Santa Clara River in the existing and proposed conditions. Also included in **Table 4.2-13** is a comparison of the total hydrology AW-score units and the total HARC AW-score units calculated for the Santa Clara River.

**Table 4.2-13**
**Summary of Hydrology Metric and Total HARC AW-Scores -- Santa Clara River**

| Condition | Source | Hydro-Period | Floodplain Connection | Surface Water Persistence | Flood Prone Area | Total Hydrology AW Units | Total HARC AW Units |
|---|---|---|---|---|---|---|---|
| Existing | 0.76 | 0.74 | 1.00 | 0.83 | 1.00 | 657.65 | 579.52 |
| Proposed | 0.66 | 0.74 | 0.98 | 0.82 | 0.90 | 654.95 | 622.37 |
| **Total Change** | **-0.10** | **0.0** | **-0.02** | **-0.01** | **-0.10** | **-2.70** | **+42.85** |

Source: URS, 2008

The HARC hydrology analysis, included in **Appendix 4.6**, indicates that the proposed Project would result in only minor changes to the geomorphic function of the Santa Clara River with small decreases in the source water and floodplain connection metrics. In total, the proposed Project would result in a net loss of 2.70 hydrology AW-score units but would increase the total HARC AW-score units by 42.85. The overall increase in HARC AW-score units is primarily attributed to the benefits provided by the proposed Project to riparian habitat as discussed in **Section 4.6**, Jurisdictional Waters and Streams. In general, the HARC analysis supports the conclusion that the relatively minor impacts to the hydrologic processes of the Santa Clara River do not have an overall negative effect on the geomorphic function of the River (*e.g.*, ability to support riparian habitat).

The estimated change in hydraulic characteristics under the proposed RMDP would be minor. Given the low frequency and duration of such conditions, the potential impacts to geomorphic function in the Santa Clara River under Significance Criterion 3 are considered less than significant.

**Santa Clara River - Significance Criterion 4: Construction and Scour Impacts to Riparian Vegetation (Less than Significant).** Most of the areas along the River corridor within the Project site consist of agricultural fields, and to a lesser extent, disturbed and upland habitat areas with limited riparian habitat. (PACE, 2008A.) The proposed Project includes the construction of 29,779 lf of soil cement, which is necessary to protect the Specific Plan's residential and commercial development, and the

Potrero Creek and Long Canyon Road Bridges as well as the already permitted Commerce Center Drive Bridge. In addition, approximately 4,600 linear feet of turf-reinforced mats would be installed on the north side of the River along the utility corridor between Chiquito Canyon and San Martinez Grande Canyon drainages, south of SR-126. The analysis of the impacts of installing bank protection, bridge piers and abutments, and erosion protection to vegetation along the Santa Clara River are primarily related to the proposed Project's hydrologic and hydraulic impacts on the Santa Clara River, as detailed below. The final design of the bridge abutments may vary from the current post-project model. Although these changes may affect the localized conditions (*i.e.*, local velocity and water depth), the overall hydraulic trends and sediment transport through the Project reach should remain unchanged from what is currently represented in the modeling results. The final Project design would be modeled to verify the predicted hydraulic trends and sediment transport regime.

**Impacts on Velocity.** An increase in flow velocities in the River would result in significant impacts to riparian vegetation if the increase causes: (1) widespread and chronic scouring (*i.e.*, increase in the frequency and magnitude of scouring from existing conditions) of the channel bed that removes a significant amount of aquatic wetland and riparian habitats from the River channel; and/or (2) substantial modification of the relative amounts of these different habitats in the River, essentially altering the quality of the riverine environment.

As discussed in **Subsection 4.2.5.1**, Impact Assessment Methods, a representative velocity of four fps was determined to be the appropriate indicator for potential erosion. **Table 4.2-11**, presented above, includes the change in the total area of floodplain, delineated by vegetation type, where velocities exceed four fps for each return interval of the proposed Project from existing conditions.

The total floodplain area subject to potentially erosive velocities would be decreased as a result of the proposed Project for all return intervals with the exception of the five-year and 20-year return period. However, an additional 1.2 and 0.8 acres subject to velocities greater than four fps during the five-year and 20-year return interval is not considered to be significant relative to the substantial decrease in area subject to erosive velocities during two-, 10-, 50-, 100-year, and capital flood events as a result of the RMDP components. In addition, no impacts to velocity would be realized upstream or downstream of the Project area. (PACE, 2008A.) The impacts relating to habitat removal and disturbance as a result of changes to River velocity are presented in **Section 4.5**, Biological Resources, of this EIS/EIR.

Based on these results, the bank stabilization, bridges, and turf-reinforced mats would not cause significant scouring, and, therefore, would not alter the amount and pattern of riparian habitats along the River within the Project area. The current pattern of scouring due to high velocities would remain intact and the proposed Project would not substantially alter the frequency and magnitude of scouring of riparian vegetation. Based on this information, the impacts expected to occur due to changes in velocity under Significance Criterion 4 would be less than significant.

**Impacts on Water Depth.** An increase in water depth in the River could result in significant impacts to riparian habitat if the additional water depth causes greater "shear forces" (*i.e.*, friction caused by the weight of water) on the River bottom, and thereby increasing scouring of the channel bed and removal of vegetation. This effect could reduce the extent of aquatic, wetland, and riparian habitats in the River.

**Table 4.2-12** provides the general hydrologic characteristics of the River channel for the two-, five-, 10-, 20-, 50-, and 100-year events, both with and without the proposed Project. The results of the hydraulic analysis indicate that water depths and, correspondingly, total shear in the River would not increase significantly due to the proposed Project. Based on PACE HEC-RAS and HEC-RMS modeling of the 100-year storm event, Project-related infrastructure would result in 52 locations of increased water surface elevation exceeding one foot, and no decreased water surface elevation locations in the River. No impacts to water surface elevation would be realized upstream or downstream of the Project site. (PACE, 2007.) The additional riparian vegetation area subject to inundation would not be changed during the two-year flood event, but would be reduced by approximately 0.3, 2.6, 80.2. 131.5, 137.1, and 225.1 acres as a result of the proposed Project during the five-, 10-, 20-, 50-, 100-year, and capital flood (discharge resulting from a hypothetical four-day storm with a 50-year return period falling on a saturated watershed with debris from a wildfire) events, respectively (PACE, 2008A). **Figures 4.2-9** and **4.2-10** show the area of inundation and velocity distribution for the 10- and 100-year flow events for both existing conditions and the proposed Project (Alternative 2). As shown in these figures, the decrease in inundated area (by percentage and acreage) would primarily affect areas of currently disturbed, agricultural land. Accordingly, impacts to riparian habitat would be limited such that water flow depths, velocities, and total shear for all return events would not be significantly different in riparian habitat between existing and proposed conditions in the Project area. Since there will not be a significant change in flow depths or total shear in existing riparian habitat, the impacts to the amount and pattern of aquatic, wetland, and riparian habitats in the River under Significance Criterion 4 are considered less than significant.

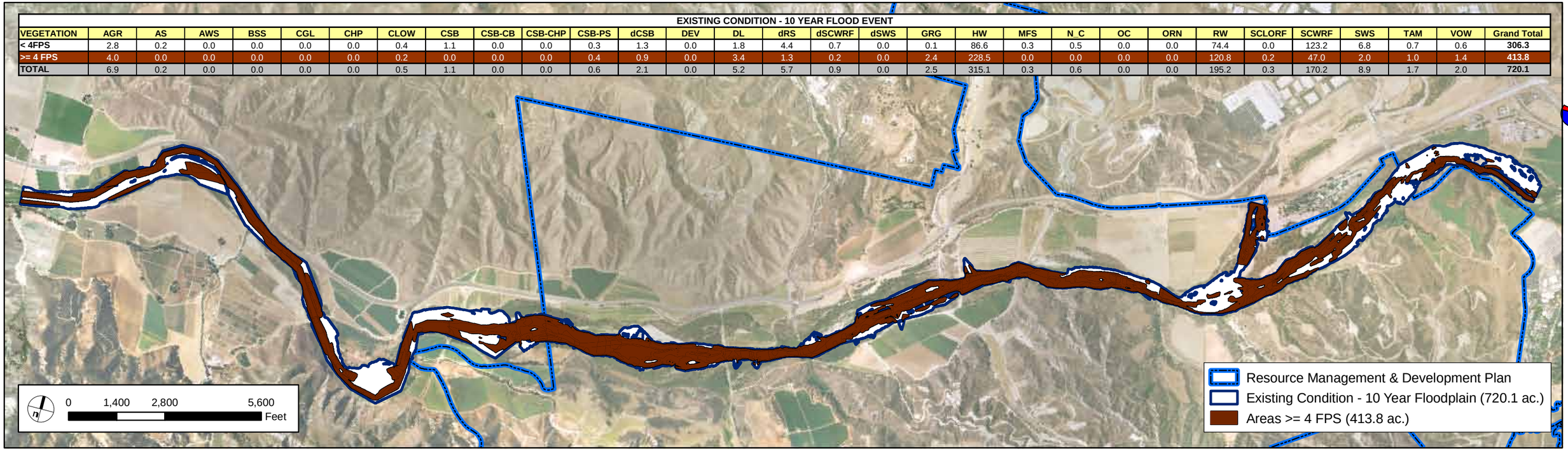
**Impacts of Modification.** The proposed reinforced concrete and riprap bridge abutments, in addition to the soil cement, would encroach into the existing 100-year floodplain in some areas. Encroachment impacts can be analyzed on the basis of depth and velocity as described below. Additionally, some banks located out of the 100-year floodplain need stabilization because of lateral migration of the riverbed outside of the prescribed limits, as well as the need to protect for the capital flood discharge. Riparian habitat may be located within and/or along these outermost banks. Long-term impacts would have the potential to occur because soil cement used to stabilize the River's banks places a permanent feature in the existing floodplain.

In other areas, the soil cement would be placed outside the existing River channel, creating additional River channel and riparian habitats. For example, soil cement buried bank stabilization proposed on the north side of the River near the confluence with Castaic River would be constructed on agricultural land, north of the existing channel. The land located between the existing river bank and the newly created stabilized bank would be excavated to widen the existing channel, which would increase the area available within the channel and increase the capacity of the River to convey flood flows.

The potential impacts from RMDP improvements to Santa Clara River riparian vegetation are anticipated to be small and localized along the River floodplain. In addition, the frequency and duration of river flow conditions is considered to be episodic. Areas excavated to widen the existing channel would be subject to an increase in frequency and duration of river flows from current conditions. However, additional riparian habitat would be created in these areas that would be subject to the same flow regime as the

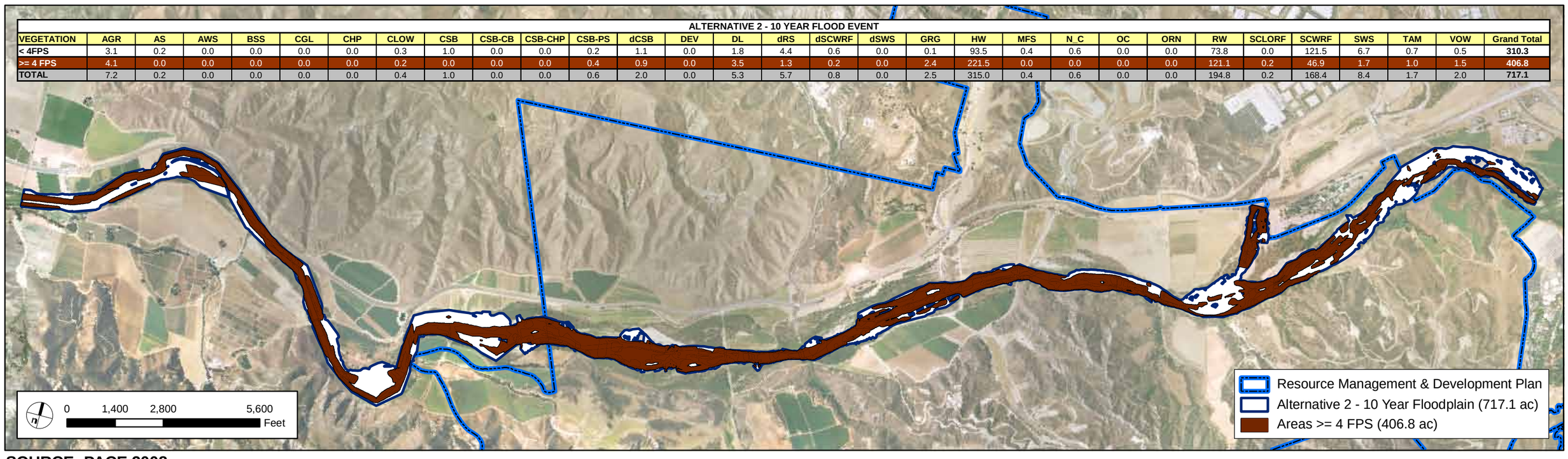
**EXISTING CONDITION - 10 YEAR FLOOD EVENT**

| VEGETATION | AGR | AS | AWS | BSS | CGL | CHP | CLOW | CSB | CSB-CB | CSB-CHP | CSB-PS | dCSB | DEV | DL | dRS | dSCWRF | dSWS | GRG | HW | MFS | N_C | OC | ORN | RW | SCLORF | SCWRF | SWS | TAM | VOW | Grand Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| < 4FPS | 2.8 | 0.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.4 | 1.1 | 0.0 | 0.0 | 0.3 | 1.3 | 0.0 | 1.8 | 4.4 | 0.7 | 0.0 | 0.1 | 86.6 | 0.3 | 0.5 | 0.0 | 0.0 | 74.4 | 0.0 | 123.2 | 6.8 | 0.7 | 0.6 | **306.3** |
| >= 4 FPS | 4.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.2 | 0.0 | 0.0 | 0.0 | 0.4 | 0.9 | 0.0 | 3.4 | 1.3 | 0.2 | 0.0 | 2.4 | 228.5 | 0.0 | 0.0 | 0.0 | 0.0 | 120.8 | 0.2 | 47.0 | 2.0 | 1.0 | 1.4 | **413.8** |
| TOTAL | 6.9 | 0.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.5 | 1.1 | 0.0 | 0.0 | 0.6 | 2.1 | 0.0 | 5.2 | 5.7 | 0.9 | 0.0 | 2.5 | 315.1 | 0.3 | 0.6 | 0.0 | 0.0 | 195.2 | 0.3 | 170.2 | 8.9 | 1.7 | 2.0 | **720.1** |




**ALTERNATIVE 2 - 10 YEAR FLOOD EVENT**

| VEGETATION | AGR | AS | AWS | BSS | CGL | CHP | CLOW | CSB | CSB-CB | CSB-CHP | CSB-PS | dCSB | DEV | DL | dRS | dSCWRF | dSWS | GRG | HW | MFS | N_C | OC | ORN | RW | SCLORF | SCWRF | SWS | TAM | VOW | Grand Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| < 4FPS | 3.1 | 0.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.3 | 1.0 | 0.0 | 0.0 | 0.2 | 1.1 | 0.0 | 1.8 | 4.4 | 0.6 | 0.0 | 0.1 | 93.5 | 0.4 | 0.6 | 0.0 | 0.0 | 73.8 | 0.0 | 121.5 | 6.7 | 0.7 | 0.5 | **310.3** |
| >= 4 FPS | 4.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.2 | 0.0 | 0.0 | 0.0 | 0.4 | 0.9 | 0.0 | 3.5 | 1.3 | 0.2 | 0.0 | 2.4 | 221.5 | 0.0 | 0.0 | 0.0 | 0.0 | 121.1 | 0.2 | 46.9 | 1.7 | 1.0 | 1.5 | **406.8** |
| TOTAL | 7.2 | 0.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.4 | 1.0 | 0.0 | 0.0 | 0.6 | 2.0 | 0.0 | 5.3 | 5.7 | 0.8 | 0.0 | 2.5 | 315.0 | 0.4 | 0.6 | 0.0 | 0.0 | 194.8 | 0.2 | 168.4 | 8.4 | 1.7 | 2.0 | **717.1** |




**SOURCE: PACE 2008**

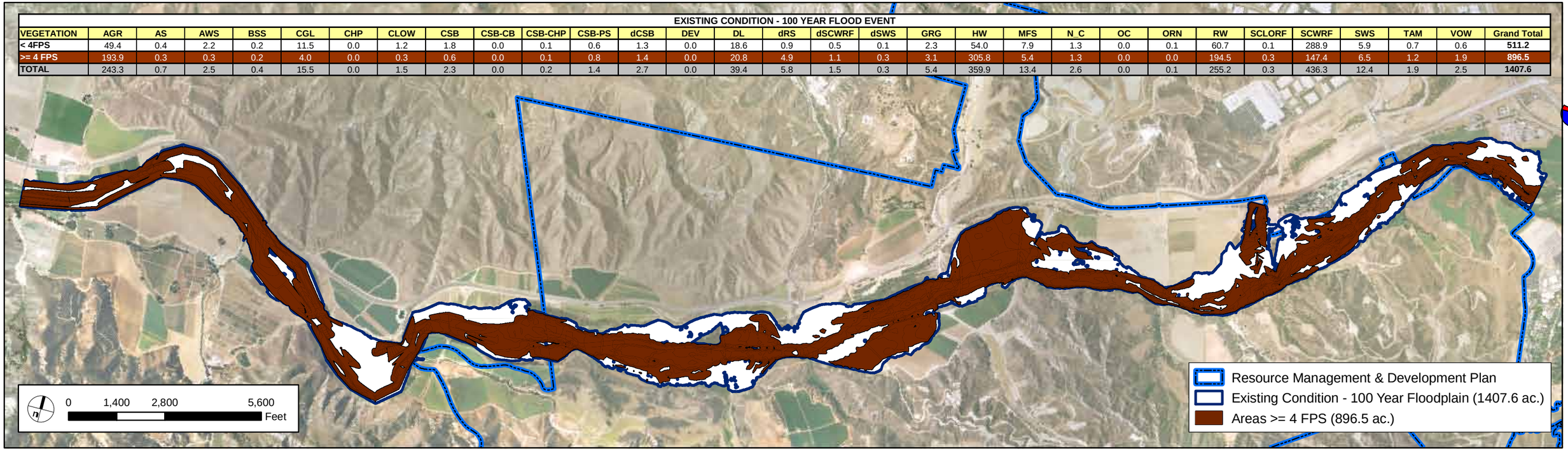
FIGURE 4.2-9

EXISTING CONDITION AND ALTERNATIVE 2
10-YEAR FLOOD INUNDATION AND VELOCITY DISTRIBUTION - SANTA CLARA RIVER

P:\8238E\GIS\mxds\EIR_2008\Section4_2\8238E_FIGURE-4-2-9_RiparianScourVelocityAnalysisAlt2_10Yr_082108.mxd

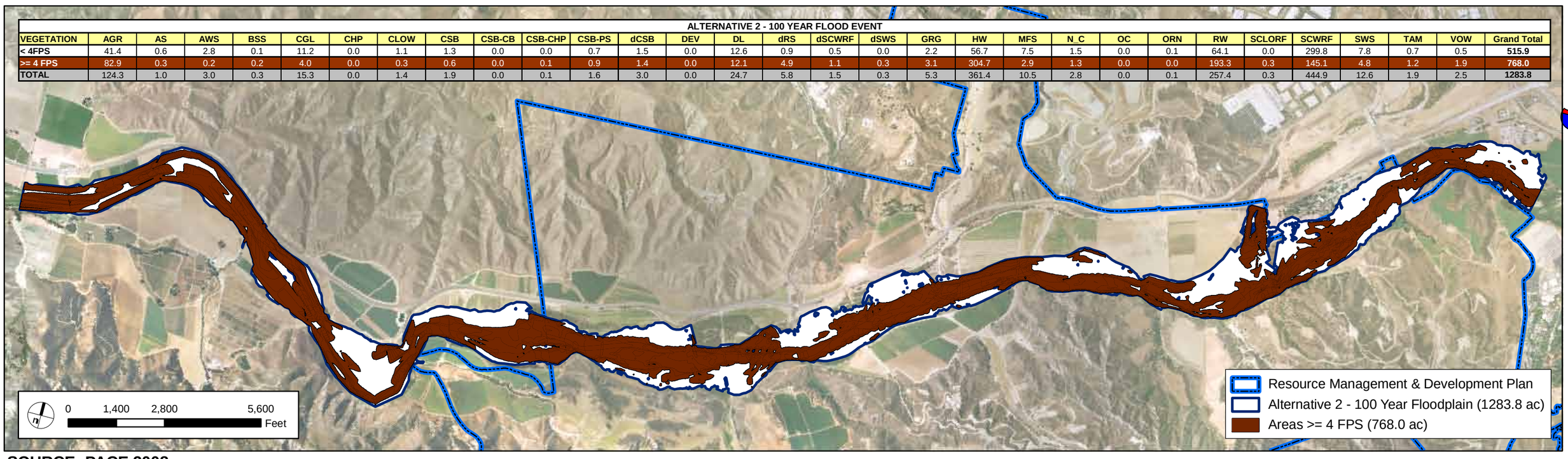
**EXISTING CONDITION - 100 YEAR FLOOD EVENT**

| VEGETATION | AGR | AS | AWS | BSS | CGL | CHP | CLOW | CSB | CSB-CB | CSB-CHP | CSB-PS | dCSB | DEV | DL | dRS | dSCWRF | dSWS | GRG | HW | MFS | N_C | OC | ORN | RW | SCLORF | SCWRF | SWS | TAM | VOW | Grand Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| < 4FPS | 49.4 | 0.4 | 2.2 | 0.2 | 11.5 | 0.0 | 1.2 | 1.8 | 0.0 | 0.1 | 0.6 | 1.3 | 0.0 | 18.6 | 0.9 | 0.5 | 0.1 | 2.3 | 54.0 | 7.9 | 1.3 | 0.0 | 0.1 | 60.7 | 0.1 | 288.9 | 5.9 | 0.7 | 0.6 | **511.2** |
| >= 4 FPS | 193.9 | 0.3 | 0.3 | 0.2 | 4.0 | 0.0 | 0.3 | 0.6 | 0.0 | 0.1 | 0.8 | 1.4 | 0.0 | 20.8 | 4.9 | 1.1 | 0.3 | 3.1 | 305.8 | 5.4 | 1.3 | 0.0 | 0.0 | 194.5 | 0.3 | 147.4 | 6.5 | 1.2 | 1.9 | **896.5** |
| TOTAL | 243.3 | 0.7 | 2.5 | 0.4 | 15.5 | 0.0 | 1.5 | 2.3 | 0.0 | 0.2 | 1.4 | 2.7 | 0.0 | 39.4 | 5.8 | 1.5 | 0.3 | 5.4 | 359.9 | 13.4 | 2.6 | 0.0 | 0.1 | 255.2 | 0.3 | 436.3 | 12.4 | 1.9 | 2.5 | **1407.6** |




**ALTERNATIVE 2 - 100 YEAR FLOOD EVENT**

| VEGETATION | AGR | AS | AWS | BSS | CGL | CHP | CLOW | CSB | CSB-CB | CSB-CHP | CSB-PS | dCSB | DEV | DL | dRS | dSCWRF | dSWS | GRG | HW | MFS | N_C | OC | ORN | RW | SCLORF | SCWRF | SWS | TAM | VOW | Grand Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| < 4FPS | 41.4 | 0.6 | 2.8 | 0.1 | 11.2 | 0.0 | 1.1 | 1.3 | 0.0 | 0.0 | 0.7 | 1.5 | 0.0 | 12.6 | 0.9 | 0.5 | 0.0 | 2.2 | 56.7 | 7.5 | 1.5 | 0.0 | 0.1 | 64.1 | 0.0 | 299.8 | 7.8 | 0.7 | 0.5 | **515.9** |
| >= 4 FPS | 82.9 | 0.3 | 0.2 | 0.2 | 4.0 | 0.0 | 0.3 | 0.6 | 0.0 | 0.1 | 0.9 | 1.4 | 0.0 | 12.1 | 4.9 | 1.1 | 0.3 | 3.1 | 304.7 | 2.9 | 1.3 | 0.0 | 0.0 | 193.3 | 0.3 | 145.1 | 4.8 | 1.2 | 1.9 | **768.0** |
| TOTAL | 124.3 | 1.0 | 3.0 | 0.3 | 15.3 | 0.0 | 1.4 | 1.9 | 0.0 | 0.1 | 1.6 | 3.0 | 0.0 | 24.7 | 5.8 | 1.5 | 0.3 | 5.3 | 361.4 | 10.5 | 2.8 | 0.0 | 0.1 | 257.4 | 0.3 | 444.9 | 12.6 | 1.9 | 2.5 | **1283.8** |




**SOURCE: PACE 2008**

FIGURE 4.2-10

EXISTING CONDITION AND ALTERNATIVE 2
100-YEAR FLOOD INUNDATION AND VELOCITY DISTRIBUTION - SANTA CLARA RIVER

P:\8238E\GIS\mxds\EIR_2008\Section4_2\8238E_FIGURE-4-2-10_RiparianScourVelocityAnalysisAlt2_100Yr_082108.mxd

existing channel banks. The River, floodplain, and riparian resources have been subjected to episodic disturbances under natural conditions and only minor changes in overall planform geomorphology occur as described above. As such, impacts of the RMDP to riparian vegetation along the Santa Clara River under Significance Criterion 4 are considered less than significant.

**Tributaries -- Significance Criterion 1: Short-Term Impacts from Construction of Bridges, Bank Stabilization, Grade Stabilizer Structures, and Buried Storm Drains (Significant but Mitigable).** Installation of buried storm drain, bank stabilization, grade stabilizer structures, and bridge piers and abutments would directly affect elements of tributary geomorphology, which would be a significant impact. There are 15 culverted road crossings, 55,770 lf of modified drainage, 59,845 lf of storm drain, and 75,429 lf of bank stabilization proposed in the tributaries within the Project area. There would be 126,434 lf of tributary drainage preserved under Alternative 2, primarily in Salt Canyon.

The RMDP also proposes to widen three roadway crossings that presently cross SR-126 to increase traffic capacity along the highway. Widened roadway decks are proposed along SR-126 at Castaic Creek (six lanes expanded to eight), Chiquito Canyon (four lanes expanded to six), and San Martinez Grande Canyon (four lanes expanded to six). The temporary area of disturbance for the road widenings would be approximately 50 percent the area currently occupied by the roadway decks.

Construction of bank stabilization, grade stabilizer structures, and buried storm drains would require grading of drainage embankments and excavation of the tributary channel. Typically, the bank lining must be buried to a depth equal to the height of the lining to resist scouring. Burying the toe of the lining requires temporary excavation and backfilling. A temporary construction zone width of 85 feet is required during construction of the bank protection. Following completion of construction activities, the temporary impact zone would be restored to channel grade and revegetated with native riparian and upland species as appropriate. The buried soil cement would not be visible, and the land above it would be used for an upland habitat buffer. For the construction of buried storm drains, the existing tributary channel will be removed during grading activity. Surface runoff will be directed to the new buried storm drains for stormwater conveyance.

Excavation depths required for bank protection would be below the channel bottom; groundwater would be frequently encountered and would need to be removed during the construction period. The dewatering activity would place shallow wells close to the excavation, drawing down the groundwater in the construction zone. Typically, soil composition within the dry streambed is such that the discharged dewatering flows would percolate quickly back into the ground from which they came. However, in some instances, the amount of discharged water may create sufficient flow during dewatering operations to form a continuous wetted channel from the work site to the tributary. It may also be necessary to prevent encountering surface water flows during these construction activities through the design and implementation of a surface water diversion plan.

As discussed previously for the Santa Clara River, to protect water quality, the generated water would be treated in conformance with RWQCB conditions. The dewatering discharge would be conveyed through an engineered system designed to remove particulates, such as a weir tank, which allows sediment to settle out of suspension before the water is discharged. Discharged water would be allowed to "sheet-

flow" from energy dissipaters soaking into the dry soils, or the discharge would be routed through a sprinkler field and sprayed over a large upland area adjacent to the streambed with the intent to percolate the entire discharge. Compliance with effluent limitations pursuant to NPDES requirements will include use of BMPs to minimize erosion of the streambed.

Specifically, construction of the RMDP components will be subject to CWA section 402(p), which regulates construction, municipal, and industrial stormwater discharges under the NPDES program. The Project proposes to implement a Subregional Stormwater Mitigation Plan (**Appendix 4.4**, Geosyntec) to comply with NPDES permit requirements. The SWPPP would require the implementation of BMPs to reduce or eliminate pollutants in stormwater discharges. Absent mitigation, there would be significant short-term sedimentation impacts during construction with respect to Significance Criterion 1. However, Mitigation Measures SP-4.2-2 (acquire state and federal permits), SP-4.2-3 (CDFG streambed agreements), SP-4.2-5 (DPW plan and map approvals), and SP-4.2-7 (DPW SUSMP and SWPPP requirements) would ensure that regulatory requirements are implemented and short-term impacts related to construction of RMDP components are less than significant through proper application of sediment controls and other BMPs required by existing local, state, and federal regulations.

**Tributaries -- Significance Criterion 2: Erosion and Downstream Deposition (Significant but Mitigable).** Implementation of the proposed Project RMDP infrastructure, particularly site clearing and grading operations, would have the potential to increase sediment flows downstream during storm events. Long-term impacts associated with erosion and sediment deposition are evaluated as a function of geomorphic stability. The basis of design for the five major tributary drainages that would be modified (Chiquito, San Martinez Grande, Lion, Long, and Potrero) is such that the channels would be designed to be in geomorphic equilibrium in terms of channel stability, sediment transport, and flow conveyance under future conditions. The channel and floodplain would be designed to meet the following criteria:

- Geomorphic stability -- The channel would not aggrade with sediment or erode its banks or bed substantially. The bankfull[11] channel will be sized for the dominant[11] (channel forming) discharge. Sizing would be based on the proposed channel slope and the modeled post-development discharge conditions.

- Flood conveyance -- The floodplain would convey the capital flood (Qcap) (discharge resulting from a hypothetical four-day storm with a 50-year return period falling on a saturated watershed with debris from a wildfire) with a minimum of three feet of freeboard, and meet DPW standards for flood channels.

- Ecological function -- The channel and floodplain would support a combination of riparian habitat, coastal sage scrub, oak woodland, *etc.*, as appropriate (see **Section 4.5**, Biological Resources, of this

[11] The design approach assumes dominant discharge is equivalent to bankfull flow for purposes of channel design. Using continuous rainfall-runoff simulation for the Newhall Ranch watersheds, Geosyntec (2008) calculated the dominant discharge; this corresponded closely with the 2-year recurrence interval storm event.

EIS/EIR for details on riparian habitat types and locations). Grade stabilizer structures, culverts, and other hydraulic structures would be designed to accommodate wildlife requirements.

- Hydromodification -- The combined urban runoff management program, in conjunction with the channel design, would address potential "hydromodification" impacts resulting from development of the RMDP and SCP areas. The channel would not aggrade or generate excess sediment from erosion or create a larger than natural downstream impact from sedimentation associated with hydrograph modification.

- Low maintenance -- The channel and associated structures would require minimum maintenance. The channel and floodplain would not require sediment removal or vegetation clearance. Following construction, a monitoring and management plan would be implemented to evaluate compliance with the basis of design criteria to ensure that the engineered channels function as intended (see Mitigation Measure GRR-7).

The preliminary Project designs for each tributary are described in the following paragraphs.

**Chiquito Canyon.** The proposed Project design in Chiquito Canyon would significantly decrease the width of the floodplain in Chiquito Canyon, which would increase the velocity of flows, resulting in a significant effect prior to mitigation. In order to minimize impacts, the Project would be designed to reduce Project effects to the geomorphic stability (*i.e.*, erosion and deposition) within Chiquito Canyon. Specifically, where the channel is not degraded and less extensive development would take place in the watershed, grade control structures would be used to maintain the existing slope. The reengineered channel would be designed to meet the specified basis of design criteria using the following approach:

1. Develop existing condition floodplain and creek hydraulic characteristics using a hydraulic model such as HEC-RAS.
2. Minimize impacts to existing condition floodplain. As a result of reducing the development impacts to the floodplain, the amount of environmental and hydraulic impacts (*e.g.*, resulting in substantial erosion or sediment deposition) from the proposed development would be minimized.
3. Creek bank flood protection (soil cement, rip rap or other suitable method) would be located to provide for bank erosion protection and flood protection from the DPW Capital design flood event. In most cases, the bank protection would be buried with soil at a 3:1 slope over the hard bank protection. The soil backfill slope would vary from flatter to steeper and may be totally eliminated in some areas where necessary such as at structures, storm drain outlets or other pinch points.
4. Chiquito Canyon would not include a re-grading of the creek invert, although the Erosion Potential (EP) of the proposed condition would be validated during the final design phase. For Chiquito Canyon, the invert stabilization method would be as follows:
    a. Creek bed grade control structures at 200 to 400 foot spacing along the creek corridor would be included.

b. These grade control structures would designed to be located at points along the creek where proposed project grading impacts will already be disturbing the creek bed and banks.

c. The grade control structures would be constructed with soil cement, rip rap or other grade stabilization methods acceptable to DPW.

d. The grade control structures would be at grade or below the existing grade and invert of the creek bed.

e. The grade control structures would be designed to function as a drop structure in the event the creek bed slope flattens overtime.

5. Chiquito Canyon top and toe elevation would be established based upon DPW standards.

The overall design approach would allow the tributary to naturally fluctuate between the stabilized existing condition and estimated equilibrium slope while providing suitable erosion and flood protection for public safety. Based upon the proposed design and use of DPW standards for bank protection top and toe, Chiquito Canyon would meet the minimal required design objectives provided by DPW. As such, the geomorphic basis of design would inherently minimize erosion and deposition.

The channel confluence with the Santa Clara River would largely be controlled by the aggradation or degradation in the Santa Clara River, as well as episodic River hydraulic events in the form of backwater effects. The influence of the Santa Clara River on long-term bed stability at the creek channel outlet is expected to exceed that of the Project channel modifications. The upstream channel inlet (near the beginning of the defined channel) is generally in a natural state and no improvements would be made in the upstream portion of the channel; as a result, no effects on channel stability in this area are expected.

Prior to mitigation, erosion and sedimentation impacts within Chiquito Canyon would be significant. The Newhall Ranch Specific Plan EIR identified feasible measures to reduce the effects of the Specific Plan on floodplains within the Project area. Specifically, Mitigation Measures SP-4.2-1 through SP-4.2-7 (flood control improvement approval from DPW, state and federal permits, CDFG stream bed agreements, FEMA CLOMR, DPW plan and map approvals, DPW-approved permanent erosion controls, DPW SUSMP and SWPPP requirements) are incorporated to reduce these impacts. In addition, Mitigation Measures GRR-1 through GRR-6 (DPW required runoff controls, minimization of bridge and structures, structural durability, hydromodification controls and channel design, sediment and debris control facilities, sediment redistribution) would further reduce these impacts by controlling runoff and sediment delivered through the project reach, minimizing localized impacts from bridge crossings, using erosion resistant materials to ensure the long-term stability of RMDP structures, and ensuring that the Project design provides an equilibrium slope for each affected tributary in the post-development condition. Finally, in order to ensure that the channel functions as intended, Mitigation Measure GRR-7 describes the Geomorphology Monitoring and Management Plan that would be implemented to evaluate compliance with the basis of the design criteria, the triggers for implementing remedial actions (if necessary), the approach for implementing remedial actions, and a description of potential remedial measures. Incorporation and implementation of proper design, regulatory compliance, facility

maintenance, and specified mitigation measures would reduce the impact of erosion and/or downstream deposition to a less-than-significant level relative to Significance Criterion 2.

**San Martinez Grande.** The proposed Project design in San Martinez Grande Canyon would significantly decrease the width of the floodplain in the tributary, which would increase the velocity of flows (*i.e.*, a decrease in channel area would result in an increase in fluid velocity to pass a given flow volume), resulting in a significant effect prior to mitigation. In order to minimize impacts, the Project would be designed to reduce Project effects to the geomorphic stability (*i.e.*, erosion and deposition) within San Martinez Grande Canyon. Specifically, where the channel is not degraded and less extensive development would take place in the watershed, grade control structures would be used to maintain the existing slope. The reengineered channel would be designed to meet the specified basis of design criteria using the following approach:

1. Develop existing condition floodplain and creek hydraulic characteristics using a hydraulic model such as HEC-RAS.
2. Minimize impacts to existing condition floodplain. As a result of reducing the development impacts to the floodplain, the amount of environmental and hydraulic impacts (*e.g.*, resulting in substantial erosion or sediment deposition) from the proposed development would be minimized.
3. Creek bank flood protection (soil cement, rip rap or other suitable method) would be located to provide for bank erosion protection and flood protection from the DPW Capital design flood event. In most cases, the bank protection would be buried with soil at a 3:1 slope over the hard bank protection. The soil backfill slope would vary from flatter to steeper and may be totally eliminated in some areas where necessary such as at structures, storm drain outlets or other pinch points.
4. San Martinez Grande Canyon would not include a re-grading of the creek invert, although the Erosion Potential (Ep) of the proposed condition would be validated during the design phase. For San Martinez Grande Canyon, the invert stabilization method would be as follows:
    a. Creek bed grade control structures at 200 to 400 foot spacing along the creek corridor would be included.
    b. These grade control structures would designed to be located at points along the creek where proposed project grading impacts would already be disturbing the creek bed and banks.
    c. The grade control structures would be constructed with soil cement, rip rap or other grade stabilization methods acceptable to DPW.
    d. The grade control structures would be at grade or below the existing grade and invert of the creek bed.
    e. The grade control structures would be designed to function as a drop structure in the event the creek bed slope flattens overtime.

5. San Martinez Grande Canyon top and toe elevation would be established based upon DPW standards.

The overall design approach would allow the tributary to naturally fluctuate between the stabilized existing condition and estimated equilibrium slope while providing suitable erosion and flood protection for public safety. Based upon the proposed design and use of DPW standards for bank protection top and toe, San Martinez Grande Canyon would meet the minimal required design objectives provided by DPW. As such, the geomorphic basis of design would inherently minimize erosion and deposition.

The channel confluence with the Santa Clara River would largely be controlled by the aggradation or degradation in the Santa Clara River, as well as episodic River hydraulic events in the form of backwater effects. The influence of the Santa Clara River on long-term bed stability at the creek channel outlet is expected to exceed that of the Project channel modifications. The upstream channel inlet (near the beginning of the defined channel) is generally in a natural state and no currently planned improvements are to be made in the upstream portion of the channel; as a result, no effects on channel stability in this area are expected.

Prior to mitigation, erosion and sedimentation impacts within San Martinez Grande Canyon would be significant. The Newhall Ranch Specific Plan EIR identified feasible measures to reduce the effects of the Specific Plan on floodplains within the Project area. Specifically, Mitigation Measures SP-4.2-1 through SP-4.2-7 (flood control improvement approval from DPW, state and federal permits, CDFG stream bed agreements, FEMA CLOMR, DPW plan and map approvals, DPW-approved permanent erosion controls, DPW SUSMP and SWPPP requirements) are incorporated to reduce these impacts. In addition, Mitigation Measures GRR-1 through GRR-6 (DPW required runoff controls, minimization of bridge and structures, structural durability, hydromodification controls and channel design, sediment and debris control facilities, sediment redistribution) would further reduce these impacts by controlling runoff and sediment delivered through the project reach, minimizing localized impacts from bridge crossings, using erosion resistant materials to ensure the long-term stability of RMDP structures, and ensuring that the Project design provides an equilibrium slope for each affected tributary in the post-development condition. Finally, in order to ensure that the channel functions as intended, Mitigation Measure GRR-7 describes the Geomorphology Monitoring and Management Plan that would be implemented to evaluate compliance with the basis of the design criteria, the triggers for implementing remedial actions (if necessary), the approach for implementing remedial actions, and a description of potential remedial measures. Incorporation and implementation of proper design, regulatory compliance, facility maintenance, and specified mitigation measures would reduce the impact of erosion and/or downstream deposition to a less-than-significant level relative to Significance Criterion 2.

***Long Canyon.*** The proposed Project would significantly decrease the width of the floodplain in Long Canyon, which would increase the velocity of flows (*i.e.*, a decrease in channel area would result in an increase in fluid velocity to pass a given flow volume), resulting in a significant effect prior to mitigation. The proposed Project design would combine soil cement bank stabilization along with a soft-bottom channel. The bank stabilization consisting of soil cement, would be emplaced according to the requirements established by the DPW. The basis of design for Long Canyon is such that any increase in flow velocities and shear stress would not exceed the performance specifications of the bank stabilization. However, the soft bottom of the channel is vulnerable to down-cutting and scour. To decrease the channel

velocities, the Project design includes grade stabilizer structures. Proper placement of grade stabilizer structures would allow the channel to reach equilibrium, defined as the condition where the amount of sediment deposited is equivalent to the sediment eroded.

The final design approach in accordance with the geomorphic basis of design is to preserve the existing channel as a back channel habitat area while creating an additional new channel sized to accommodate the changes in sediment and water delivery due to the build-out of the Newhall Ranch Specific Plan. The recommended approach for designing the reaches where valley grading is proposed involves breaking the valley into alternating long reaches that are at equilibrium grade and short reaches that are much steeper. This approach involves creating reaches of between 100 and 300 feet length where elevation drops of 10 to 30 feet occur (10 percent gradient). Concentrating the drop in these reaches using sequences of step-pools that convey the capital flood has the advantage of creating a more naturally functioning channel between the drops, and reducing the number and aerial extent of rock structures. The Long Canyon channel design incorporates the calculated post-development equilibrium slope to ensure a dynamically stable condition allowing for more or less equal amounts of erosion and deposition.

Prior to mitigation, erosion and sedimentation impacts within Long Canyon would be significant. The Newhall Ranch Specific Plan EIR identified feasible measures to reduce the effects of the Specific Plan on floodplains within the Project area. Specifically, Mitigation Measures SP-4.2-1 through SP-4.2-7 (flood control improvement approval from DPW, state and federal permits, CDFG stream bed agreements, FEMA CLOMR, DPW plan and map approvals, DPW-approved permanent erosion controls, DPW SUSMP and SWPPP requirements) are incorporated to reduce these impacts. In addition, Mitigation Measures GRR-1 through GRR-6 (DPW required runoff controls, minimization of bridge and structures, structural durability, hydromodification controls and channel design, sediment and debris control facilities, sediment redistribution) a would further reduce these impacts by controlling runoff and sediment delivered through the project reach, minimizing localized impacts from bridge crossings, using erosion resistant materials to ensure the long-term stability of RMDP structures, and ensuring that the Project design provides an equilibrium slope for each affected tributary in the post-development condition. Finally, in order to ensure that the channel functions as intended, Mitigation Measure GRR-7 describes the Geomorphology Monitoring and Management Plan that would be implemented to evaluate compliance with the basis of the design criteria, the triggers for implementing remedial actions (if necessary), the approach for implementing remedial actions, and a description of potential remedial measures. Incorporation and implementation of proper design, regulatory compliance, facility maintenance, and specified mitigation measures would reduce the impact of erosion and/or downstream deposition to a less-than-significant level relative to Significance Criterion 2.

***Potrero Canyon.*** The proposed Project would significantly decrease the width of the floodplain in Potrero Canyon, which would increase the velocity of flows (*i.e.*, a decrease in channel area would result in an increase in fluid velocity to pass a given flow volume), resulting in a significant effect prior to mitigation. The proposed Project design would combine soil cement bank stabilization along with a soft-bottom channel. The bank stabilization, consisting of soil cement, would be emplaced according to the requirements established by the DPW. The relocated channel would be constructed within imported fill material that forms a 5 to 25 foot-thick pad and provides a geotechnically-sound base for buildings and other structures. The basis of design for Potrero Canyon is such that any increase in flow velocities and

shear stress would not exceed the performance specifications of the bank stabilization. However, the soft bottom of the re-engineered channel would be vulnerable to down-cutting and scour. To decrease the channel velocities, the design includes grade stabilizer structures. These structures are  Proper placement of grade stabilizer structures would allow the channel to reach equilibrium, defined as the condition where the amount of sediment deposited is equivalent to the sediment eroded. The Potrero channel design incorporates the calculated post-development equilibrium slope  to ensure a dynamically stable condition allowing for more or less equal amounts of erosion and deposition to sustain revegetated riparian and adjacent upland habitat areas.

The geomorphic basis of design is such that Potrero Canyon would be designed to convey sediment under future conditions with a "dynamically stable channel" (neither long-term erosion nor deposition) and to support the proposed native re-vegetation program.

Prior to mitigation, erosion and sedimentation impacts within Potrero Canyon would be significant.  The Newhall Ranch Specific Plan EIR identified feasible measures to reduce the effects of the Specific Plan on floodplains within the Project area. Specifically, Mitigation Measures SP-4.2-1 through SP-4.2-7 (flood control improvement approval from DPW, state and federal permits, CDFG stream bed agreements, FEMA CLOMR, DPW plan and map approvals, DPW-approved permanent erosion controls, DPW SUSMP and SWPPP requirements) are incorporated to reduce these impacts. In addition, Mitigation Measures GRR-1 through GRR-6 (DPW required runoff controls, minimization of bridge and structures, structural durability, hydromodification controls and channel design, sediment and debris control facilities, sediment redistribution) would further reduce these impacts by controlling runoff and sediment delivered through the project reach, minimizing localized impacts from bridge crossings, using erosion resistant materials to ensure the long-term stability of RMDP structures, and ensuring that the Project design provides an equilibrium slope for each affected tributary in the post-development condition.  Finally, in order to ensure that the channel functions as intended, Mitigation Measure GRR-7 describes the Geomorphology Monitoring and Management Plan that would be implemented to evaluate compliance with the basis of the design criteria, the triggers for implementing remedial actions (if necessary), the approach for implementing remedial actions, and a description of potential remedial measures.  Incorporation and implementation of proper design, regulatory compliance, facility maintenance, and specified mitigation measures would reduce the impact of erosion and/or downstream deposition to a less-than significant-level relative to Significance Criterion 2.

***Lion Canyon.*** The proposed Project design includes the placement of three new road crossings in Lion Canyon. These crossings may constrict the floodplain, resulting in an increase in the velocity of flows (*i.e.*, a decrease in channel area would result in an increase in fluid velocity to pass a given flow volume), which would be a significant effect prior to mitigation. The basis of design for this drainage is such that Lion Canyon would be designed to be in geomorphic equilibrium in terms of stability and delivery of sediment and water under future conditions. The channel floodplain would be designed to maximize geomorphic stability and ecological function, provide adequate flood conveyance, and avoid hydromodification to the extent possible. In addition, the design would minimize the need for maintenance activities.

Phillip Williams and Associates (PWA, 2007g) evaluated the channel design erosion potential. Post-development condition sediment supplies to the Lion Canyon drainage are predicted to range from 27 percent to 37 percent of the existing condition. The results of the analysis indicate that with the proposed RMDP components, the erosion potential within Lion Canyon would be in equilibrium and that the proposed channel would not aggrade or generate excess sediment from erosion or create a larger than natural downstream impact from sedimentation associated with hydromodification. Mitigation measure SP-4.2-3 (state and federal permits) would require that hydraulic modeling be performed for the final design to assess the effects within Lion Canyon, and that the design would be modified as necessary to reduce any erosion or deposition impacts. The Lion channel design incorporates the calculated post-development equilibrium slope to ensure a dynamically stable condition allowing for more or less equal amounts of erosion and deposition.

Prior to mitigation, erosion and sedimentation impacts within Lion Canyon would be significant. The Newhall Ranch Specific Plan EIR identified feasible measures to reduce the effects of the Specific Plan on floodplains within the Project area. Specifically, Mitigation Measures SP-4.2-1 through SP-4.2-7 (flood control improvement approval from DPW, state and federal permits, CDFG stream bed agreements, FEMA CLOMR, DPW plan and map approvals, DPW-approved permanent erosion controls, DPW SUSMP and SWPPP requirements) are incorporated to reduce these impacts. In addition, Mitigation Measures GRR-1 through GRR-6 (DPW required runoff controls, minimization of bridge and structures, structural durability, hydromodification controls and channel design, sediment and debris control facilities, sediment redistribution) would further reduce these impacts by controlling runoff and sediment delivered through the project reach, minimizing localized impacts from bridge crossings, using erosion resistant materials to ensure the long-term stability of RMDP structures, and ensuring that the Project design provides an equilibrium slope for each affected tributary in the post-development condition. Finally, in order to ensure that the channel functions as intended, Mitigation Measure GRR-7 describes the Geomorphology Monitoring and Management Plan that would be implemented to evaluate compliance with the basis of the design criteria, the triggers for implementing remedial actions (if necessary), the approach for implementing remedial actions, and a description of potential remedial measures. Incorporation and implementation of proper design, regulatory compliance, facility maintenance, and specified mitigation measures would reduce the impact of erosion and/or downstream deposition to a less-than-significant level relative to Significance Criterion 2.

***Minor Drainages.*** Implementation of the proposed RMDP would involve the placement of one new culverted road crossing in Ayers Canyon, a minor drainage on the south side of the River; in addition, the existing six-lane bridge allowing SR-126 to cross the Castaic Creek drainage would be expanded to eight lanes.

The other drainages to be converted to underground storm drains within the limits of development include drainages in Homestead Canyon, Off-Haul Canyon, Mid-Martinez Canyon, Humble Canyon, Exxon Canyon, Unnamed Canyon B, Unnamed Canyon C, Dead-End Canyon, Unnamed Canyon D, Middle Canyon, Magic Mountain Canyon, Unnamed Canyon 1 and Unnamed Canyon 2.

The conversion of open drainages to buried underground conduits would eliminate the erosion of existing drainage channels and the associated sediment loading from other upland sources. The impact of

underground storm drains would significantly decrease erosion and siltation. The sediment supplied by these minor drainages prior to construction of the RMDP components is negligible compared to the overall sediment regime of the Santa Clara River watershed. As such, the decrease in erosion and siltation in these tributaries would not result in downstream sediment deprivation or erosion. Because the proposed underground conduits would not be erodible, and because the flows entering these systems from developed areas would not contain high sediment volumes, there would be negligible potential for aggradation or erosion impacts within the underground storm drains. Accordingly, the modification of 7,782 feet of drainage and the construction of the combined 39,101 feet of buried storm drain would not result in significant erosion or deposition impacts within the minor drainages**.**

Prior to mitigation, erosion and sedimentation impacts within the minor tributary drainages would be significant. The Newhall Ranch Specific Plan EIR identified feasible measures to reduce the effects of the Specific Plan on floodplains within the Project area. Specifically, Mitigation Measures SP-4.2-1 through SP-4.2-7 (flood control improvement approval from DPW, state and federal permits, CDFG stream bed agreements, FEMA CLOMR, DPW plan and map approvals, DPW-approved permanent erosion controls, DPW SUSMP and SWPPP requirements) are incorporated to reduce these impacts. In addition, Mitigation Measures GRR-1 through GRR-6 (DPW required runoff controls, minimization of bridge and structures, structural durability, hydromodification controls and channel design, sediment and debris control facilities, sediment redistribution) would further reduce this potential impact to less-than-significant levels within the minor tributary drainages relative to Significance Criterion 2 by controlling runoff and sediment delivered through the project reach, minimizing localized impacts from bridge crossings, using erosion resistant materials to ensure the long-term stability of RMDP structures, and ensuring that the Project design provides an equilibrium slope for each affected tributary in the post-development condition.

**Tributaries -- Significance Criterion 3: Impacts to Geomorphic Function (Significant but Mitigable).** The proposed tributary drainage treatments incorporate hydromodification controls that reduce potential stormwater-related impacts (intensity and duration) to the River and tributary geomorphic function. The following includes an analysis of the potential impacts to the geomorphic function of the affected tributaries within the Project area.

The RMDP proposes that portions of 19 drainages within the RMDP site be graded to accommodate pads for residential and commercial buildings or road way infrastructure, and that these flows be conveyed by buried storm drains varying in diameter from 30 to 144 inches. In total, approximately 59,845 feet of existing drainage channel would be converted to buried storm drains. The RMDP also proposes four partially-lined open channels on tributaries to the mainstem of the Santa Clara River within the RMDP boundaries, including Potrero Canyon, Long Canyon, San Martinez Grande Canyon, and Chiquito Canyon. In some cases, streams would be relocated from their current locations and soft-bottom channels would be recreated in different locations generally parallel to the current alignments. The total area affected by the conversion to buried storm drain, reengineering, and/or bank stabilization for each drainage within the RMDP area is included in **Table 4.2-14**.

**Table 4.2-14**
**Total Impacted Channel Area By Treatment Type**
**Alternative 2 -- Tributaries**

| Tributary | Storm Drain (feet) | Storm Drain Area (acres) | Stabilized and Reengineered Channel Area (acres) | Road Crossings - Bridges and Culverts (acres) |
|---|---|---|---|---|
| Ayers Canyon | 0.0 | 0.0 | 0.0 | 0.2 |
| Agricultural Ditch | 1,479 | 1.4 | 0.2 | 0.0 |
| Chiquito Canyon | 2,549 | 1.0 | 16.0 | 1.0 |
| Dead-End Canyon | 1,931 | 1.3 | 0.0 | 0.0 |
| Exxon Canyon | 1,276 | 0.3 | 0.0 | 0.0 |
| Homestead Canyon | 609 | 0.6 | 0.0 | 0.0 |
| Humble Canyon | 421 | 0.1 | 0.0 | 0.0 |
| Lion Canyon | 6,316 | 3.4 | 3.0 | 0.4 |
| Long Canyon | 961 | 0.7 | 4.8 | 0.3 |
| Magic Mountain Canyon | 6,111 | 6.4 | 0.0 | 0.0 |
| Middle Canyon | 7,439 | 5.6 | 0.0 | 0.0 |
| Mid-Martinez Canyon | 4,541 | 2.1 | 0.0 | 0.0 |
| Off-Haul Canyon | 7,593 | 5.4 | 0.0 | 0.0 |
| Potrero Canyon | 10,918 | 7.6 | 29.3 | 0.1 |
| Salt Creek Canyon | 0.0 | 0.0 | 6.9 | 0.0 |
| San Martinez Grande Canyon | 0.0 | 0.0 | 2.4 | 0.1 |
| Unnamed Canyon 1 | 4,647 | 0.3 | 0.0 | 0.0 |
| Unnamed Canyon 2 | 416 | 0.5 | 0.0 | 0.0 |
| Unnamed Canyon A | 0.0 | 0.0 | 0.0 | 0.0 |
| Unnamed Canyon B | 1,004 | 0.5 | 0.0 | 0.0 |
| Unnamed Canyon C | 402 | 0.2 | 0.0 | 0.0 |
| Unnamed Canyon D | 1,232 | 0.7 | 0.0 | 0.0 |
| **TOTAL** | **59,845** | **38.0** | **62.7** | **2.1** |

Source: RMDP, 2008.

Reengineered channel area, installation of bank stabilization, and conversion of the existing channels to buried storm drain would result in a total of 102.8 acres of existing channel impacted by the RMDP components, with 62.7 acres altered through reengineering and installation of bank stabilization. These impacts would be significant prior to mitigation.

The effects of these changes on the geomorphic function of the tributaries within the Project area can be determined with an evaluation using the five hydrologic function metrics of the HARC (see **Section 4.6**, Jurisdictional Waters and Streams).

As discussed in **Subsection 4.2.5.1**, Impact Assessment Methods, above, the HARC metric scores were evaluated on a scale of zero (degraded condition) to one (optimal condition). Although the HARC score provides a means for comparing the quality of different stream reaches with respect to certain wetland functions, it does not take into consideration the differing size of the reaches. In order to incorporate this variable, each HARC score was multiplied by the assessment area of the reach. The resulting product is termed the number of HARC AW-score units. This number ultimately describes the value of a particular reach, and the number of AW-score units impacted versus preserved will show the impacts of the proposed Project and alternatives on wetland and riparian resources. Conceptually, the alternative with the fewest lost AW-score units would be the least damaging alternative. An alternative with a greater loss of HARC AW-score units, though, may be mitigated by producing AW-score units in another location within the Project area through wetland/riparian restoration or creation (see **Section 4.6**, Jurisdictional Waters and Streams, for further discussion on the HARC assessment methods).

**Table 4.2-15** compares the sum of the hydrology metrics for the tributaries within the Project area in the existing and proposed conditions. **Table 4.2-15** also compares the total hydrology AW-score units (only the hydrology metrics) with that of the total HARC AW-score units calculated for the tributaries.

The HARC analysis indicates that, overall, the proposed Project would result in substantial changes to the geomorphic function of the tributaries with net losses observed for the source water and hydroperiod and net gains observed for the floodplain connection, surface water persistence, and flood prone area metrics. In total, the proposed Project would result in a net loss of 17.28 hydrology AW-score units, and overall the Total HARC AW-score has a net loss of 7.17 units within the tributaries. Absent mitigation, the loss in HARC AW-score units would be a significant impact.

Mitigation Measures SW-1 through SW-3 are proposed in **Section 4.6**, Jurisdictional Waters and Streams, to increase post-Project AW-score units through enhancement of areas within Salt Creek. Accordingly, the post-Project AW-score units will be required to exceed the existing conditions and thereby result in a net lift to geomorphic function. These mitigation measures also specify that the success criteria for mitigation sites should take into consideration the functions targeted for "lift" through mitigation. The functional lift obtained through avoidance and restoration must be greater than the loss of total HARC AW-score units. In addition, the impacts to geomorphology to the tributary drainages would be further reduced through the implementation of Project-specific Mitigation Measure GRR-4. This measure requires that instream channel design features be incorporated to control potential hydromodification impacts to geomorphology and riparian resources. Accordingly, the net loss in HARC hydrology AW-score units, presented in **Table 4.2-15**, below, would be offset by the required net gain in the Total AW-score units within the tributaries as specified in Mitigation Measure SW-3 and as a result of implementation of Mitigation Measures SW-1 and SW-2. The basis of design for the tributary streams described in the impact analysis considered current site conditions, and set as a performance standard that the restored channels must convey sediment under future conditions in a "dynamically stable condition" (neither long-term erosion nor deposition) and that they support the proposed native revegetation program. Accordingly, the impacts of the RMDP to the geomorphic function of the tributaries with the implementation of SW-1 through SW-3 and GRR-4 are considered less than significant relative to Significance Criterion 3.

**Table 4.2-15**
**Summary of Hydrology Metrics and Total HARC AW-Scores, Alternative 2 - Tributaries**

| Condition | Source | Hydro-period | Floodplain Connection | Surface Water Persistence | Flood Prone Area | Total HARC AW Units | Total Hydrology HARC AW Units |
|---|---|---|---|---|---|---|---|
| **Chiquito Canyon** | | | | | | | |
| Existing | 0.95 | 0.95 | 0.96 | 0.48 | 0.94 | 12.59 | 15.95 |
| Proposed | 0.52 | 0.49 | 0.61 | 0.49 | 0.61 | 9.61 | 9.02 |
| CHANGE | -0.43 | -0.46 | -0.35 | 0.01 | -0.33 | -2.98 | -6.93 |
| **San Martinez Grande Canyon** | | | | | | | |
| Existing | 0.90 | 1.00 | 0.97 | 0.72 | 0.97 | 2.84 | 3.22 |
| Proposed | 1.95 | 1.50 | 2.35 | 2.25 | 2.25 | 4.44 | 4.64 |
| CHANGE | 1.05 | 0.50 | 1.38 | 1.53 | 1.28 | 1.60 | 1.42 |
| **Long Canyon** | | | | | | | |
| Existing | 0.68 | 0.67 | 0.58 | 0.46 | 0.43 | 3.22 | 3.55 |
| Proposed | 0.50 | 0.50 | 0.66 | 0.75 | 0.66 | 7.03 | 6.55 |
| CHANGE | -0.18 | -0.17 | 0.08 | 0.29 | 0.23 | 3.81 | 3.00 |
| **Potrero Canyon** | | | | | | | |
| Existing | 0.98 | 0.94 | 0.94 | 0.83 | 0.94 | 34.50 | 39.08 |
| Proposed | 0.63 | 0.70 | 0.75 | 0.82 | 0.71 | 18.64 | 19.77 |
| CHANGE | -0.35 | -0.24 | -0.19 | -0.01 | -0.23 | -15.86 | -19.31 |
| **Lion Canyon** | | | | | | | |
| Existing | 0.95 | 0.90 | 1.00 | 0.50 | 1.00 | 5.41 | 5.96 |
| Proposed | 0.66 | 0.52 | 1.00 | 0.50 | 1.00 | 2.45 | 2.63 |
| CHANGE | -0.29 | -0.38 | 0.00 | 0.00 | 0.00 | -2.96 | -3.33 |
| **Minor Drainages*** | | | | | | | |
| Existing | 0.87 | 0.84 | 0.64 | 0.49 | 0.43 | 21.27 | 21.70 |
| Proposed | 0.75 | 0.71 | 0.79 | 0.59 | 0.79 | 7.64 | 7.18 |
| CHANGE | -0.12 | -0.13 | 0.15 | 0.10 | 0.36 | -13.63 | -14.52 |
| **Salt Creek Canyon** | | | | | | | |
| Existing | 0.90 | 0.69 | 0.71 | 0.63 | 0.79 | 71.85 | 67.83 |
| Proposed | 0.92 | 0.88 | 0.76 | 0.64 | 0.82 | 97.05 | 91.75 |
| CHANGE | 0.02 | 0.19 | 0.05 | 0.01 | 0.03 | 25.20 | 23.92 |
| **Total Change** | **-0.30** | **-0.69** | **+1.12** | **+1.93** | **+1.31** | **-7.17** | **-17.28** |

* "Minor Drainages" are located in the following canyons: Bridge Construction -- Castaic Creek; Buried Storm Drains - Homestead (2), Off-Haul (2), Mid Martinez (1), Humble (1), Exxon (2), Unnamed Canyon B (1), Unnamed Canyon C (1), Dead End (2), Unnamed Canyon D (1), Middle (1) and Magic Mountain (1).

Source: URS, 2008

**Tributaries -- Significance Criterion 4: Construction and Scour Impacts to Riparian Vegetation (Significant but Mitigable).** Impacts to riparian vegetation within the tributaries located within the RMDP boundary are primarily associated with the physical alterations to the stream channels. As described in **Section 2.0**, Project Description, of this EIS/EIR, in some cases where a channel is currently incised and eroding its riparian corridor, it is more feasible to provide the desired degree of ecological function by relocating the channel and creating a stable channel with new vegetative plantings; where the channel is in good condition and has a healthy riparian corridor it is more desirable to preserve the creek channel location and retrofit with small step-pool structures to protect against future headcuts. Under Alternative 2, approximately 59,845 lf of tributary channel would be converted to buried storm drain. In addition, 75,429 lf of bank stabilization, 189 grade stabilizer structures, and 15 culverts would be constructed as part of the proposed Project. Accordingly, nearly all tributary riparian reaches within the RMDP area would sustain impacts to riparian vegetation resources from grading or installation of RMDP components within the reach. The seven reaches in the Salt Creek drainage are exceptions in this regard; the entire portion of the Salt Creek watershed within the applicant's ownership would be dedicated as permanent open space and no fill of the drainage is proposed.

Reengineered channel area, installation of bank stabilization, and conversion of the existing channels to buried storm drain, and road crossings would result in a total of 102.8 acres of existing channel impacted by the RMDP components. These changes could have a significant effect on riparian vegetation of the tributary drainages. The effects of these changes on the geomorphic function of the tributaries within the Project area can be determined by an evaluation of the hydrologic function metrics of the HARC (see **Section 4.6**, Jurisdictional Waters and Streams).

As discussed in the previous impact discussion, the number of hydrology and total HARC AW-score units impacted versus preserved show the impacts of the proposed Project and alternatives on wetland and riparian resources (*i.e.*, post-Project HARC scores serve as a surrogate indicator of potential increases in the frequency and magnitude of scour of riparian vegetation [refer to **Subsection 4.2.5.1.4**, Scour Impacts to Riparian Vegetation]).

Conceptually, the alternative with the fewest lost total AW-score units would be the least damaging alternative. However, an alternative with a greater loss of HARC AW-score units may be mitigated by producing AW-score units in another location within the Project area through wetland/riparian restoration or creation (see **Section 4.6**, Jurisdictional Waters and Streams, for further discussion on the HARC assessment methods). **Table 4.2-15**, presented above, compares the sum of the hydrology metrics for the tributaries within the Project area in the existing and proposed conditions. **Table 4.2-15** also compares the total hydrology AW-score units and the total HARC AW-score units calculated for the tributaries.

The HARC analysis indicates that, overall, the proposed Project would result in substantial changes to the hydrologic function of the tributaries with net losses observed for the source water and hydroperiod and net gains observed for the floodplain connection, surface water persistence, and flood prone area metrics. In total, the proposed Project would result in a net loss of 19.98 hydrology AW-score units but a net gain of 35.68 total HARC AW-score units within the tributaries. Absent mitigation, the decrease in HARC AW-score units within the tributaries may be the result of an increase in the frequency and magnitude of scouring of riparian vegetation which, absent mitigation, would be a significant impact.

To mitigate these impacts Mitigation Measures SW-2 and SW-3 presented in **Section 4.6**, Jurisdictional Waters and Streams, would provide riparian enhancement through removal of exotic species, restoration of sediment equilibrium, and recontouring of existing, incised banks to increase the extent of Corps and CDFG jurisdictional areas as well as providing avoidance and restoration measures in the Potrero and Salt Creek watershed. In reaches where RMDP components would be constructed, the temporary impact zone would be revegetated with native riparian plants. Specifically, Mitigation Measure SW-5 (**Section 4.6**, Jurisdictional Waters and Streams) would be implemented to ensure that all areas where temporary construction impacts affect Corps or CDFG jurisdictional areas are revegetated (generally, these are areas where impacts would occur due to the construction of Project facilities). In addition, riparian habitat restoration activities that would be implemented in conjunction with the RMDP would include revegetation of native plant communities on candidate sites contiguous to existing riparian habitats. Site restoration would also include the maintenance of revegetation sites, including the control of non-native plants and irrigation system maintenance. As described in Mitigation Measures BIO-1, BIO-6, and BIO-7, monitoring of the restoration sites would be conducted to evaluate the success of revegetation efforts. Contingency plans and appropriate remedial measures to be implemented should habitat restoration objectives not be achieved would also be included in tentative map-level habitat restoration plans. **Section 4.5**, Biological Resources, of this EIS/EIR, provides more detail on the restoration methods proposed to be used.

Accordingly, the impacts of the RMDP to the riparian habitat of the tributaries are considered significant prior to mitigation, but less than significant under Significance Criterion 4 through implementation of Mitigation Measures SW-2, SW-3, SW-5, BIO-1, BIO-6, and BIO-7.

**Significance Criterion 5: Impacts to Riparian Resources Supported by the Middle Canyon Spring (Significant but Mitigable).** The Middle Canyon Spring is a natural freshwater spring complex occupying approximately 3.7 acres that supports dense riparian habitat including southern cottonwood-willow riparian that surrounds the core spring area. Mature Fremont cottonwoods are present with heights of 30 to 45 feet and mature arroyo willow trees with heights of 20 feet are also present. The spring is supported by groundwater and development in the Middle Canyon watershed could affect groundwater hydrology in the canyon and discharge from the spring. In 2007, GSI Water Solutions, Inc. and Allen E. Seward Engineering Geology, Inc. conducted a study to determine the source of the water discharging from the spring and the factors that govern the flow of groundwater into the spring. (GSI, 2007.) Based on the groundwater chemistry data collected as part of the study, the water discharging from the spring appears to consist of a mixture of deeper alluvial groundwater and shallow groundwater. The origin of the deeper alluvial groundwater is either from the deeper Saugus Formation or from outside of Middle Canyon and the origin of the shallow groundwater is likely the upper Saugus Formation. In regards to groundwater flow, the results of the study indicate that flow into the spring is controlled by the following factors:

- The permeable beds at the top of the Saugus Formation in the lower end of Middle Canyon act as the primary conduit of groundwater flow to the spring. These localized permeable beds connect the shallow alluvial groundwater system in lower Middle Canyon to the spring and are underlain by fine-grained material, which limits downward groundwater migration and maintains flow through the permeable beds. Observed water quality markers indicate that alluvial groundwater makes up the

predominant contribution to the spring outflow, along with lesser, comingled contributions from the deeper Saugus aquifer.

- The faulted synclinal structure, the Saddle Lineament, traverses the lower end of Middle Canyon. This structure prevents downward groundwater flow along the Saugus Formation bedding planes and converges with the upper permeable beds of the Saugus Formation, which supply the spring.

- The fine-grained older alluvium at the mouth of Middle Canyon which restricts alluvial groundwater movement from Middle Canyon to the Santa Clara River alluvium.

- The shallow slump within the spring area forms an elevated area of irregular topography with variable internal permeability. The slump affects the surficial expression of the spring and its outlets.

The results of the GSI 2007 study provide a conceptual model of the spring system. Accordingly, the Middle Canyon Spring Habitat Management Plan (HMP) (Dudek, 2008) has been prepared to outline the monitoring program that would be implemented to obtain additional data and to specify the framework for management decisions related to the spring. The objective of the Middle Canyon Spring HMP is to provide the information necessary to avoid, minimize, and, mitigate potential impacts of the proposed Project on the Middle Canyon Spring complex. The HMP includes the following primary components:

- The collection of pre-development baseline data for the spring and the associated biotic community in order to establish a framework for adaptive management. The data will include the collection of the following hydrologic and riparian data:

    - Comprehensive inventory of plant species present within and adjacent to the spring;

    - Percent plant cover and percent bare ground within and adjacent to the spring;

    - Percent native versus non-native plant cover within and adjacent to the spring (recommend using the relevé method based on site size and vegetation characteristics);

    - Structural description of the vegetation communities, including relative distribution of vegetation among strata using both height and defined wetland parameters (*i.e.*, submerged, emergent, littoral, and overhanging);

    - GPS location, diameter at breast height (DBH), and height of all trees within the core spring area and within 100 feet of the core spring area;

    - Indices of the plant community, including relative abundance and dominance by species and functional categories( recommend using the relevé method);

    - Photo-documentation of the core spring area from multiple permanently designated photo points using established protocols, repeated to capture seasonal changes;

- Surveying and mapping of the hydrological and topographic features of the spring area, including apparent historical earthworks;

- Survey to determine the precise elevation of the spring inlets and outlets, and comparison of this elevation to groundwater elevations in three piezometers that together monitor the Alluvial and shallow Saugus water-bearing zones that provide water to the spring complex;

- Estimates of surface water coverage area and surface water depth profiles;

- Flow rate of spring outlets and calculation of total spring discharge using an established monitoring location with the ability to collect and record diurnal flow data;

- Determine approximate evapotranspiration rates of the vegetation community (the ET for the spring complex will be estimated by comparing the day and night flow records. This difference in flow can promote understanding of the water budget requirements of the spring and associated vegetation community.);

- Shallow groundwater elevation data using established monitoring locations. Data will be collected using continuous-data recorders at a frequency suitable for demonstrating seasonal fluctuations in local subsurface conditions and to correlate local water table elevation fluctuations to spring flow variations;

- Water temperature at an established monitoring location in the spring and at the two Saugus piezometers where water levels are being measured with the ability to continuously record data;

- Water quality/chemistry data in the spring and the three nearby piezometers; and

- As available, compile a record of historical photographs and aerial photographs of the spring and adjacent areas.

- A construction monitoring program to ensure that appropriate avoidance and minimization measures are followed during construction to protect the existing vegetation and water quality in the spring complex area. The monitoring program will include the following:

  - Monthly qualitative observations of the spring complex to assess vegetation health;

  - Surveying for special-status species (monitoring of the undescribed sunflower and snail population distribution, abundance, and density, along with other indicators of health identified in the baseline phase);

  - Photo-documentation of the spring area using permanently designated photo points;

  - Mapping of the perimeters of the spring surface water area, and outflows using GPS;

- Surface water depth, flow velocity, and outflow volume; shallow groundwater elevation data; at the locations determined during pre-development baseline data collection outlined described in Site Assessment above;

- Sampling of key water-quality variables as determined by hydrogeologists during Site Assessment for comparison to baseline data-collection, in addition to other parameters at other locations where unacceptable contaminant levels are a concern;

- Changes in sunlight and temperature patterns that may result from altering the landscape adjacent to the southern margin of the spring area, and the extent to which such changes may potentially impact the biotic community of the spring; and

- The preparation of periodic construction monitoring reports to document identified construction issues and resolutions implemented to protect the spring complex during construction.

- A post-development monitoring program to assist in evaluating trends and changes in discharge volume and/or water quality, a shift in spring habitat composition, or changes in conditions that could affect the spring system. The data collected and the frequency of monitoring may be adjusted as appropriate, consistent with a growing knowledge base of the spring community and with new conditions in the area. Some potential impacts may be present post-construction but may not be observable for several years. For the first 3 years post-construction monitoring would be frequent, but as conditions stabilize, monitoring likely will be come less frequent. A post-development monitoring program will be created to detect trends and changes in the populations of special-status species, a shift of spring habitat composition, or changes in conditions that could potentially impact the spring system. Such changes in spring habitat or conditions may be indicated by an increase in proportion of non-native plants or animals compared to baseline, and measurable changes in the following factors: relative abundance of plant species, vegetation community structural distribution, moisture regimes at the spring area, water inputs to the spring system, spring water quality, and changes at the margins of the spring area or the associated biotic community. Values used to evaluate the biological significance of changes in the above parameters will be generated through the baseline data analysis and monitoring. Post-development monitoring activities are subject to revision and refinement based upon results of initial data collection and feedback with ongoing monitoring. Analysis and comparison of baseline and post-development data will establish "working thresholds" based on available data with refinement based on collection of additional information. These thresholds will serve to trigger adaptive management measures.

- Management actions to be implemented prior to and following construction activities. These actions include:

  - During the pre-development phase:

    - Maintain livestock exclusion fencing in the area of the spring.

- Stabilize the unconsolidated material associated with the ranch road above the entire south margin of the spring area. Consider revegetation of this area with native vegetation to control erosion and sedimentation.

- Prior to construction, install temporary or permanent fencing along the spring area that effectively excludes unauthorized persons from entering the area immediately around the spring. The location of the protective fencing would be determined following the initial site assessment.

- During construction and post-development:

  - Maintain dust control and construction fence and implement other appropriate methods to reduce deposits of dust, particulates, and trash in the spring area.

  - Investigate the appropriateness of installing drift fencing or netting along the edge of the Commerce Center Drive Bridge as it passes near the spring area and south of the spring area between the spring and upslope development.

  - Any public access trails in the vicinity of the spring should have adequate barrier fencing between the trail and spring, primarily along the southern limit of the spring, to prevent unauthorized entry.

  - All such fences should have regular inspection for maintenance and possible trash collection.

- Evaluation and implementation of potential enhancement/restoration alternatives for the spring complex including:

  - Reshape or remove existing berms and basins to the west of the current spring area in order to allow water to flow west and northwest along the river terrace toward the Santa Clara River.

  - Where cottonwood trees are present, partial removal of the berms could promote a diffuse flow of spring water that could eventually saturate a portion of the river terrace.

  - The river terrace surfaces could be graded based on suitable habitat determinations and results of geologic investigations completed under this HMP (gradient, substrata, vegetation, algae growth). Such a landscape could accommodate the full range of biotic communities associated with the spring.

  - In conjunction with potential expansion to the north and east, the excavated channels directing spring outflow to the north could be partially blocked or eliminated. This action could allow spring water to saturate soils along the western extent of the upper river terrace. The creation of a larger spring complex to the west may be beneficial to the protection of both special-status species by increasing their potential habitat area and creating microsite refugia that could be more resistant to perturbations.

- An adaptive management plan that uses the monitoring data to determine whether new or additional information is necessary, to identify whether new or additional management actions are necessary, and to evaluate changes. The management plan includes annual monitoring reports and, as necessary, interim reports to ensure timely response to any significant issues.

If the post-development monitoring data indicates a decrease in flow (either short or long term) from the Middle Canyon Spring or an adverse impact to riparian resources that are supported by the spring then, as specified in HMP, the following measures will be implemented:

- Providing supplementary water to the spring should a significant decrease in discharge occur or should the water quality be reduced to unacceptable levels. The water will be provided via an existing deep Saugus well in Middle Canyon (Well 156) and will be piped to the head of the spring for discharge, thus simulating natural water input to the spring; and,

- Expanding the area of the spring complex or modifying the existing drainage channels should a significant increase in discharge occur. The spring area could be allowed to expand westward and/or existing drainage channels could be configured to promote more rapid water discharge from the spring area into the Santa Clara River wash.

The development within Middle Canyon associated with Alternative 2 would result in a significant impact to riparian resources supported by the Middle Canyon Spring by affecting the existing groundwater hydrology and/or water quality at the spring. However, implementation of Mitigation Measures BIO-74 and BIO-77 would reduce these impacts to less than significant relative to Significance Criterion 5. Mitigation Measure BIO-74 requires the installation of fencing and signage around the spring prior to construction, during construction, and following construction to restrict access and protect the spring area. Mitigation Measure BIO-77 includes the development of the Middle Canyon Spring HMP in consultation with CDFG and implementation of HMP following approval by CDFG.

**SCP Direct Impacts**

**Significance Criterion 1: Short-Term Impacts from Construction (No Impact).** The proposed SCP is a conservation and permitting plan for an upland plant species (spineflower), and would not authorize any construction activities within the River Corridor or tributaries. Therefore, no direct impacts would result from the implementation of the SCP relative to Significance Criterion 1.

**Significance Criterion 2: Erosion and Downstream Deposition (No Impact).** The same analysis for Significance Criterion 1, above, applies to this criterion.

**Significance Criterion 3: Impacts to Geomorphic Function (No Impact).** The same analysis for Significance Criterion 1, above, applies to this criterion.

**Significance Criterion 4: Construction and Scour Impacts to Riparian Vegetation (No Impact).** The same analysis for Significance Criterion 1, above, applies to this criterion.

#### 4.2.5.3.2 Indirect Impacts

**RMDP Indirect Impacts**

**Significance Criterion 1: Short-Term Indirect Impacts from Construction of Newhall Ranch Specific Plan Development (Significant but Mitigable).** Construction of the Specific Plan development (particularly site clearing and grading operations) would have the potential to increase sediment flows downstream during storm events. This would be considered a significant impact prior to mitigation.

Temporary erosion control to protect property that is in the development process is required by Los Angeles County ordinance and will be implemented as part of each subdivision as the Specific Plan builds out. Temporary erosion control measures may include minimizing removal of existing vegetation; using temporary soil covers (such as hydroseeding, mulch/binder and erosion control blankets) to protect exposed soil from wind and rain; and installing silt fencing, berms, and dikes to protect storm drain inlets and drainage courses as approved by DPW.

Permanent erosion control measures, such as drainage swales, subsurface drains, slope drains, storm drain inlet/outlet protection, and sediment traps; checking dams to reduce flow velocities; and permanent desilting basins, would be designed as part of final drainage plans prepared during the subdivision process. (Mitigation Measure SP-4.2-6, DPW-approved permanent erosion controls.) In addition, a Hydrology Plan, Drainage Plan, and Grading Plan (including an Erosion Control Plan, if required) for each subdivision would be prepared by the applicant to ensure that no significant erosion, sedimentation, or flooding impacts would occur during or after site development. (Mitigation Measure SP-4.2-5, DPW plan and map approvals.) To further reduce construction impacts, the proposed Project includes measures to satisfy all NPDES Program requirements, including the preparation of a Standard Urban Stormwater Mitigation Plan (SUSMP) and Stormwater Management Pollution and Prevention Plan (SWPPP). (Mitigation Measure SP-4.2-7, DPW SUSMP and SWPPP requirements.)

Absent mitigation, there would be significant short-term sedimentation impacts during construction with respect to Significance Criterion 1. However, Mitigation Measures SP-4.2-2 (acquire state and federal permits), SP-4.2-3 (CDFG streambed agreements), SP-4.2-5 (DPW plan and map approvals), and SP-4.2-7 (DPW SUSMP and SWPPP requirements) would ensure that regulatory requirements are implemented and short-term impacts related to construction of RMDP components are less than significant through proper application of sediment controls and other BMPs required by existing local, state, and federal regulations.

**Significance Criterion 2: Indirect Impacts from Erosion and Downstream Deposition (Significant but Mitigable).** The drainage areas in which the Specific Plan site lies would not be completely developed; therefore, storm flows from the upper reaches would contain sediment and vegetative debris. The amount of sediment and debris contained in the storm flows would be dependent upon the size of the area being drained and whether the area had been subject to recent burning. If this debris enters and clogs on-site drainages, upstream flooding could occur, which would be a significant impact.

In order to prevent sediment and debris from the upper reaches of the drainage areas from entering storm drainage improvements, permanent erosion control measures would be implemented, including the

installation of desilting and debris basins, drainage swales, slope drains, storm drain inlet/outlet protection, and sediment traps. (Mitigation Measure SP-4.2-6, DPW-approved permanent erosion controls.) The specific improvements for each drainage area would be designed as part of the final Drainage Plan prepared to DPW standards during the subdivision process. (Mitigation Measure SP-4.2-5, DPW plan and map approvals.) In addition, Mitigation Measure SP-4.2-7, DPW SUSMP and SWPPP requirements would further reduce erosion impacts by requiring that stormwater discharges from open channels or drainage systems discharging to the Santa Clara River in excess of four fps (erosive flows) be controlled to prevent accelerated erosion and protect River habitat. Discharge flows would be regulated using water control features and energy dissipation structures where required to reduce discharge velocities to non-erosive rates. Specifically, implementation of GRR-1 and GRR-4, (DPW required runoff controls and hydromodification controls and channel design respectively) would further control the rate of stormwater runoff to minimize downstream erosion through construction of BMPs, and channels would be designed to incorporate the calculated post-development equilibrium slope to ensure a dynamically stable condition allowing for more or less equal amounts of erosion and deposition.

Finally, the developed area of the Specific Plan would be covered with non-erosive surfaces, including pavement and permanent vegetation, which would reduce the sedimentation of site runoff. Minor permanent erosion control measures that reduce sediment in runoff include check dams to reduce flow velocities in tributary water courses, drainage swales, slope drains, subsurface drains, storm drain inlet/outlet protection, and sediment traps. The Specific Plan proposes that 21 drainages be graded to accommodate pads for residential and commercial buildings and roadway improvements. The specific improvements for each drainage area would be designed as part of the final Drainage Plan prepared to DPW standards during the subdivision process. (Mitigation Measure SP-4.2-5, DPW plan and map approvals.)

With installation of these temporary and permanent erosion/sedimentation control measures, Specific Plan development would not result in significant sedimentation or debris-related impacts either on the RMDP site or downstream of the site. Instead, the Specific Plan would have a beneficial post-construction impact on downstream sedimentation because, as the site builds out, some steep slopes would be graded to flatter slopes, and many of the areas of the site that have been subject to the vegetation-denuding effects of grazing and burning would be covered with vegetation and other non-erodible surfaces. These changes to the site would reduce site sedimentation to below existing levels and reduce debris volume generation throughout the tributary watershed by roughly 30 percent (1,203,790 cy currently produced during the capital storm event, reduced to a post-Project level of roughly 842,370 cy for a total reduction of roughly 361,420 cy). (Impact Sciences, 2003.) This would, in turn, have beneficial downstream deposition impacts because burned and bulked flows from the site would be substantially reduced, resulting in lower flood flow rates. With implementation of the previously incorporated Specific Plan Mitigation Measures SP-4.2-5, SP-4.2-6, and SP-4.2-7 (DPW plan and map approvals, DPW-approved erosion controls, and DPW SUSMP and SWPPP requirements, respectively) erosion and deposition impacts resulting from build-out of the Specific Plan development are considered less than significant. However, implementation of Project-specific mitigation measures GRR-1 and GRR-4 (DPW required runoff controls and hydromodification controls and channel design, respectively) would further reduce these impacts and ensure that impacts remain less than significant. Accordingly, erosion and downstream deposition impacts would be less than significant under Significance Criterion 2.

**Significance Criterion 3: Indirect Impacts to Geomorphic Function (Significant but Mitigable).** Potential indirect hydromodification impacts to the Santa Clara River and tributaries include stream corridor disturbances from Specific Plan build-out and associated increased runoff intensity, and the altered sediment transport regime resulting from the urbanization (*i.e.*, conversion of land to impermeable surfaces) of the tributary drainages. These impacts would be significant prior to mitigation.

Development along the River would be protected from erosion with bank stabilization built to DPW criteria (Mitigation Measure SP 4.2-6, DPW-approved permanent erosion controls). As future subdivision maps are prepared for portions of the proposed development that are within the floodplain and capital floodway of the Santa Clara River, detailed grading and engineering plans would be prepared with specifications necessary to remove flood and erosion hazards (Mitigation Measure 4.2-5, DPW plan and map approvals). These plans would follow the design criteria established for the River Corridor by the DPW. Final design may result in adjustments to the floodway (*i.e.*, the area of the floodplain that should be kept free of obstructions to allow floodwaters to move downstream) in order to contain the capital flood design event. An evaluation of the more frequent one-year storms is used to determine effects within the channel on an average annual basis. During smaller one-year storms (rather than the 50-year capital flood design event), the depth of flow in the Santa Clara River at the County line would range from approximately 1.3 feet under pre-development conditions to 1.5 feet under post-development conditions due to an increase in impermeable surfaces, which represents an increase of 0.2 feet (2.4 inches) in depth. Further, the velocity of flow would increase no more than 10 percent at the County line due to the development of the Specific Plan and, in all cases, the post-development velocity for the one-year storms would be approximately four fps. (Impact Sciences, 2003). This would not result in a substantial increase in erosiveness based on the DPW Sedimentation Manual, (*i.e.*, Sedimentation Design Curves -- based on the difference in the equilibrium slope and the natural slope [existing slope conditions] and given a 10 percent change in velocity, no change in sediment supply is expected) (December 1990).

The confluence of the tributaries to the Santa Clara River would all be maintained within the SMA/SEA 23 boundaries and preserved in a largely natural state. As indicated above, no significant increases in velocity, erosion, or sedimentation would occur in the River because of the proposed build-out of the Specific Plan. During most storm events, the velocity and depth of the River would remain unchanged from current conditions, since the course of the River is able to meander without being constrained by bridge abutments or bank protection. It is only in the infrequent, 50- to 100-year event where small increases in depth or velocity would occur at these locations along the River as described in **Subsection 4.2.5.3.1**, Direct Impacts. The Criterion 3 analysis in **Subsection 4.2.5.3.1**, Direct Impacts, determined that the impacts to the River for all storm events, including the less frequent 20-, 50-, and 100-year storm events, would be less than significant.

Under the proposed Project, the RMDP is designed to improve drainages within the Specific Plan area that are tributary to the Santa Clara River. The components incorporated into the RMDP would accommodate site grading and land development needs, as well as meeting design standards for flood control, water quality, and habitat restoration purposes (Mitigation Measures 4.2-1 through 4.2-5, flood control improvement approval from DPW, state and federal permits, CDFG streambed agreements, FEMA CLOMR, and DPW plan and map approvals, respectively). Specifically, each of the tributary drainages is designed with hydromodification control components (typically grade stabilizers) in

accordance with DPW design standards to ensure that soft-bottom waterways maintain an equilibrium between sediment supply to the waterway and sediment transport through the waterway. The reconstructed drainage areas would integrate flood control and grade stabilizing measures (*i.e.*, a combination of drop structures/grade stabilizers and bank protection) to maintain sediment equilibrium and protect the channel bed and banks from hydromodification impacts. This design methodology would create stable drainage channels that would support the in-channel revegetated habitat following project implementation. The channel designs focus on adequate channel width, depth, slope, and other parameters based on the post-development flow and sediment regime of each drainage, using an integrated approach that predicts stable characteristics, and that uses structures and other measures only in those drainage locations where erosional forces would exceed the natural stability of the drainage channel. Implementation of Mitigation Measures SP-4.2-5 (DPW plan and map approvals) would ensure that no significant erosion or sedimentation impacts would occur as a result of the proposed Project. The additional implementation of GRR-1 through GRR-6 (DPW required runoff controls, minimization of bridge and structures, structural durability, hydromodification controls and channel design, sediment and debris control facilities, sediment redistribution) would ensure no substantial reductions in geomorphic function would occur in the RMDP area tributaries. Accordingly, with mitigation, impacts resulting from the Specific Plan development are considered less than significant relative to Significance Criterion 3.

**Significance Criterion 4: Indirect Construction and Scour Impacts to Riparian Vegetation (Significant but Mitigable).** Implementation of the Specific Plan would result in the loss of riparian vegetation (inclusive of mule fat scrub, southern willow scrub, southern willow riparian woodland, southern cottonwood willow riparian forest, arrow weed scrub, cottonwood/oak woodland, and alluvial scrub). The impacts to riparian vegetation can be evaluated with the use of the HARC analysis. In addition, this topic is addressed in **Section 4.5**, Biological Resources of this EIS/EIR. As discussed in **Subsection 4.2.5.1**, Impact Assessment Methods, the number of AW-score units ultimately describes the value of a particular reach, and the number of AW-score units impacted versus preserved will show the impacts of the proposed Project and alternatives on wetland and riparian resources (*i.e.*, post-Project HARC scores serve as a surrogate indicator of potential increases in the frequency and magnitude of scour of riparian vegetation [refer to **Subsection 4.2.5.1.4**, Scour Impacts to Riparian Vegetation]). Conceptually, the alternative with the fewest lost AW-score units would be the least damaging alternative. However, an alternative with a greater loss of HARC AW-score units may be mitigated by producing AW-score units in another location within the Project area through wetland/riparian restoration or creation (see **Section 4.6**, Jurisdictional Waters and Streams, for further discussion on the HARC assessment methods).

**Tables 4.2-13** and **4.2-15**, presented above, compare the sum of the hydrology metrics for the Santa Clara River and tributaries, respectively, in the existing and proposed conditions. Also included in **Tables 4.2-13** and **4.2-15** is a comparison of the total hydrology AW-score units and the total HARC AW-score units calculated for the Santa Clara River and tributaries, respectively.

The HARC analysis indicates that the proposed Project would result in a net loss of 2.70 hydrology AW-score units, but would increase the total HARC AW-score units by 42.85 in the Santa Clara River.

In the tributaries, the HARC analysis indicates that, overall, the proposed Project would result in a net loss of 17.08 hydrology AW-score units and 7.17 total HARC AW-score units within the tributaries. Absent mitigation, the decrease in HARC AW-score units within the tributaries would be a significant impact.

The overall increase in HARC AW-score units is primarily attributed to the benefits provided by the proposed Project to riparian habitat as discussed in **Section 4.6**, Jurisdictional Waters and Streams, of this EIS/EIR. Specifically, implementation of Mitigation Measures SW-2 and SW-3 presented in **Section 4.6**, Jurisdictional Waters and Streams, would provide riparian enhancement through removal of exotic species, restoration of sediment equilibrium, and recontouring of existing, incised banks to increase the extent of Corps and CDFG jurisdictional areas as well as providing avoidance and restoration measures in the Potrero and Salt Creek watershed. The basis of design for the tributary streams described in the impact analysis considered current site conditions, and set as performance standards that the restored channels must convey sediment under future conditions in a "dynamically stable condition" (neither long-term erosion nor deposition) and that they support the proposed native revegetation program. These mitigation measures also specify that the success criteria for mitigation sites should take into consideration the functions targeted for "lift" through mitigation. The functional lift obtained through avoidance and restoration must be greater than the loss of total HARC AW-score units. Specifically, Mitigation Measure SW-5 (**Section 4.6**, Jurisdictional Waters and Streams) would be implemented to ensure that all areas where temporary construction impacts affect Corps or CDFG jurisdictional areas are revegetated (generally, these are areas where impacts would occur due to the construction of Project facilities). Accordingly, the indirect impacts to the riparian habitat of the tributaries are considered significant prior to mitigation, but less than significant relative to Significance Criterion 4 through implementation of Mitigation Measures SW-2, SW-3, and SW-5 to fulfill a functional lift in revegetated tributary drainages.

**SCP Indirect Impacts**

**Significance Criteria 1: Short-Term Impacts from Construction Newhall Ranch Specific Plan, VCC, and Entrada Developments (Significant but Mitigable).** Implementation of the proposed SCP component would indirectly facilitate the build-out of the Specific Plan, VCC, and a portion of the Entrada site. Short-term construction impacts to geomorphology associated with construction of the Specific Plan development are included among the indirect impacts of the RMDP component, and are discussed in the preceding subsections.

The VCC site approved for development by Los Angeles County in 1991, includes 12 million sf of industrial/commercial space. Approximately 137 acres (six million square feet) of the VCC site is currently occupied by industrial/commercial buildings. The approved land uses include 177.6 acres of additional industrial/commercial development (including associated public facilities), and 143.6 acres of open space. Build-out of the VCC development has been previously authorized by the Corps (Permit No. 89-00419-A0A), but authorization from CDFG pursuant to Fish and Game Code sections 1600 *et seq*. has not yet been granted. Impacts associated with build-out of the VCC were evaluated in the VCC EIR (Sikand Engineering Associates, 1990). In addition, impacts associated with the filling of waters or

modification of streambeds within the VCC planning area would be mitigated by the terms and conditions set forth in the Corps permit and in a CDFG agreement if CDFG decides to authorize such impacts.

The Entrada planning area consists of approximately 316.1 acres. The proposed land uses consist of approximately 129.5 acres as open space and the remaining 186.6 acres as residential, commercial/industrial, public facilities, and recreational uses.

Construction of the VCC and Entrada developments (particularly site clearing and grading operations) would have the potential to increase sediment flows to and downstream from Castaic Creek, Hasley Creek, Unnamed Canyon 1, Unnamed Canyon 2, Unnamed Canyon 3 and Magic Mountain Canyon during storm events. Absent mitigation, this impact would be significant.

No previously adopted mitigation measures exist for the VCC or Entrada planning areas. Therefore, the geomorphology-related mitigation measures required by this EIS/EIR in those planning areas include the measures previously adopted by Los Angeles County for the Specific Plan site in addition to new measures proposed by the Corps and CDFG. Mitigation measures previously incorporated from the Specific Plan analysis include Mitigation Measures SP-4.2-1 through SP-4.2-7. The full list of mitigation measures related to geomorphology and riparian resources is found in **Subsection 4.2.6**, Mitigation Measures, of this EIS/EIR.

Temporary erosion control to protect property that is in the development process is required by Los Angeles County ordinance and would be implemented as part of the subdivision as the VCC and Entrada sites build-out. Temporary erosion control measures may include minimizing removal of existing vegetation; using temporary soil covers (such as hydroseeding, mulch/binder, and erosion control blankets) to protect exposed soil from wind and rain; and installing silt fencing, berms, and dikes to protect storm drain inlets and drainage courses.

Permanent erosion control measures, such as drainage swales, subsurface drains, slope drains, storm drain inlet/outlet protection, and sediment traps; checking dams to reduce flow velocities; and permanent desilting basins, would be designed as part of final drainage plans prepared during the subdivision process. (Mitigation Measure SP-4.2-6.) In addition, a Hydrology Plan, Drainage Plan, and Grading Plan (including an Erosion Control Plan, if required) for each subdivision would be prepared by the applicant to ensure that no significant erosion, sedimentation, or flooding impacts would occur during or after site development. (Mitigation Measure SP-4.2-5.) To further reduce construction impacts, the proposed Project includes measures to satisfy all NPDES Program requirements, including the preparation of an SUSMP and a SWPPP. (Mitigation Measure SP-4.2-7.)

Absent mitigation, there would be significant short-term sedimentation impacts during construction with respect to Significance Criterion 1. However, previously incorporated Specific Plan Mitigation Measures SP-4.2-6, SP-4.2-5, and SP-4.2-7 would ensure that regulatory requirements are implemented and short-term impacts related to construction are less than significant through proper application of sediment controls and other BMPs required by existing local, state, and federal regulations.

**Significance Criteria 2: Indirect Impacts from Erosion and Downstream Deposition (Significant but Mitigable).** Implementation of the proposed SCP component would indirectly facilitate the build-out of

the Specific Plan, VCC, and a portion of the Entrada site. Indirect impacts of erosion and downstream deposition associated with build-out of the Specific Plan development are included among the indirect impacts of the RMDP Project component, and are discussed in the preceding subsections. Impacts to Ventura County beaches are included among the secondary impacts.

Indirect impacts of erosion and downstream deposition associated with build-out of the VCC and Entrada planning areas could occur in Castaic Creek and Hasley Creek within the VCC planning area and Unnamed Canyon 1, Unnamed Canyon 2, Unnamed Canyon 3 and portions of Magic Mountain Canyon in the Entrada planning area. The developed area of the VCC and Entrada developments would be covered with non-erosive surfaces including pavement and permanent vegetation, which would reduce the sedimentation of site runoff. Permanent erosion control measures that reduce sediment in runoff include check dams to reduce flow velocities in tributary water courses, drainage swales, slope drains, subsurface drains, storm drain inlet/outlet protection, and sediment traps. The specific improvements for each drainage area within the VCC and Entrada development would be designed as part of the final Drainage Plan prepared to DPW standards during the subdivision process. (Mitigation Measure SP-4.2-5, DPW plan and map approvals.)

In order to prevent sediment and debris from the upper reaches of the drainage areas from entering storm drainage improvements, permanent erosion control measures would be implemented, including the installation of desilting and debris basins, drainage swales, slope drains, storm drain inlet/outlet protection, and sediment traps. (Mitigation Measure SP-4.2-6.) The specific improvements for each drainage area would be designed as part of the final Drainage Plan prepared to DPW standards during the subdivision process. (Mitigation Measure SP-4.2-5.) In addition, Mitigation Measure SP-4.2-7 would further reduce erosion impacts by requiring that stormwater discharges from open channels or drainage systems discharging to the Santa Clara River and Project tributaries in excess of four fps (erosive flows) be controlled to prevent accelerated erosion and protect River habitat. Discharge flows would be regulated using water control features and energy dissipation structures where required to reduce discharge velocities to non-erosive rates.

With installation of temporary and permanent erosion/sedimentation control measures, build-out of the VCC and Entrada sites would not result in significant sedimentation or debris-related impacts within Castaic Creek, Hasley Creek, Unnamed Canyon 1, Unnamed Canyon 2, Unnamed Canyon 3 or within the Project reach of the Santa Clara River. Instead, the developments would have a beneficial post-construction impact on downstream sedimentation because, as the sites build-out, some steep slopes would be graded to flatter slopes, and many of the areas of the site that have been subject to the vegetation-denuding effects of grazing and burning would become covered with vegetation and other non-erodible surfaces. This, in turn, would have beneficial downstream deposition impacts because burned and bulked flows from the site would be reduced, resulting in lower flood flow rates. With implementation of Mitigation Measures SP-4.2-5, SP-4.2-6, and SP-4.2-7, impacts within the Santa Clara River resulting from build-out of the VCC and Entrada developments are considered less than significant relative to Significance Criterion 2.

**Significance Criteria 3: Indirect Impacts to Geomorphic Function (Significant but Mitigable).** Implementation of the proposed SCP component would indirectly facilitate build-out of the Specific Plan,

VCC, and a portion of the Entrada site. Indirect hydromodification impacts associated with build-out of the Specific Plan development are included among the indirect impacts of the RMDP Project component, and are discussed in the preceding subsections. Potential indirect hydromodification impacts to the Santa Clara River, Castaic Creek, Hasley Creek, Unnamed Canyon 1, Unnamed Canyon 2, Unnamed Canyon 3, and portions of Magic Mountain Canyon include stream corridor disturbances from VCC and Entrada build-out and associated increased runoff intensity from the urbanized tributary drainages.

As described in the discussion of Significance Criterion 2 above, no significant increases in velocity, erosion, or sedimentation would occur in the River because of build-out of the proposed VCC and Entrada sites. Thus, the geomorphic impacts to the Santa Clara River resulting from the build-out of the VCC and Entrada developments are considered less than significant.

PACE has prepared a "Hydrology/Hydraulic Study for Public Drain 2508, Hasley Creek Bank and Flood Protection at Valencia Commerce Center-Phase 7" (PACE, 2005). As part of that study, the sediment transport potential in Hasley Creek was calculated on a reach-by-reach basis to determine equilibrium slopes for the Project reach, specifically in the downstream soil cement bank protection reaches. Required erosion protection was determined for the west bank just downstream of Hasley Canyon Road. The existing conditions natural channel centerline would be realigned because of the adjacent development. The maximum offset from the existing centerline to the proposed channel centerline is approximately 400 feet. The proposed flood protection for Hasley Creek would tie-in to the existing downstream concrete channel improvements. The soil cement bank protection alignment extends approximately 2,700 feet along the east bank and wraps around the parcel boundary and ties-in to Hasley Canyon Road. The west bank alignment extends approximately 1,600 feet. A bio-engineered slope protection is proposed on the west bank immediately following the soil cement bank protection at the last drop structure. Riprap bank protection is also part of the channel improvements and it would protect the oil well site on the west side and Hasley Canyon Road. The proposed bank stabilization utilizes soil cement bank protection to provide scour and flood protection up to the Los Angeles County capital flood. Velocities expected in Project reach range from 7.7 to 18.4 fps within the channel and channel depths range from 3.5 to 15.5 along the soil cement reach. Four drop structures are proposed within the Project reach as part of the stable slope design. The longitudinal distance of each drop structure invert is approximately 40 to 50 feet. Vertical drops are typically five to nine feet. Drop structure velocities could exceed 30 fps during the design event. The proposed vegetative slope bank protection along the west bank would be a bio-engineered design. The average velocity within the bio-engineered reach in the proposed condition would be 10 fps and the maximum water depth would be three feet with an average top width of 365 feet. The Hasley Creek design components are incorporated into the channel design to accommodate site grading and land development needs, as well as meeting design standards for flood control, water quality, and habitat restoration purposes. (See **Section 4.6**, Jurisdictional Waters and Streams.)

PACE has also prepared the "Castaic Fluvial Study Phase" (PACE, 2006b) to evaluate the impacts from build-out of the VCC planning area from: (1) fluvial modifications of the Castaic Creek bed from single hypothetical storm events; and (2) changes in the floodplain fluvial operation over the long term. The proposed buried soil cement bank protection on both the east and west banks of the Creek is intended to provide long-term erosion protection from lateral migration of the bank and flood protection for the adjacent proposed development areas. The results of the analysis indicate no grade differences greater

than one foot between the existing and proposed conditions resulting from general streambed adjustments, since the majority of the length of the proposed bank protection does not alter the hydraulics. The exception to this is at the Commerce Center Drive Bridge, where degradation increased by 2.0 feet because of the channelization of Castaic Creek in the proposed condition. In addition, an overall trend in general adjustment for the study reach was not apparent for either the existing condition or proposed condition. The change in water surface elevations would be negligible, with changes less than 0.1 feet between the existing and proposed condition. The hydraulic modeling also indicates that velocities in the existing and proposed conditions do not vary more than 0.2 fps. Accordingly, the estimated change in hydraulic characteristics to Castaic Creek would be relatively minor and impacts would be less than significant.

In the Entrada planning area, 2,840, 3,776, and 356 lf of buried storm drain is proposed to convert Unnamed Canyon 1, Unnamed Canyon 2, and Unnamed Canyon 3, respectively. These modifications would result in approximately 0.2, 1.6, and 0.6 acres of converted channel area along Unnamed Canyons 1, 2, and 3, respectively, which would be a significant impact to the geomorphic function of these tributaries prior to mitigation. These design components incorporated into the engineering design would accommodate site grading and land development needs of the build-out of VCC and Entrada, as well as meeting design standards for flood control and water quality purposes.

In accordance with Mitigation Measure SP-4.2-5, prior to the approval of each subdivision map, a Hydrology Plan, Drainage Plan, and Grading Plan for each subdivision would be prepared to ensure that no significant erosion, sedimentation, or flooding impacts would occur during or after site development. The channel modification components incorporated into the designs as described above for Castaic Creek, Hasley Creek, Unnamed Canyon 1, Unnamed Canyon 2 and Unnamed Canyon 3 are proposed to reduce the channel impacts resulting from area development to less than significant.

However, as discussed above, there would be impacts to the geomorphic function of RMDP area tributaries resulting from disturbances related to build-out of the Specific Plan and associated modifications to runoff frequency and intensity, and the sediment transport regime from the urbanized drainages. Under Alternative 2 (proposed Project), the RMDP is designed to improve drainages within the Specific Plan area that are tributary to the Santa Clara River. Each of the tributary drainages is designed with hydromodification control components in accordance with DPW design standards to ensure that soft-bottom waterways maintain an equilibrium between sediment supply to the waterway and sediment transport through the waterway. In addition, Mitigation Measures GRR-1, GRR-2, and GRR-4 (DPW required runoff controls, minimization of bridge and structures, and hydromodification controls and channel design) would be implemented to reduce impacts to the geomorphic function of the tributaries resulting from the build-out of the proposed developments. These measures would ensure that erosion and deposition impacts are reduced to less-than-significant levels. Accordingly, with mitigation, impacts resulting from the build-out of the Specific Plan, VCC, and Entrada planning areas are considered less than significant relative to Significance Criterion 3.

**Significance Criterion 4: Indirect Construction and Scour Impacts to Riparian Vegetation (Less than Significant).** Implementation of the proposed SCP component would indirectly facilitate the build-out of the Specific Plan, VCC, and a portion of the Entrada site. Indirect impacts to riparian vegetation

associated with build-out of the Specific Plan development are included among the indirect impacts of the RMDP Project component, and are discussed in the preceding subsections.

Riparian vegetation communities associated with the Santa Clara River occur adjacent to the VCC and Entrada sites. The confluence of the VCC tributaries with the Santa Clara River occurs at the mouth of Castaic Creek, which is within the SMA/SEA 23 boundaries and would be preserved in a largely natural state. The ephemeral drainages within the Entrada planning area have very low discharge rates due to their small watershed size, and these flows would not substantially affect riparian areas in the River. As indicated above, no significant increases in velocity, erosion, or sedimentation would occur in the River because of the proposed build-out. Thus, no significant impact to riparian vegetation would occur in the River due to the VCC or Entrada developments.

Tributary riparian vegetation communities occur within the Castaic Creek and Hasley Creek corridors within the VCC planning area. The ephemeral tributaries in the Entrada planning area do not support robust riparian vegetation. As indicated in the preceding impact discussion, no significant increases in velocity, erosion, or sedimentation would occur in the VCC and Entrada planning tributaries because of the proposed build-out and impacts to riparian vegetation would be less than significant. However, grading during construction could lead to loss of riparian vegetation, as described in **Section 4.5**, Biological Resources, of this EIS/EIR.

#### 4.2.5.3.3 Secondary Impacts

**RMDP and SCP Secondary Impacts**

**Significance Criterion 6: Impacts to the "Dry Gap" (Less than Significant).** The Santa Clara River is perennial from the existing Valencia WRP to approximately 3.5 miles downstream of the Los Angeles County/Ventura County line near Rancho Camulos. Further downstream, the Santa Clara River flows through the Piru groundwater basin where surface water flow in the River is lost to groundwater. GSI Water Solutions, Inc. (2008) evaluated a series of historic air photos from 1927 to present, and assessed observed conditions in conjunction with known vegetation and geological information. GSI noted a fault control on the upstream end of the Piru basin, leading to a thick accumulation of alluvial sediments and a deep groundwater table. Taken together, these factors led to an ephemeral Santa Clara River in this zone during each year evaluated. Specifically, surface water flow in the River disappears completely and infiltrates into the Piru groundwater basin, forming an ephemeral "Dry Gap" reach for most of the year.

Two WRPs are located upstream of the future Newhall Ranch WRP. These two WRPs are the Valencia WRP and the Saugus WRP, which are operated by the County Sanitation Districts of Los Angeles County (CSD), the agency that will operate the Newhall Ranch WRP. Both upstream WRPs discharge water to the Santa Clara River. Discharges from the Saugus WRP began in 1966, and discharges from the Valencia WRP began in 1967. The Saugus WRP, located near the Bouquet Canyon Road bridge, has a permitted dry weather average design capacity of 6.5 mgd, and the Valencia WRP has a permitted dry weather average design capacity of 21.6 mgd. The combined average discharge of treated water from the Saugus and Valencia WRPs was approximately 20 mgd during the period January 2004 through June 2007. In 2006, the combined annual discharge volume from these two WRPs was 22,913 AF.

The timing and magnitude of future discharges from the Newhall Ranch WRP were originally identified from water demand projections for the Newhall Ranch community. These projections were developed and presented in documents supporting the Newhall Ranch Specific Plan (FORMA, 2003) which was approved by Los Angeles County on May 27, 2003. As discussed in the Draft Additional Analysis for the Specific Plan (Impact Sciences, 2001), the Newhall Ranch WRP will be a near-zero discharge facility. Most of the treated water generated by the Newhall WRP will be recycled to meet non-potable (outdoor irrigation) demands of the Specific Plan. Based on a detailed water demand analysis presented, the inflows to the Newhall Ranch WRP will average 5,630 acre-feet per year (AF/yr), of which 5,344 AF/yr will be recycled. The remaining 286 AF will be discharged to the Santa Clara River during the wettest (winter) months, at a rate of between 0.6 and 2.0 mgd, which is equivalent to rates of 0.9 to 3.1 cubic feet per second (cfs). This discharge will occur primarily during December and January. Additionally, during wet years (when rainfall is significantly above average because of heavy winter storms), non-potable demands may be lower than average during the winter and early spring months, resulting in Newhall Ranch WRP discharge volumes greater than 286 AF. This discharge volume could amount to as much as 1,025 AF, based on a 5- to 6-month discharge period (beginning as early as October or November and potentially extending through March) and the discharge limit of 2 mgd that is specified in the permit for the Newhall Ranch WRP (Los Angeles RWQCB, 2007).

Compared with the 2006 annual discharge of 22,913 AF from the Valencia WRP and the Saugus WRP, the future Newhall Ranch WRP discharge of 286 AF is low (about 1.25%). Additionally, future discharges from the Saugus and Valencia WRPs will increase over time. Specifically, the annual discharges to the River from the Saugus and Valencia WRPs could increase to about 24,300 AF in the future, an increase of 1,400 AF/yr compared with annual discharge for 2006 (GSI Water Solutions, Inc., 2008). Accordingly, in the future, the volume of discharge from the Newhall Ranch WRP will likely represent a smaller fraction of the total discharges from WRPs to the Santa Clara River.

The future Newhall Ranch WRP discharge is also negligible compared with the total river flow volume, which consists of WRP discharges, groundwater discharges to the river, and storm flows. During a recent 5-year period of low rainfall (calendar years 1999 through 2003), total annual flow in the Santa Clara River, as measured at the Los Angeles County/Ventura County line, ranged from about 25,000 to 44,000 AF/yr, and the non-storm flow (groundwater discharge and WRP flows) ranged from about 23,000 to 30,000 AF/yr (GSI Water Solutions, Inc., 2008). For this period of dry conditions, the future Newhall Ranch WRP average discharge of 286 AF/yr would have represented between 0.6 and 1.1 percent of the total annual flow volume in the river. The Newhall Ranch WRP discharge would represent a much smaller percentage of the total annual flow volume in the River during wet years when the annual volume of river flow at the county line can exceed 100,000 AF/yr -- and even 200,000 AF/yr -- because of high rainfall runoff from the watershed. For example, historical streamflow measurements at the Los Angeles County/Ventura County line during the period 1977 through 2006 indicate that the 90th and 95th percentile values of November-March streamflow, which are indicative of significant rainfall years, are 385 and 692 cfs, respectively (GSI Water Solutions, Inc., 2008). These flows are substantially greater than the future discharges from the Newhall Ranch WRP. Specifically, the future average discharge from the Newhall Ranch WRP (0.6 mgd [0.9 cfs]) is 0.13 percent to 0.23 percent of these streamflows, while the future potential maximum discharge from the Newhall Ranch WRP (2.0 mgd [3.1 cfs]) is 0.45 percent to 0.81 percent of these streamflows. Additionally, the total non-storm flow during wet years can exceed

50,000 AF/yr, with the year-to-year variability reflecting the influence of groundwater discharges to the river (which vary according to rainfall-induced fluctuations in the water table elevation). In summary, the future Newhall Ranch WRP discharges will be very small compared with future river flows, comprising 1 percent or less of river flow during average and dry years, and only 0.1 percent to 0.8 percent of river flows during wet years, which will not substantially lengthen the duration of seasonal flows in the Dry Gap.

The potential impacts of the Newhall Ranch WRP to the Dry Gap are considered less than significant relative to Significance Criterion 6 since they will not substantially lengthen the duration of seasonal flow in the Dry Gap. This significance finding is based on the fact that discharge from the Newhall Ranch WRP would occur in the winter and would be small relative to the overall flow in the Santa Clara River, and the existing data shows that increases in base flow due to discharges from the Valencia WRP and the Saugus WRP since the 1960s have not led to a substantial change in the duration of seasonal flow in the Dry Gap.

**Significance Criterion 7: Impacts to Ventura County Beaches (Less than Significant).** The effects of the Project components on beach replenishment are a function of the sediment load delivered through the Project reach. As discussed in **Subsection 4.2.3.1.3**, Beach Replenishment, above, the Santa Clara River contributes approximately 60 percent of beach sand within Ventura County. The reduction of area subject to erosion due to project components and the build-out of the proposed Specific Plan, VCC, and Entrada developments could result in a relative reduction of floodwater sediment, which could negatively impact beaches, as incrementally less sediment would be available for their replenishment.

The RMDP component of the proposed Project that would have the most effect on sediment supply in the tributaries is the conversion of tributary drainage to buried storm drain. For this analysis, it is assumed that the area converted to buried storm drain results in a net loss of sediment supplied by the affected area. As detailed in **Subsection 4.2.4.1.3**, Beach Replenishment, roughly 1,170 tons per square mile per year of suspended sediment originates from the area upstream of the Los Angeles County/Ventura County line. Approximately 38 acres (0.06 square miles) within the tributaries that could potentially contribute to sediment supply would be converted to buried storm drain; this could result in a net reduction of 70 tons of sediment per year in the tributaries.

In order to estimate the impacts to sediment supply associated with the RMDP components within the Santa Clara River floodplain, it is assumed that the areas of the floodplain that are subject to velocities greater than four fps contribute to the sediment supply within the Project reach during the capital flood event (chosen to provide a conservative impact estimate since the capital flood would have the maximum reduction in area subject to velocities greater than 4 fps as a result of the proposed Project ). Accordingly, the proposed Project would result in a maximum reduction of 181.7 acres (0.28 square miles) of floodplain area subject to velocities greater than four fps during the capital flood event (discharge resulting from a hypothetical four-day storm with a 50-year return period falling on a saturated watershed with debris from a wildfire) (see **Table 4.2-11**). Therefore, the proposed Project would result in a maximum net reduction of about 181.7 acres (0.28 square miles) of channel area that could potentially contribute to sediment supply. Given this estimate, the reduction of 181.7 acres (0.28 square miles) would result in a maximum direct reduction of approximately 330 tons of sediment per year. In total, the

proposed Project could result in a reduction of approximately 400 tons (70 tons from tributaries and 330 tons from Santa Clara River) of sediment per year delivered through the Project reach.

The build-out of the Specific Plan would have greater effects to the sediment supplied to the River system. The build-out of the Specific Plan area under Alternative 2 would convert approximately 5,087 acres (8.0 square miles) to non-erodible surfaces, including pavement and permanent vegetation that would reduce the sedimentation of site runoff. Accordingly, this would result in the reduction of roughly 9,299 tons of sediment per year.

The drainage areas in which the VCC and Entrada sites lie would not be completely developed; therefore, storm flows from the upper reaches would contain sediment and vegetative debris. The VCC planning area is approximately 321.3 acres. The approved land uses include 177.6 acres of industrial/commercial development (including associated public facilities), and 143.6 acres of open space. The Entrada planning area consists of approximately 316.1 acres. The proposed land uses consist of approximately 129.5 acres as open space and the remaining 186.6 acres as residential, commercial, and recreational uses and public facilities. Combined, the build-out of the VCC and Entrada sites would result in approximately 364.2 acres (0.57 square miles) of non-erosive surfaces, including pavement and permanent vegetation that would reduce the sedimentation of site runoff. The reduction of 364.2 acres (0.57 square miles) of sediment-generating area would result in a direct reduction of roughly 667 tons of sediment per year.

As detailed in **Subsection 4.2.3.1.3**, Beach Replenishment, the Santa Clara River exports an estimated 4.08 million tons per year from its mouth into the Santa Barbara Channel. In total, the RMDP and SCP would result in the net reduction of 9,966 tons of sediment per year, or approximately 0.25 percent reaching the Santa Barbara Channel, which would be a less-than-significant impact. In order to minimize this reduction in sediment delivery to Ventura County beaches, Mitigation Measure GRR-6 specifies that sediment from upland sources, such as debris basins and other sediment retention activities, would be redistributed in permitted upland and/or riparian locations along the Santa Clara River to reintroduce sediment for beach replenishment purposes. This sediment management activity would lessen the adverse effect of debris and sediment reduction on downstream beach erosion.

Based on this analysis, the reduction of sediment delivered to Ventura County beaches due to the RMDP components and build-out of the Specific Plan, VCC and Entrada planning areas would be less than significant under Significance Criterion 7 since the decrease in average annual sediment transported to the beaches would be less than 1 percent.

#### 4.2.5.4 Impacts of Alternative 3 (Elimination of Planned Potrero Bridge and Additional Spineflower Preserves)

**Santa Clara River. Figure 3.0-12** (**Section 3.0**, Description of Alternatives) depicts the locations of the Alternative 3 proposed RMDP Santa Clara River features relative to river jurisdictional areas. As shown, one proposed bridge, Long Canyon Road Bridge, and one previously approved bridge, Commerce Center Drive Bridge, would be located across the main stem of the Santa Clara River, resulting in permanent

impacts due to bridge crossings.[12] No bridge is proposed under Alternative 3 at the mouth of Potrero Canyon (Potrero Canyon Road Bridge).[13] As shown, buried bank stabilization would be installed in upland and riparian areas along approximately one-half of the north bank and one-third of the south bank of the Santa Clara River. The WRP outfall to the Santa Clara River also would be constructed. As shown, permanent bank stabilization impact areas exist on the north and south banks of the Santa Clara River. The geofabric utility corridor bank protection also is proposed on the north side of the Santa Clara River between San Martinez Grande Canyon and Chiquito Canyon. A summary of the RMDP infrastructure authorized under the RMDP components of Alternative 3 is presented in **Table 4.2-16a**. The proposed RMDP components within the Santa Clara River are described and illustrated in **Section 3.0**, Description of Alternatives, Alternative 3 & 4 -- RMDP Santa Clara River Features.

**Table 4.2-16a** summarizes the characteristics of the major RMDP infrastructure along the Santa Clara River, including north side (18,811 lf) and south side (7,728 lf), for a total of 26,540 lf of buried bank stabilization to be constructed along the Santa Clara River. This table also shows 22 storm drain outlets along the north bank and three such outlets on the south bank of the Santa Clara River (25 storm drain outlets). In addition, the table documents the length, width, and vertical clearance of the two bridges, as well as the number of piers supporting the bridges.

**Table 4.2-16a**
**Alternative 3 Santa Clara River Major RMDP Infrastructure**

| Santa Clara River Location | Bank Stabilization (lf) | Outlets (No.) | Bridges | | | |
|---|---|---|---|---|---|---|
| | | | Length (lf) | Width (lf) | Piers (No.) | Vertical Clearance (ft) |
| **Bridges** | | | | | | |
| Commerce Center Drive Bridge | - | - | 1,200 | 100 | 9 | 22 |
| Long Canyon Road Bridge | - | - | 980 | 100 | 9 | 31-40 |
| Potrero Canyon Road Bridge | - | - | - | - | - | - |
| **Banks** | | | - | - | - | - |
| North River Bank | 18,811 | 22 | - | - | - | - |
| South River Bank | 7,728 | 3 | - | - | - | - |
| **Total** | **26,540** | **25** | - | - | - | - |

Source: RMDP, 2008.

Alternative 3 would involve the designation of 84.5 acres of Newhall Ranch as spineflower preserve, in addition to the 64.3 acres of previously designated spineflower conservation easements. Including the 72.9-acre preserve in the Entrada planning area, the overall spineflower preserves under this alternative

[12] The Commerce Center Drive Bridge was previously analyzed in the Final EIS/EIR prepared and approved by the Corps and CDFG in connection with previously adopted NRMP (SCH No. 1997061090, August 1998).

[13] The Potrero Canyon Road Bridge was approved by Los Angeles County as part of the Specific Plan on May 27, 2003.

would total 221.8 acres. Implementation of Alternative 3 would result in the reduction of approximately 262.9 acres of developable area on Newhall Ranch when compared to the build-out potential of the proposed RMDP. This alternative also would result in a decrease of 46.8 acres of developable area for the Entrada planning area and no difference in developable area in the VCC planning area. The reduction of developable area would occur due to preservation of streams and riparian areas, designation of spineflower preserves, proximity to unstabilized drainages, and reduction of access to isolated parcels.

**Tributary Drainages. Figure 3.0-13** (**Section 3.0**, Description of Alternatives) illustrates the modified, converted, and preserved tributary drainages within the Project area under Alternative 3. If this alternative is implemented, 51,725 lf of tributary drainages will be modified, and 3 new bridges and 12 culverted road crossings would be constructed within the Project area. This alternative would require 60,010 lf of ephemeral and intermittent drainages to be replaced with buried storm drains to accommodate the creation of building pads. Approximately 130,314 lf of tributary drainages will be preserved, primarily in Salt Canyon. The proposed RMDP components are described and illustrated in **Section 3.0**, Description of Alternatives (Alternative 3 Unimproved and Converted Tributary Drainages).

Under Alternative 3, there are five major tributary drainages that would be partially regraded or modified but remain in a soft-bottom channel condition: Chiquito Canyon, San Martinez Grande Canyon, Potrero Canyon, Long Canyon, and Lion Canyon. Significant portions of several small, tributary drainages would be graded and replaced with storm drains or other appropriate conveyance facilities, including: Magic Mountain Canyon, Middle Canyon, Dead-End Canyon, Exxon Canyon, Mid-Martinez Canyon, Off-Haul Canyon, Homestead Canyon, the Chiquito Canyon agricultural ditch, Unnamed Canyon B, Unnamed Canyon C, Unnamed Canyon D, Unnamed Canyon 1, and Unnamed Canyon 2.

**Chiquito Canyon.** Chiquito Canyon would be modified to require stabilizing treatments to protect the channel and surrounding development from excessive vertical scour and lateral channel migration as shown on **Figure 3.0-14** (**Section 3.0**, Description of Alternatives). The existing drainage would remain intact, but would sustain permanent and temporary impacts from construction of stabilization elements, including buried bank stabilization and grade stabilization structures. Approximately 7,264 lf of buried bank stabilization would be installed along the west bank and 7,380 lf of buried bank stabilization would be installed along the east bank of Chiquito Canyon. In addition, approximately 2,791 lf of drainage would be converted to buried storm drain. Three culverted road crossings would be installed along Chiquito Canyon to accommodate Specific Plan traffic circulation, plus a culverted road extension would be installed for the Caltrans SR-126 road widening project.[14] **Table 4.2-16b** describes the Alternative 3 tributary drainage RMDP infrastructure characteristics, including the Chiquito Canyon modified drainage. The proposed RMDP components are described and illustrated in **Section 3.0**, Description of Alternatives, Proposed Chiquito Canyon Tributary Treatments -- Alternatives 3 & 6.

[14] In addition, as part of the Caltrans SR-126 road widening project, the existing six-lane bridge allowing SR-126 to cross the Castaic Creek drainage would be expanded to eight lanes.

**Table 4.2-16b**
**Alternative 3 Tributary Drainage RMDP Infrastructure**

| Drainage Location | Drainage Modified (lf) | Drainage Converted to Buried Storm Drain (lf) | Bank Stabilization[1] (lf) | | Preserved Drainage (lf) | Road Crossings | |
|---|---|---|---|---|---|---|---|
| | | | West Bank | East Bank | | Bridges | Culverts |
| **Modified Drainages** | | | | | | | |
| Chiquito Canyon | 8,370 | 2,791 | 7,264 | 7,380 | 898 | - | 3 |
| Lion Canyon | 5,614 | 6,316 | - | - | - | - | 1 |
| Long Canyon | 9,669 | 910 | 8,828 | 8,815 | - | - | 3 |
| Potrero Canyon | 15,503 | 10,918 | 14,594 | 13,195 | 13,272 | 2 | 3 |
| San Martinez Grande Canyon | 4,792 | - | 2,739 | 3,059 | 378 | 1 | 1 |
| Subtotal | 43,948 | 20,935 | 33,426 | 32,450 | 14,548 | 3 | 11 |
| **Unimproved/Converted Drainages** | | | | | | | |
| Agricultural Ditch | 317 | 1,479 | - | - | - | - | - |
| Ayers Canyon | 147 | - | - | - | 2,318 | - | 1 |
| Dead-End Canyon | - | 1,931 | - | - | - | - | - |
| Exxon Canyon | - | 1,276 | - | - | 2,265 | - | - |
| Homestead Canyon | - | 609 | - | - | - | - | - |
| Humble Canyon | - | 421 | - | - | 5,116 | - | - |
| Middle Canyon | - | 7,439 | - | - | 148 | - | - |
| Mid-Martinez Canyon | 22 | 4,541 | - | - | 250 | - | - |
| Off-Haul Canyon | - | 7,593 | - | - | 1,185 | - | - |
| Salt Canyon | 7,290 | - | - | 1,992 | 101,470 | - | - |
| Magic Mountain Canyon | - | 6,111 | - | - | - | - | - |
| Unnamed Canyon 1 | - | 4,647 | - | - | - | - | - |
| Unnamed Canyon 2 | 2 | 391 | - | - | 24 | - | - |
| Unnamed Canyon A | - | - | - | - | 1,293 | - | - |
| Unnamed Canyon B | - | 1,004 | - | - | 568 | - | - |
| Unnamed Canyon C | - | 402 | - | - | 869 | - | - |
| Unnamed Canyon D | - | 1,232 | - | - | 260 | - | - |
| Subtotal | 7,777 | 39,075 | - | 1,992 | 115,765 | - | 1 |
| **Totals** | **51,725** | **60,010** | **33,426** | **34,442** | **130,314** | **3** | **12** |

Notes:

[1] The lf of bank stabilization does not necessarily reflect impacts to jurisdictional areas; it only provides the linear feet of bank protection to be installed along various tributary drainages.

Source: RMDP, 2008.

**San Martinez Grande Canyon.** Alternative 3 also proposes that a soft-bottom channel be constructed to incorporate the existing alignment of San Martinez Grande Canyon Road between SR-126 and the northern Project boundary as shown on **Figure 3.0-15** (**Section 3.0**, Description of Alternatives). The existing drainage would sustain permanent and temporary impacts from construction of the modified tributary drainage, including buried bank stabilization and grade stabilizing structures. Approximately 2,739 lf of buried bank stabilization would be installed along the west bank and 3,059 lf of buried bank stabilization would be installed along the east bank of San Martinez Grande Canyon. As shown, one bridge and one culverted road crossings would be installed along San Martinez Grande Canyon to accommodate Specific Plan traffic circulation, plus a culverted road extension would be installed for the Caltrans SR-126 road widening project. **Table 4.2-16b**, above, describes the Alternative 3 tributary drainage RMDP infrastructure characteristics, including the San Martinez Grande Canyon modified drainage. The proposed RMDP components are described and illustrated in **Section 3.0**, Description of Alternatives, Proposed San Martinez Grande Tributary Treatments -- Alternative 3).

**Long Canyon. Table 4.2-16b**, above, describes the Alternative 3 tributary drainage RMDP infrastructure characteristics, including the Long Canyon modified drainage). Approximately 8,828 lf of buried bank stabilization would be installed along the west bank and 8,815 lf of buried bank stabilization would be installed along the east bank of Long Canyon. In addition, approximately 910 lf of drainage would be converted to buried storm drain. Three culverted road crossing would be installed along Long Canyon to accommodate Specific Plan circulation. The proposed RMDP components are described and illustrated in **Section 3.0**, Description of Alternatives, Proposed Long Canyon Tributary Treatments -- Alternatives 2 & 3.

**Potrero Canyon.** In Potrero Canyon, Alternative 3 would require bank stabilization to be constructed along both sides of the Potrero Canyon drainage as shown on **Figure 3.0-16** (**Section 3.0**, Description of Alternatives). In the eastern upstream reaches of Potrero Canyon, the existing drainage would be graded and flows would be converted to underground storm drain. At a point approximately four-fifths of the way up the drainage, the storm drain would convey flows into a soft-bottom channel constructed approximately parallel to the existing drainage. Between the top of the mesic meadow and the top of the cottonwood/willow woodland just upstream of the saltgrass meadow, bank stabilization would be constructed in upland areas, effectively widening the soft-bottom channel in this reach. Bank stabilization would be discontinued immediately upstream of the mesic meadow, which would remain unstabilized.

Two new bridges and two road crossing culverts would be constructed at approximately even intervals between the upstream end of the mesic meadow and the upstream end of the saltgrass meadow. A fifth road crossing culvert would cross the channel farther upstream, just downstream of the point where the drainage begins to branch **Figure 3.0-16** (**Section 3.0**, Description of Alternatives). Grade stabilization structures are proposed along the entire length of the soft-bottom channel. Approximately 14,594 lf of buried bank stabilization would be installed along the west bank, and 13,195 lf of buried bank stabilization would be installed along the east bank of Potrero Canyon. Approximately 10,918 lf of drainage would be converted to buried storm drain. As stated, two bridge crossings and three road crossing culverts would be constructed to allow Specific Plan roadways to cross the Potrero Canyon drainage at the locations shown in **Figure 3.0-16** (**Section 3.0**, Description of Alternatives).

**Figure 3.0-16** (**Section 3.0**, Description of Alternatives) also shows the relationship of the proposed Potrero Canyon drainage modifications to the proposed Potrero spineflower preserve to the west. **Table 4.2-16b**, above, describes the Alternative 3 tributary drainage RMDP infrastructure characteristics, including the Potrero Canyon modified drainage. The proposed RMDP components are described and illustrated in **Section 3.0**, Description of Alternatives, Proposed Potrero Tributary Treatments -- Alternative 3.

**Lion Canyon.** Proposed drainage treatments in Lion Canyon for Alternative 3 include approximately 6,316 lf of drainage would be converted to buried storm drain in the western, central, and eastern portions of Lion Canyon, as shown on **Figure 3.0-9** (**Section 3.0**, Description of Alternatives). One culverted road crossing would be constructed to allow Specific Plan roadways to cross the Lion Canyon drainage at the locations shown on **Figure 3.0-9** (**Section 3.0**, Description of Alternatives). **Table 4.2-16b**, above, describes the Alternative 3 tributary drainage RMDP infrastructure characteristics, including the Lion Canyon modified drainage. The proposed RMDP components are described and illustrated in **Section 3.0**, Description of Alternatives, Lion Canyon Detail Alternative 2 -- 6 Proposed RMDP Tributary Treatments.

**Minor Tributaries and Drainages.** One culverted road crossing would be constructed across the mouth of the Ayers Canyon drainage. No other drainage facilities would be constructed in Ayers Canyon. In addition, the existing six-lane bridge allowing SR-126 to cross the Castaic Creek drainage would be expanded to eight lanes. Approximately 39,075 lf of drainage within the minor tributaries would be converted to buried storm drain and approximately 115,765 lf of minor tributary drainage would be preserved under Alternative 3. **Table 4.2-16b**, above, describes the Alternative 3 tributary drainage RMDP infrastructure characteristics, including the converted and preserved drainages.

#### 4.2.5.4.1 Direct Impacts

**RMDP Direct Impacts**

**Santa Clara River -- Significance Criterion 1: Short-Term Impacts from Construction of Bridges, Bank Stabilization, and Turf Reinforcement Mats (Significant but Mitigable).** Installation of bank stabilization features and bridge piers and abutments would directly impact elements of Santa Clara River geomorphology. Bridge piers and abutments would have localized effects on channel alignment resulting in significant impacts. Under Alternative 3, the Potrero Canyon Road Bridge is not proposed and the associated bridge pier and abutment features are not required and fewer linear feet of bank stabilization would be constructed. Therefore, Alternative 3 would have a lesser, but still significant direct short-term impact on the Santa Clara River geomorphology than Alternative 2. Specifically, Alternative 3 would result in approximately 10 percent less floodplain area temporarily disturbed during the construction of RMDP components within the Santa Clara River and terrace areas along the edge of the riverbed. Direct construction impacts associated with build-out of the proposed RMDP are included among the direct impacts of the RMDP under Alternative 2, and are discussed in detail in the preceding subsections.

Implementation of Mitigation Measure SP-4.2-2 (acquire state and federal permits), SP-4.2-3 (CDFG streambed agreements), SP-4.2-5 (DPW plan and map approvals), and SP-4.2-7 (DPW SUSMP and SWPPP requirements) would reduce the short-term impacts to the Santa Clara River geomorphology.

Specifically, construction of the RMDP components would be subject to CWA section 402(p), which regulates construction, municipal, and industrial stormwater discharges under the NPDES program. The Project proposes to implement a regional stormwater mitigation plan (**Appendix 4.4**, Geosyntec, 2008) to comply with NPDES permit requirements. Pursuant to NPDES regulations for permitting of stormwater discharges, SWRCB has issued a statewide general Permit and Waste Discharge Requirements for stormwater discharges from construction sites. Under this Construction General Permit, discharges of stormwater from construction sites with a disturbed area of one or more acres are required to either obtain individual NPDES permits for stormwater discharges or be covered by the Construction General Permit. Coverage under the Construction General Permit is accomplished by completing and filing a Notice of Intent with SWRCB and implementing a SWPPP. This plan requires the implementation of BMPs to reduce or eliminate pollutants in stormwater discharges.

Absent mitigation, there would be significant short-term sedimentation impacts during construction with respect to Significance Criterion 1. However, Mitigation Measures SP-4.2-2 (acquire state and federal permits), SP-4.2-3 (CDFG streambed agreements), SP-4.2-5 (DPW plan and map approvals), and SP-4.2-7 (DPW SUSMP and SWPPP requirements) would ensure that regulatory requirements are implemented and short-term impacts related to construction of RMDP components are less than significant through proper application of sediment controls and other BMPs required by existing local, state, and federal regulations.

**Santa Clara River -- Significance Criterion 2: Erosion and Downstream Deposition (Significant but Mitigable).** Implementation of the RMDP improvements and facilities, which are subject to the Corps and CDFG permitting requirements (particularly site clearing and grading operations), would have the potential to increase sediment flows downstream during storm events, which may result in substantial erosion and deposition and could result in significant impacts downstream.

As discussed in **Subsection 4.2.5.1**, Impact Assessment Methods, a representative velocity of 4.0 fps was determined to be the appropriate indicator for potential erosion. Direct impacts associated with erosion could result if the RMDP improvements resulted in an increase of the two- to 100-year and capital flood floodplain area subject to velocities greater than four fps. **Table 4.2-17** includes the change of Alternative 3, from existing conditions, in the total area of floodplain, delineated by vegetation type, where velocities exceed four fps for each return interval.

The total floodplain area subject to potentially erosive velocities would be decreased as a result of Alternative 3 for all return intervals with the exception of the 10-year return period. However, the additional 0.3 acres subject to velocities greater than four fps during the 10-year return interval is not considered to be significant relative to the substantial decrease in area subject to erosive velocities during two-, 20-, 50-, 100-year, and capital flood events as a result of the RMDP components. In some areas, velocities greater than four fps correspond with outlet structures, access ramps, or bridge abutments, which could result in a significant erosion impact. **Appendix 4.1**, Newhall Ranch Resource Management & Development Plan: River & Tributaries Drainage Analysis, Santa Clara River (PACE, 2008A) identifies locations of potential erosion within Santa Clara River riparian areas.

**Table 4.2-17**
**Changes in Vegetation Area Susceptible to Scour Where Velocity > 4 fps**
**Alternative 3 -- Santa Clara River**

| Vegetation Type | Change in Flood Plain Area (Acres) | | | | | | |
|---|---|---|---|---|---|---|---|
| | 2-Year | 5-Year | 10-Year | 20-Year | 50-Year | 100-Year | CAP |
| Agriculture | 0.0 | -0.1 | -0.6 | -2.4 | -65.0 | -107 | -149.2 |
| Alluvial Scrub | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 0.0 |
| Arroweed Scrub | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 0.0 | -0.2 |
| Big Sagebrush Scrub | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| California Annual Grassland | 0.0 | 0.0 | 0.0 | 0.0 | 0.2 | 0.1 | -0.1 |
| Undifferentiated Chaparral | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| California Sagebrush | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -0.1 |
| California Sagebrush-California Buckwheat | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| California Sagebrush-Undifferentiated Chaparral | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| California Sagebrush-Purple Sage | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 0.1 | 0.2 |
| Cottonwood Willow Riparian Forest | -0.5 | 0.0 | 0.5 | 0.2 | 0.4 | -3.4 | -1.1 |
| Burned California Sagebrush | 0.0 | 0.0 | 0.0 | 0.0 | -0.1 | 0.0 | 0.0 |
| Disturbed Cottonwood Willow Riparian Forest | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 0.0 | 0.0 |
| Developed | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Disturbed Land | 0.0 | 0.0 | 0.0 | -0.4 | -3.4 | -8.0 | -15.3 |
| Disturbed Riparian Scrub | 0.0 | 0.0 | 0.0 | 0.0 | -0.2 | 0.0 | 0.0 |
| Disturbed Southern Willow Scrub | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Giant Reed | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 0.0 | 0.0 |
| Herbaceous Wetlands | -0.4 | 0.1 | 0.1 | 0.9 | -1.5 | -1.4 | 0.0 |
| Live Oak Woodland | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Mulefat Scrub | 0.0 | 0.0 | 0.0 | -0.4 | -0.2 | -1.8 | -3.5 |
| Open Channel | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Southern Coast Live Oak Riparian Forest | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Ornamental | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| River Wash | 0.0 | -0.2 | 0.6 | 0.3 | 1.6 | -1.0 | 0.0 |
| Southern Willow Scrub | 0.0 | 0.0 | -0.3 | -0.2 | -1.2 | -1.8 | 0.1 |
| Tamarisk Scrub | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 |
| Valley Oak Woodland | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **TOTAL CHANGE** | **-0.9** | **-0.2** | **0.3** | **-2.0** | **-69.1** | **-124** | **-169.1** |

Source: PACE, 2008A.

Where necessary to minimize erosion and structural damage to such structures, erosion resistant materials such as concrete, soil cement or secured rip-rap would be used according to the standards, criteria, and specifications developed by the DPW to ensure long-term stability (Mitigation Measure GRR-3). The specific improvements for each drainage area would be designed as part of the final drainage plans prepared to DPW standards during the subdivision process. (Mitigation Measures SP-4.2-5 and SP-4.2-6.) No impacts to velocity would be realized upstream or downstream of the proposed Project.

Downstream deposition characteristics and potential erosion of the soils covering the buried soil cement would be approximately the same under both Alternatives 2 and 3 since the location of the buried bank stabilization is approximately the same for both alternatives. Accordingly, erosion and downstream deposition impacts resulting from Alternative 3 are expected to be significant but mitigable. Specifically, to minimize erosion and structural damage to such structures, erosion resistant materials such as concrete, soil cement or secured rip-rap would be used according to the standards, criteria, and specifications developed by the DPW to ensure long-term stability (Mitigation Measure GRR-3). The specific improvements for each drainage area would also be designed as part of the final drainage plans prepared to DPW standards during the subdivision process. (Mitigation Measures SP-4.2-5, DPW plan and map approvals and SP-4.2-6, DPW-approved permanent erosion controls.). Incorporation and implementation of proper design, regulatory compliance, facility maintenance, and specified mitigation measures would reduce the impact of erosion and/or downstream deposition to less than significant relative to Significance Criterion 2.

**Santa Clara River -- Significance Criterion 3: Impacts to Geomorphic Function (Less than Significant).** The RMDP improvements and facilities associated with Alternative 3 would have limited and localized hydromodification impacts to the Santa Clara River. Under moderate storm runoff events, localized increases in flow quantity and velocity would be present at drainage outlet facilities along the banks of the Santa Clara River. In selected locations along the northern and southern banks of the Santa Clara River, the existing floodplain would be protected by buried soil cement and be inaccessible to infrequent flood flows (50- and 100-year events). Similar to Alternative 2, Santa Clara River flows of lower than the 50-year event would utilize the existing floodplain under the Alternative 3 condition. Bridge piers and abutments would have localized effects on channel alignment. Under Alternative 3, Potrero Canyon Road Bridge is not proposed and the associated bridge pier and abutment features are not required. Therefore, Alternative 3 would have less of a direct effect on Santa Clara River geomorphic function than Alternative 2.

**Table 4.2-18** provides general hydraulic characteristics of the River channel for the two-, five-, 10-, 20-, 50-, and 100-year events, comparing the existing conditions to those resulting from Alternative 3. Included in these characteristics are: maximum river flow depth measured in feet, average flow velocity measured in fps, friction slope (a measure of flow erodibility), flow area measured in sf, channel top width measured in feet, and total shear (a measure of friction caused by the weight of water on the River bottom, and an indicator of scour/erosion potential) measured in pounds per square foot. As shown, with Alternative 3 most of these characteristics increase in magnitude with an increase in storm intensity (return interval). Relative to existing conditions, Alternative 3 results in an increase in the maximum flow depth of less than one foot during the 50- and 100-year storm events. During the 20-year return interval, Alternative 3 would result in minor increases in average velocity, with essentially no change or a decrease

in velocities for the two-, five-, 10-, and 50-year events and a decrease in average velocity during the 100-year event. Average friction slopes remain relatively unchanged as a result of Alternative 3, with minor increases during the 50- and 100-year return intervals. Alternative 3 would result in minor increases in the top width during the two- and five-year events, with a decrease in average top width observed during the 10-, 20-, 50-, and 100-year events due primarily to channel constrictions at bridge crossings. Lastly, Alternative 3 would have a nominal effect on the total shear during the two-, five-, and 10-year events with minor increases observed during the less frequent 20-, 50-, and 100-year events.

**Table 4.2-18**
**Summary of Average Channel Hydraulic Parameters**
**Existing vs. Alternative 3 -- Santa Clara River**

| Condition | Return Interval (years) | Max. Flow Depth (ft) | Average Velocity (fps) | Friction Slope (--) | Flow Area (sq. ft.) | Top Width (ft) | Total Shear (psf) |
|---|---|---|---|---|---|---|---|
| Existing | 2 | 3.34 | 4.46 | 0.0053 | 774.2 | 404.2 | 0.72 |
| Existing | 5 | 5.11 | 5.82 | 0.0053 | 1585.2 | 520.3 | 1.16 |
| Existing | 10 | 6.50 | 6.65 | 0.0052 | 2423.6 | 614.0 | 1.48 |
| Existing | 20 | 7.99 | 6.89 | 0.0052 | 3658.7 | 887.0 | 1.60 |
| Existing | 50 | 9.84 | 7.48 | 0.0051 | 5581.5 | 1131.1 | 1.85 |
| Existing | 100 | 11.27 | 8.00 | 0.0051 | 7283.6 | 1236.1 | 2.13 |
| Alternative 3 | 2 | 3.30 | 4.5 | 0.0053 | 771.4 | 404.5 | 0.72 |
| Alternative 3 | 5 | 5.06 | 5.9 | 0.0053 | 1574.9 | 520.6 | 1.1 |
| Alternative 3 | 10 | 6.45 | 6.67 | 0.0052 | 2404.3 | 610.2 | 1.47 |
| Alternative 3 | 20 | 7.93 | 7.09 | 0.0052 | 3550.3 | 805.9 | 1.66 |
| Alternative 3 | 50 | 10.14 | 7.43 | 0.0052 | 5633.6 | 1006.1 | 2.06 |
| Alternative 3 | 100 | 11.79 | 7.84 | 0.0052 | 7470.2 | 1114.4 | 2.39 |
| Alternative 2 | 100 | 11.87 | 7.8 | 0.0051 | 7489.4 | 1093.4 | 2.43 |

Source: PACE, 2008A.

The estimated change in hydraulic characteristics under the Alternative 3 RMDP would be relatively minor. For the high frequency floods (two-, five-, and 10-year), the proposed floodplain modifications would not increase erosion potential (as indicated by shear stress), hinder flows, or substantially reduce the floodplain area. Instead, these flows would spread across the River channel, unaffected by the bank protection because the River would have sufficient width to allow these flows to meander and spread out as under pre-Project conditions. Compared with Alternative 2, during the 100-year event, the RMDP components proposed by Alternative 3 would result in minor reductions in the maximum flow depth and flow area, with an increase in top width. As with Alternative 2, Alternative 3 river flows would be impacted by proposed improvements to the width of the buried soil cement during more infrequent 20- and 100-year discharges. This would limit the area of the floodplain during these infrequent flood events, causing inundation over a smaller area because the bank protection would be developed under the Specific Plan to protect various land uses, including residential, commercial, industrial, and parks.

The HARC analysis indicates that the Alternative 3 would result in only minor changes to the hydrologic function of the Santa Clara River with small decreases in the source water and floodplain connection metrics. In total, Alternative 3 would result in a net loss of 5.67 hydrology AW-score units but would increase the total HARC AW-score units by 58.04. The overall increase in HARC AW-score units is primarily attributed to the benefits provided by Alternative 3 to riparian habitat as discussed in **Section 4.6**, Jurisdictional Waters and Streams. In general, the HARC analysis supports the conclusion that the relatively minor impacts to the hydrologic processes of the Santa Clara River would not result in a substantial reduction in geomorphic function , *e.g.*, ability to support riparian habitat. Accordingly, given the low frequency and duration of the lower frequency events, the potential effects to geomorphic function in the Santa Clara River relative to Significance Criterion 3 are considered less than significant.

**Santa Clara River -- Significance Criterion 4: Construction and Scour Impacts to Riparian Vegetation (Less than Significant).** Most of the areas along the River corridor within the Project site consist of agricultural fields, and to a lesser extent, disturbed and upland habitat areas with limited riparian habitat. (PACE, 2008A.) Alternative 3 includes the construction of 26,540 lf of soil cement, which is necessary to protect the Specific Plan's residential and commercial development and the bridges at Commerce Center Drive and Long Canyon Road. In addition, approximately 4,600 linear feet of turf-reinforced mats would be installed on the north side of the River along the utility corridor between Chiquito Canyon and San Martinez Grande Canyon drainages, south of SR-126. The analysis of the impacts of installing bank protection, bridge piers and abutments, and erosion protection to vegetation along the Santa Clara River are primarily related to the Alternative 3 hydrologic and hydraulic impacts on the Santa Clara River, as detailed below.

**Impacts on Velocity.** An increase in flow velocities in the River could result in significant impacts to riparian vegetation if the increase causes: (1) widespread and chronic scouring of the channel bed that removes a significant amount of aquatic wetland and riparian habitats from the River channel; and/or (2) substantial modification of the relative amounts of these different habitats in the River, essentially altering the quality of the riverine environment.

Impacts associated with erosion and sediment deposition and, therefore, streambed modification within the River are evaluated as a function of in-stream velocities, which are indicators for potential riverbed scouring. As discussed in **Subsection 4.2.5.1**, Impact Assessment Methods, a representative velocity of four fps was determined to be the appropriate indicator for potential erosion. **Table 4.2-17**, presented above, includes the change of Alternative 3, from existing conditions, in the total area of floodplain, delineated by vegetation type, where velocities exceed four fps for each return interval.

The total floodplain area subject to potentially erosive velocities would be decreased as a result of Alternative 3 for all return intervals with the exception of the 10-year return period. However, an additional 0.4 acres subject to velocities greater than four fps during the 10-year return interval is not considered to be significant relative to the substantial decrease in area subject to erosive velocities during two-, 20-, 50-, 100-year, and capital flood events as a result of the RMDP components. In addition, no impacts to velocity would be realized upstream or downstream of the Project reach. (PACE, 2008A.) The impacts relating to habitat removal and disturbance as a result of changes to River velocity are presented in **Section 4.5**, Biological Resources, of this EIS/EIR.

Based on these results, the bank stabilization, bridges, and turf-reinforced mats would not cause significant scouring, and, therefore, would not alter the amount and pattern of riparian habitats along the River within the Project area. The current pattern of scouring due to high velocities would remain intact and the proposed Project would not substantially alter the frequency and magnitude of scouring of riparian vegetation. Based on this information, no significant impacts would occur due to changes in velocity relative to Significance Criterion 4.

**Impacts on Water Depth.** An increase in water depth in the River could result in significant impacts to riparian habitat if the additional water depth causes greater "shear forces" (*i.e.*, friction caused by the weight of water) on the river bottom, and thereby increasing scouring of the channel bed and removal of vegetation. This effect could reduce the extent of aquatic, wetland, and riparian habitats in the River.

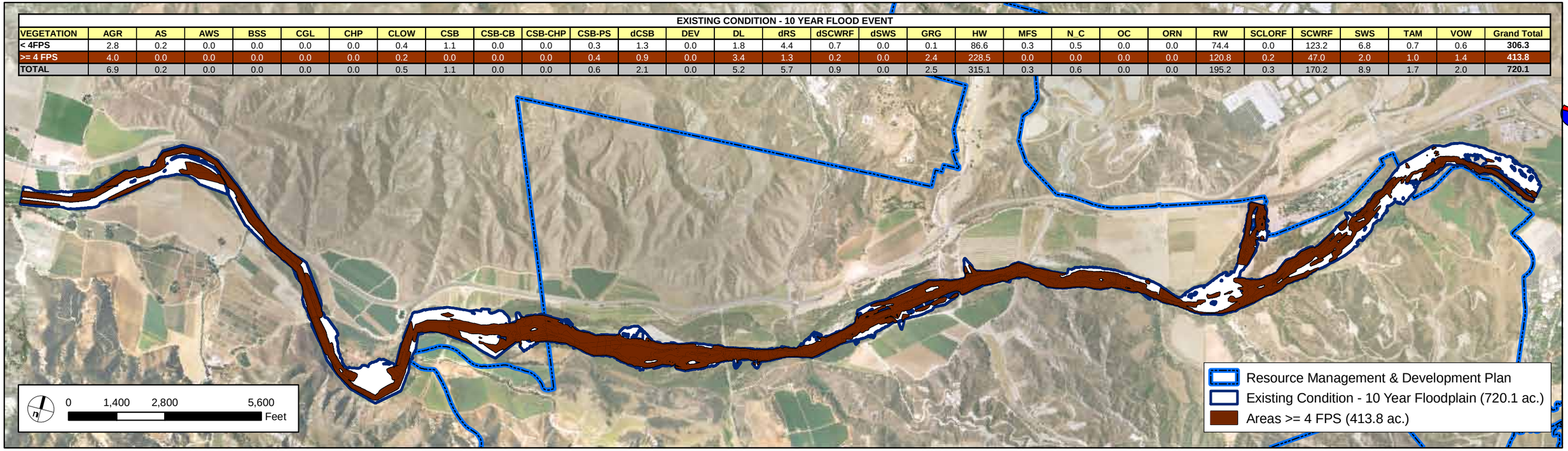
**Table 4.2-18** provides the general hydrologic characteristics of the River channel for the two-, five-, 10-, 20-, 50-, and 100-year events, both with and without Alternative 3 project components. The results of the hydraulic analysis indicate that water depths and, correspondingly, total shear in the River would not increase significantly due to Alternative 3 improvements. The additional riparian vegetation area subject to inundation would be increased slightly during the two- and five-year flood events (0.3 and 0.5 acres, respectively), but would be reduced by approximately 4.9, 65.2, 114.5, 109.6, and 197.6 acres as a result of Alternative 3 during the 10-, 20-, 50-, 100-year, and capital flood events, respectively. (PACE, 2008A.) **Figures 4.2-11** and **4.2-12** show the area of inundation and velocity distribution for the 10- and 100-year flow events for both existing conditions and Alternative 3. As shown in these figures, the decrease in inundated area (by percentage and acreage) would primarily affect areas of currently disturbed, agricultural land. Accordingly, impacts to riparian habitat would be limited such that water flow depths, velocities, and total shear for all return events would not be significantly different in riparian habitat between existing and proposed conditions at the Project site. Since there would not be a significant change in flow depths or total shear in existing riparian habitat, the impacts to the amount and pattern of aquatic, wetland, and riparian habitats in the River are expected to be less than significant relative to Significance Criterion 4.

**Impacts of Modification.** The reinforced concrete and riprap bridge abutments, in addition to the soil cement proposed by Alternative 3, would encroach into the existing 100-year floodplain in some areas. Encroachment impacts can be analyzed on the basis of depth and velocity, as described below. Additionally, some banks located out of the floodplain need stabilization because of lateral migration of the riverbed, as well as the need for protection against the capital flood discharge. Long-term impacts would have the potential to occur because soil cement used to stabilize the River's banks places a permanent feature in the existing floodplain.

In other areas, the soil cement would be placed outside the existing River channel, creating additional River channel and riparian habitats. For example, soil cement proposed on the north side of the River near the confluence with Castaic River would be constructed on agricultural land, north of the existing channel. The land located between the existing river bank and the newly created stabilized bank would be excavated to widen the existing channel, which would increase the area available within the channel and

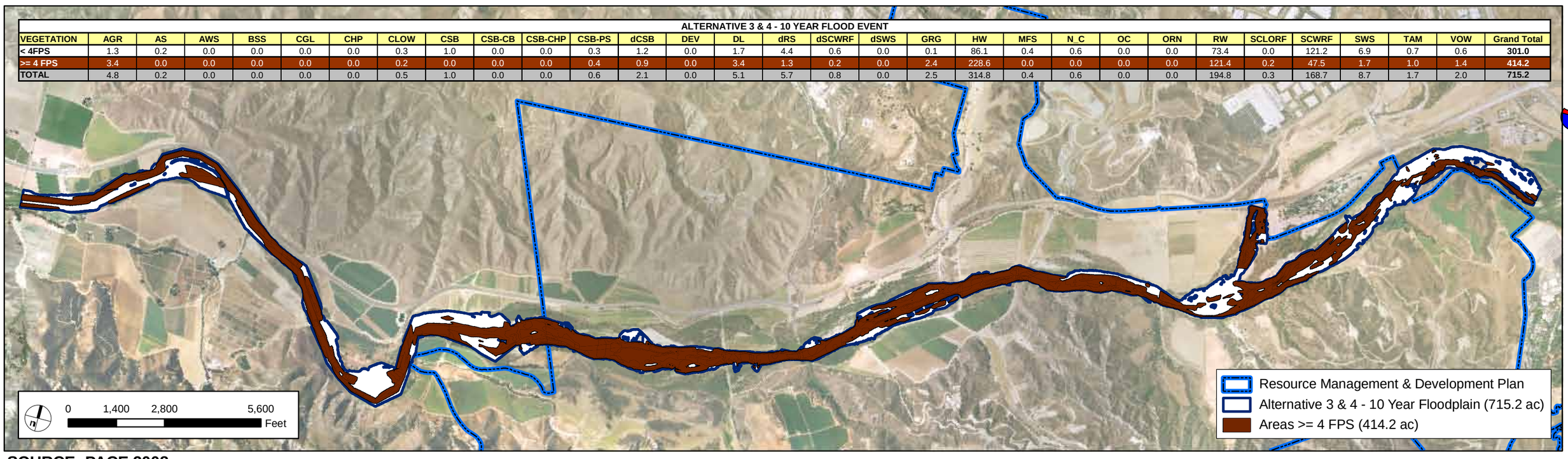
**EXISTING CONDITION - 10 YEAR FLOOD EVENT**

| VEGETATION | AGR | AS | AWS | BSS | CGL | CHP | CLOW | CSB | CSB-CB | CSB-CHP | CSB-PS | dCSB | DEV | DL | dRS | dSCWRF | dSWS | GRG | HW | MFS | N_C | OC | ORN | RW | SCLORF | SCWRF | SWS | TAM | VOW | Grand Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| < 4FPS | 2.8 | 0.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.4 | 1.1 | 0.0 | 0.0 | 0.3 | 1.3 | 0.0 | 1.8 | 4.4 | 0.7 | 0.0 | 0.1 | 86.6 | 0.3 | 0.5 | 0.0 | 0.0 | 74.4 | 0.0 | 123.2 | 6.8 | 0.7 | 0.6 | **306.3** |
| >= 4 FPS | 4.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.2 | 0.0 | 0.0 | 0.0 | 0.4 | 0.9 | 0.0 | 3.4 | 1.3 | 0.2 | 0.0 | 2.4 | 228.5 | 0.0 | 0.0 | 0.0 | 0.0 | 120.8 | 0.2 | 47.0 | 2.0 | 1.0 | 1.4 | **413.8** |
| TOTAL | 6.9 | 0.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.5 | 1.1 | 0.0 | 0.0 | 0.6 | 2.1 | 0.0 | 5.2 | 5.7 | 0.9 | 0.0 | 2.5 | 315.1 | 0.3 | 0.6 | 0.0 | 0.0 | 195.2 | 0.3 | 170.2 | 8.9 | 1.7 | 2.0 | **720.1** |




**ALTERNATIVE 3 & 4 - 10 YEAR FLOOD EVENT**

| VEGETATION | AGR | AS | AWS | BSS | CGL | CHP | CLOW | CSB | CSB-CB | CSB-CHP | CSB-PS | dCSB | DEV | DL | dRS | dSCWRF | dSWS | GRG | HW | MFS | N_C | OC | ORN | RW | SCLORF | SCWRF | SWS | TAM | VOW | Grand Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| < 4FPS | 1.3 | 0.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.3 | 1.0 | 0.0 | 0.0 | 0.3 | 1.2 | 0.0 | 1.7 | 4.4 | 0.6 | 0.0 | 0.1 | 86.1 | 0.4 | 0.6 | 0.0 | 0.0 | 73.4 | 0.0 | 121.2 | 6.9 | 0.7 | 0.6 | **301.0** |
| >= 4 FPS | 3.4 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.2 | 0.0 | 0.0 | 0.0 | 0.4 | 0.9 | 0.0 | 3.4 | 1.3 | 0.2 | 0.0 | 2.4 | 228.6 | 0.0 | 0.0 | 0.0 | 0.0 | 121.4 | 0.2 | 47.5 | 1.7 | 1.0 | 1.4 | **414.2** |
| TOTAL | 4.8 | 0.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.5 | 1.0 | 0.0 | 0.0 | 0.6 | 2.1 | 0.0 | 5.1 | 5.7 | 0.8 | 0.0 | 2.5 | 314.8 | 0.4 | 0.6 | 0.0 | 0.0 | 194.8 | 0.3 | 168.7 | 8.7 | 1.7 | 2.0 | **715.2** |




**SOURCE: PACE 2008**

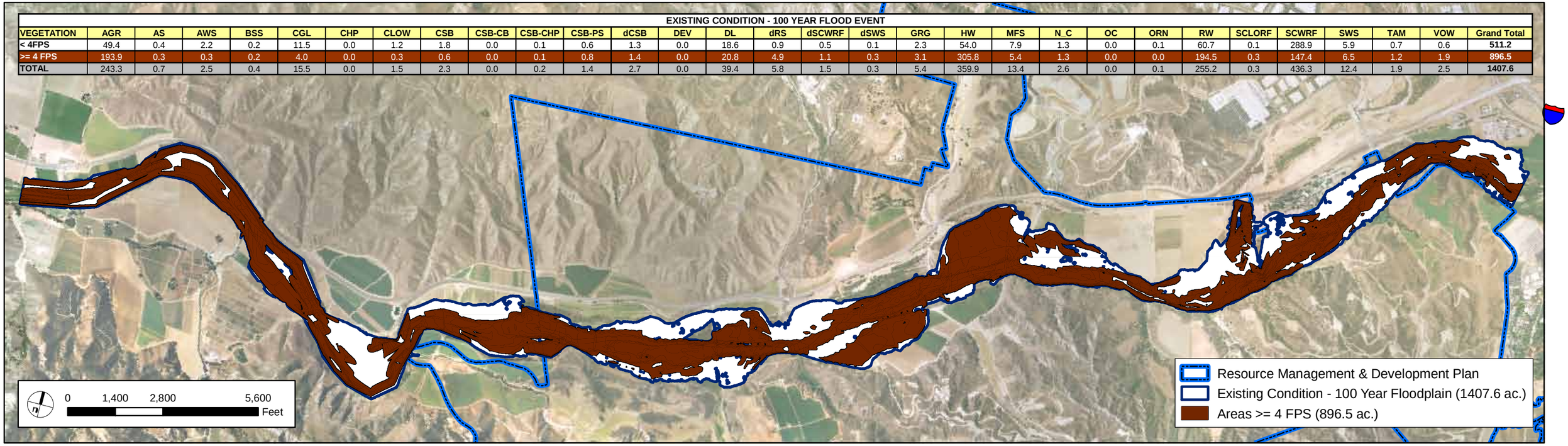
FIGURE 4.2-11

EXISTING CONDITION AND ALTERNATIVE 3 & 4
10-YEAR FLOOD INUNDATION AND VELOCITY DISTRIBUTION - SANTA CLARA RIVER

P:\8238E\GIS\mxds\EIR_2008\Section4_2\8238E_FIGURE-4-2-11_RiparianScourVelocityAnalysisAlt3_4_10Yr_082108.mxd

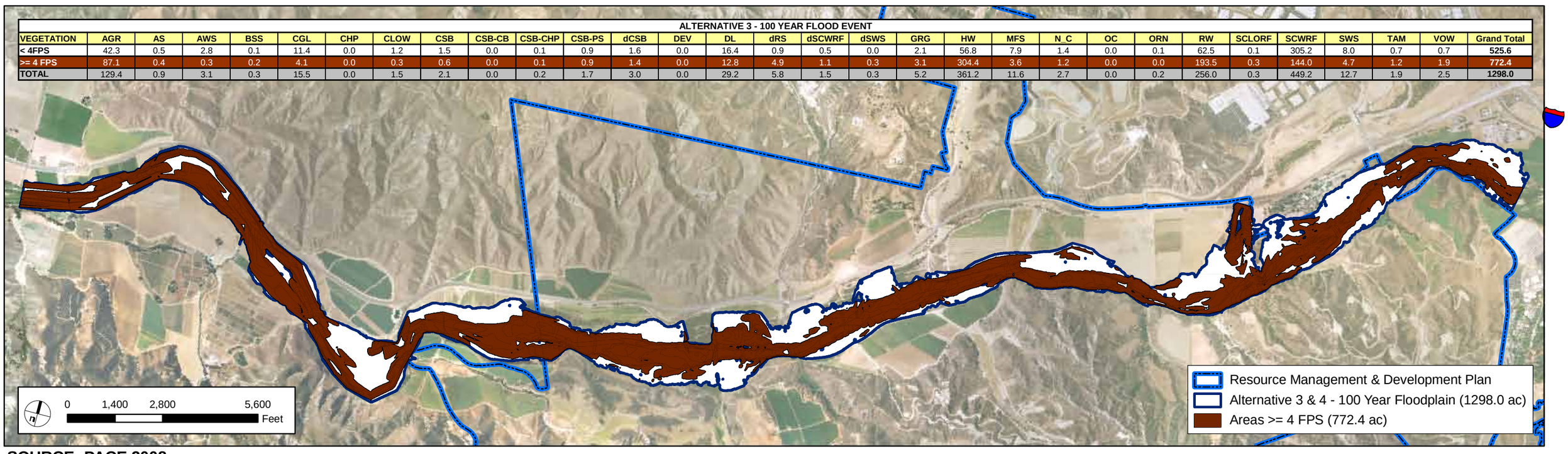
**EXISTING CONDITION - 100 YEAR FLOOD EVENT**

| VEGETATION | AGR | AS | AWS | BSS | CGL | CHP | CLOW | CSB | CSB-CB | CSB-CHP | CSB-PS | dCSB | DEV | DL | dRS | dSCWRF | dSWS | GRG | HW | MFS | N_C | OC | ORN | RW | SCLORF | SCWRF | SWS | TAM | VOW | Grand Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| < 4FPS | 49.4 | 0.4 | 2.2 | 0.2 | 11.5 | 0.0 | 1.2 | 1.8 | 0.0 | 0.1 | 0.6 | 1.3 | 0.0 | 18.6 | 0.9 | 0.5 | 0.1 | 2.3 | 54.0 | 7.9 | 1.3 | 0.0 | 0.1 | 60.7 | 0.1 | 288.9 | 5.9 | 0.7 | 0.6 | **511.2** |
| >= 4 FPS | 193.9 | 0.3 | 0.3 | 0.2 | 4.0 | 0.0 | 0.3 | 0.6 | 0.0 | 0.1 | 0.8 | 1.4 | 0.0 | 20.8 | 4.9 | 1.1 | 0.3 | 3.1 | 305.8 | 5.4 | 1.3 | 0.0 | 0.0 | 194.5 | 0.3 | 147.4 | 6.5 | 1.2 | 1.9 | **896.5** |
| TOTAL | 243.3 | 0.7 | 2.5 | 0.4 | 15.5 | 0.0 | 1.5 | 2.3 | 0.0 | 0.2 | 1.4 | 2.7 | 0.0 | 39.4 | 5.8 | 1.5 | 0.3 | 5.4 | 359.9 | 13.4 | 2.6 | 0.0 | 0.1 | 255.2 | 0.3 | 436.3 | 12.4 | 1.9 | 2.5 | **1407.6** |




**ALTERNATIVE 3 - 100 YEAR FLOOD EVENT**

| VEGETATION | AGR | AS | AWS | BSS | CGL | CHP | CLOW | CSB | CSB-CB | CSB-CHP | CSB-PS | dCSB | DEV | DL | dRS | dSCWRF | dSWS | GRG | HW | MFS | N_C | OC | ORN | RW | SCLORF | SCWRF | SWS | TAM | VOW | Grand Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| < 4FPS | 42.3 | 0.5 | 2.8 | 0.1 | 11.4 | 0.0 | 1.2 | 1.5 | 0.0 | 0.1 | 0.9 | 1.6 | 0.0 | 16.4 | 0.9 | 0.5 | 0.0 | 2.1 | 56.8 | 7.9 | 1.4 | 0.0 | 0.1 | 62.5 | 0.1 | 305.2 | 8.0 | 0.7 | 0.7 | **525.6** |
| >= 4 FPS | 87.1 | 0.4 | 0.3 | 0.2 | 4.1 | 0.0 | 0.3 | 0.6 | 0.0 | 0.1 | 0.9 | 1.4 | 0.0 | 12.8 | 4.9 | 1.1 | 0.3 | 3.1 | 304.4 | 3.6 | 1.2 | 0.0 | 0.0 | 193.5 | 0.3 | 144.0 | 4.7 | 1.2 | 1.9 | **772.4** |
| TOTAL | 129.4 | 0.9 | 3.1 | 0.3 | 15.5 | 0.0 | 1.5 | 2.1 | 0.0 | 0.2 | 1.7 | 3.0 | 0.0 | 29.2 | 5.8 | 1.5 | 0.3 | 5.2 | 361.2 | 11.6 | 2.7 | 0.0 | 0.2 | 256.0 | 0.3 | 449.2 | 12.7 | 1.9 | 2.5 | **1298.0** |




**SOURCE: PACE 2008**

FIGURE 4.2-12

EXISTING CONDITION AND ALTERNATIVE 3 & 4
100-YEAR FLOOD INUNDATION AND VELOCITY DISTRIBUTION - SANTA CLARA RIVER

P:\8238E\GIS\mxds\EIR_2008\Section4_2\8238E_FIGURE-4-2-12_RiparianScourVelocityAnalysisAlt3_4_100Yr_082108.mxd

increase the capacity of the River to convey flood flows. Overall, Alternative 3 proposes fewer feet of bank stabilization and fewer bridges within the Santa Clara River and would, therefore, result in fewer impacted/removed acres compared with Alternative 2. Specifically, Alternative 3 would result in 22.7 acres of modified channel, where Alternative 2 would result in 36.9 acres of modified channel within the Santa Clara River floodplain.

The potential impacts from Alternative 3 RMDP improvements to Santa Clara River riparian vegetation are anticipated to be small and localized along the River floodplain. In addition, the frequency and duration of river flow conditions is considered to be episodic. The River, the floodplain, and riparian resources have been subjected to episodic disturbances under natural conditions and only minor changes in overall planform geomorphology occur as described above. As such, impacts of the RMDP to riparian vegetation along the Santa Clara River are considered less than significant relative to Significance Criterion 4.

**Tributaries -- Significance Criterion 1: Short-Term Impacts from Construction of Bridges, Bank Stabilization, Grade Stabilizer Structures, and Buried Storm Drain (Significant but Mitigable).** Installation of bank stabilization features, grade stabilizer structures, buried storm drains, and bridge piers and abutments would directly affect elements of tributary geomorphology which would be a significant impact. Direct construction impacts associated with build-out of the proposed RMDP components are included among the direct impacts of the RMDP under Alternative 2, and are discussed in the preceding subsections.

Alternative 3 would authorize 67,868 linear feet (7,561 lf decrease) of buried bank stabilization and 60,010 linear feet of drainage converted to buried storm drain (165 lf increase), and one less grade stabilizer structure when compared with the proposed RMDP. These impacts would still be significant. As with Alternative 2, short-term sedimentation impacts with respect to Significance Criterion 1 during construction would be reduced to a less than significant through the implementation of existing regulatory requirements and obtaining required permits from the State and County.

Absent mitigation, there would be significant short-term sedimentation impacts during construction with respect to Significance Criterion 1. However, Mitigation Measures SP-4.2-2 (acquire state and federal permits), SP-4.2-3 (CDFG streambed agreements), SP-4.2-5 (DPW plan and map approvals), and SP-4.2-7 (DPW SUSMP and SWPPP requirements) would ensure that regulatory requirements are implemented and short-term impacts related to construction of RMDP components are less than significant through proper application of sediment controls and other BMPs required by existing local, state, and federal regulations.

**Tributaries -- Significance Criterion 2: Erosion and Downstream Deposition (Significant but Mitigable).** Implementation of Alternative 3 RMDP improvements and facilities, particularly site clearing and grading operations, would have the potential to increase sediment flows downstream during storm events. Long-term impacts associated with erosion and sediment deposition are evaluated as a function of geomorphic stability. The basis of design for the five major tributary drainages that would be modified (Chiquito, San Martinez Grande, Lion, Long, and Potrero) is such that the channels would be designed to be in geomorphic equilibrium in terms of stability and delivery of sediment and flows under future

conditions. As described in greater detail for Alternative 2, the channel designs will meet the following criteria: geomorphic stability; flood conveyance; ecological function; hydromodification control; and, low level maintenance. The preliminary channel designs under Alternative 3 for each tributary are described below.

**Chiquito Canyon.** The proposed design in Chiquito Canyon under Alternative 3 would significantly decrease the width of the floodplain in Chiquito Canyon, which would increase the velocity of flows, resulting in a significant effect prior to mitigation. In order to minimize impacts, the Project would be designed to reduce Project effects to the geomorphic stability (*i.e.*, erosion and deposition) within Chiquito Canyon. Specifically, where the channel is not degraded and less extensive development would take place in the watershed, grade control structures would be used to maintain the existing slope. The reengineered channel would be designed to meet the specified basis of design criteria using the following approach:

1. Develop existing condition floodplain and creek hydraulic characteristics using a hydraulic model such as HEC-RAS.
2. Minimize impacts to existing condition floodplain. As a result of reducing the development impacts to the floodplain, the amount of environmental and hydraulic impacts (*e.g.*, resulting in substantial erosion or sediment deposition) from the proposed development would be minimized.
3. Creek bank flood protection (soil cement, rip rap or other suitable method) would be located to provide for bank erosion protection and to provide flood protection from the DPW Capital design flood event. In most cases, the bank protection would be buried with soil at a 3:1 slope over the hard bank protection. The soil backfill slope would vary from flatter to steeper and may be totally eliminated in some areas where necessary such as at structures, storm drain outlets or other pinch points.
4. Chiquito Canyon would not include a re-grading of the creek invert although the Erosion Potential (Ep) of the proposed condition will be validated during the design phase. For Chiquito Canyon, the invert stabilization method will be as follows:
    a. Creek bed grade control structures at 200 to 400 foot spacing along the creek corridor would be included.
    b. These grade control structures would be designed to be located at points along the creek where proposed project grading impacts would already be disturbing the creek bed and banks.
    c. The grade control structures would be constructed with soil cement, rip rap or other grade stabilization methods acceptable to DPW.
    d. The grade control structures would be at grade or below the existing grade and invert of the creek bed.
    e. The grade control structures would be designed to function as a drop structure in the event the creek bed slope flattens overtime.

5. Chiquito Canyon top and toe elevation would be established based upon DPW standards.

The overall design approach would allow the tributary to naturally fluctuate between the stabilized existing condition and estimated equilibrium slope while providing suitable erosion and flood protection for public safety. Based upon the proposed design and use of DPW standards for bank protection top and toe, Chiquito Canyon would meet the minimal required design objectives provided by DPW. As such, the geomorphic basis of design would inherently minimize erosion and deposition.

The channel confluence with the Santa Clara River would largely be controlled by the aggradation or degradation in the Santa Clara River, as well as episodic River hydraulic events in the form of backwater effects. The influence of the Santa Clara River on long-term bed stability at the creek channel outlet is expected to exceed that of the Project channel modifications. The upstream channel inlet (near the beginning of the defined channel) is generally in a natural state and no currently planned improvements are to be made in the upstream portion of the channel; as a result, no effects on channel stability in this area are expected.

Prior to mitigation, erosion and sedimentation impacts within Chiquito Canyon would be significant. The Newhall Ranch Specific Plan EIR identified feasible measures to reduce the effects of the Specific Plan on floodplains within the Project area. Specifically, Mitigation Measures SP-4.2-1 through SP-4.2-7 (flood control improvement approval from DPW, state and federal permits, CDFG stream bed agreements, FEMA CLOMR, DPW plan and map approvals, DPW-approved permanent erosion controls, DPW SUSMP and SWPPP requirements) are incorporated to reduce these impacts. In addition, Mitigation Measures GRR-1 through GRR-6 (DPW required runoff controls, minimization of bridge and structures, structural durability, hydromodification controls and channel design, sediment and debris control facilities, sediment redistribution) would further reduce these impacts by controlling runoff and sediment delivered through the project reach, minimizing localized impacts from bridge crossings, using erosion resistant materials to ensure the long-term stability of RMDP structures, and ensuring that the Project design provides an equilibrium slope for each affected tributary in the post-development condition. Finally, in order to ensure that the channel functions as intended, Mitigation Measure GRR-7 describes the Geomorphology Monitoring and Management Plan that would be implemented to evaluate compliance with the basis of the design criteria, the triggers for implementing remedial actions (if necessary), the approach for implementing remedial actions, and a description of potential remedial measures. Incorporation and implementation of proper design, regulatory compliance, facility maintenance, and specified mitigation measures would reduce the impact of erosion and/or downstream deposition to less than significant relative to Significance Criterion 2.

**San Martinez Grande.** The proposed design in San Martinez Grande Canyon under Alternative 3 would significantly decrease the width of the floodplain in the tributary, which would increase the velocity of flows, resulting in a significant effect prior to mitigation. In order to minimize impacts, the Project would be designed to reduce Project effects to the geomorphic stability (*i.e.*, erosion and deposition) within San Martinez Grande Canyon. Specifically, where the channel is not degraded and less extensive development would take place in the watershed, grade control structures would be used to maintain the existing slope. The reengineered channel would be designed to meet the specified basis of design criteria using the following approach:

1. Develop existing condition floodplain and creek hydraulic characteristics using a hydraulic model such as HEC-RAS.

2. Minimize impacts to existing condition floodplain. As a result of reducing the development impacts to the floodplain, the amount of environmental and hydraulic impacts (*e.g.*, resulting in substantial erosion or sediment deposition) from the proposed development would be minimized.

3. Creek bank flood protection (soil cement, rip rap or other suitable method) would be located to provide for bank erosion protection and to provide flood protection from the DPW Capital design flood event. In most cases, the bank protection would be buried with soil at a 3:1 slope over the hard bank protection. The soil backfill slope would vary from flatter to steeper and may be totally eliminated in some areas where necessary such as at structures, storm drain outlets or other pinch points.

4. San Martinez Grande Canyon would not include a re-grading of the creek invert although the Erosion Potential (Ep) of the proposed condition will be validated during the design phase. For San Martinez Grande Canyon, the invert stabilization method will be as follows:

    a. Creek bed grade control structures at 200 to 400 foot spacing along the creek corridor would be included.

    b. These grade control structures would be designed to be located at points along the creek where proposed project grading impacts would already be disturbing the creek bed and banks.

    c. The grade control structures would be constructed with soil cement, rip rap or other grade stabilization methods acceptable to DPW.

    d. The grade control structures would be at grade or below the existing grade and invert of the creek bed.

    e. The grade control structures would be designed to function as a drop structure in the event the creek bed slope flattens overtime.

5. San Martinez Grande Canyon top and toe elevation would be established based upon DPW standards.

The overall design approach would allow the tributary to naturally fluctuate between the stabilized existing condition and estimated equilibrium slope while providing suitable erosion and flood protection for public safety. Based upon the proposed design and use of DPW standards for bank protection top and toe, San Martinez Grande Canyon would meet the minimal required design objectives provided by DPW. As such, the geomorphic basis of design would inherently minimize erosion and deposition.

The channel confluence with the Santa Clara River would largely be controlled by the aggradation or degradation in the Santa Clara River, as well as episodic River hydraulic events in the form of backwater effects. The influence of the Santa Clara River on long-term bed stability at the creek channel outlet is expected to exceed that of the Project channel modifications. The upstream channel inlet (near the

beginning of the defined channel) is generally in a natural state and no currently planned improvements are to be made in the upstream portion of the channel; as a result, no effects on channel stability in this area are expected.

Prior to mitigation, erosion and sedimentation impacts within San Martinez Grande Canyon would be significant. The Newhall Ranch Specific Plan EIR identified feasible measures to reduce the effects of the Specific Plan on floodplains within the Project area. Specifically, Mitigation Measures SP-4.2-1 through SP-4.2-7 (flood control improvement approval from DPW, state and federal permits, CDFG stream bed agreements, FEMA CLOMR, DPW plan and map approvals, DPW-approved permanent erosion controls, DPW SUSMP and SWPPP requirements) are incorporated to reduce these impacts. In addition, Mitigation Measures GRR-1 through GRR-6 (DPW required runoff controls, minimization of bridge and structures, structural durability, hydromodification controls and channel design, sediment and debris control facilities, sediment redistribution) would further reduce these impacts by controlling runoff and sediment delivered through the project reach, minimizing localized impacts from bridge crossings, using erosion resistant materials to ensure the long-term stability of RMDP structures, and ensuring that the Project design provides an equilibrium slope for each affected tributary in the post-development condition. Finally, in order to ensure that the channel functions as intended, Mitigation Measure GRR-7 describes the Geomorphology Monitoring and Management Plan that would be implemented to evaluate compliance with the basis of the design criteria, the triggers for implementing remedial actions (if necessary), the approach for implementing remedial actions, and a description of potential remedial measures. Incorporation and implementation of proper design, regulatory compliance, facility maintenance, and specified mitigation measures would reduce the impact of erosion and/or downstream deposition to a less-than-significant level relative to Significance Criterion 2.

***Long Canyon.*** The proposed design in Long Canyon under Alternative 3 would significantly decrease the width of the floodplain in Long Canyon, which would increase the velocity of flows, resulting in a significant effect prior to mitigation. The proposed Project design would combine soil cement bank stabilization along with a soft-bottom channel. The bank stabilization consisting of soil cement, would be emplaced according to the requirements established by the DPW. The basis of design for Long Canyon is such that any increase in flow velocities and shear stress would not exceed the performance specifications of the bank stabilization. However, the soft bottom of the channel is vulnerable to down-cutting and scour. To decrease the channel velocities, the Project design includes grade stabilizer structures. Proper placement of grade stabilizer structures would allow the channel to reach equilibrium, defined as the condition where the amount of sediment deposited is equivalent to the sediment eroded.

The final design approach in accordance with the geomorphic basis of design is to preserve the existing channel as a back channel habitat area while creating an additional new channel sized to accommodate the changes in sediment and water delivery due to the build-out of the Specific Plan. The recommended approach for designing the reaches where valley grading is proposed involves breaking the valley into alternating long reaches that are at equilibrium grade and short reaches that are much steeper. This approach involves creating reaches of between 100 and 300 feet length where elevation drops of 10 to 30 feet occur (10 percent gradient). Concentrating the drop in these reaches using sequences of step-pools that convey the capital flood has the advantage of creating a more naturally functioning channel between the drops, and reducing the number and aerial extent of rock structures. The Long Canyon channel design

incorporates the calculated post-development equilibrium slope to ensure a dynamically stable condition allowing for more or less equal amounts of erosion and deposition.

Prior to mitigation, erosion and sedimentation impacts within Long Canyon would be significant. The Newhall Ranch Specific Plan EIR identified feasible measures to reduce the effects of the Specific Plan on floodplains within the Project area. Specifically, Mitigation Measures SP-4.2-1 through SP-4.2-7 (flood control improvement approval from DPW, state and federal permits, CDFG stream bed agreements, FEMA CLOMR, DPW plan and map approvals, DPW-approved permanent erosion controls, DPW SUSMP and SWPPP requirements) are incorporated to reduce these impacts. In addition, Mitigation Measures GRR-1 through GRR-6 (DPW required runoff controls, minimization of bridge and structures, structural durability, hydromodification controls and channel design, sediment and debris control facilities, sediment redistribution) would further reduce these impacts by controlling runoff and sediment delivered through the project reach, minimizing localized impacts from bridge crossings, using erosion resistant materials to ensure the long-term stability of RMDP structures, and ensuring that the Project design provides an equilibrium slope for each affected tributary in the post-development condition. Finally, in order to ensure that the channel functions as intended, Mitigation Measure GRR-7 describes the Geomorphology Monitoring and Management Plan that would be implemented to evaluate compliance with the basis of the design criteria, the triggers for implementing remedial actions (if necessary), the approach for implementing remedial actions, and a description of potential remedial measures. Incorporation and implementation of proper design, regulatory compliance, facility maintenance, and specified mitigation measures would reduce the impact of erosion and/or downstream deposition to a less-than-significant level relative to Significance Criterion 2.

***Potrero Canyon.*** The proposed design under Alternative 3 would significantly decrease the width of the floodplain in Potrero Canyon, which would increase the velocity of flows, resulting in a significant effect prior to mitigation. The proposed Project design would combine soil cement bank stabilization along with a soft-bottom channel. The bank stabilization consisting of soil cement, would be emplaced according to the requirements established by the DPW. The basis of design for Potrero Canyon is such that any increase in flow velocities and shear stress would not exceed the performance specifications of the bank stabilization. However, the soft bottom of the channel is vulnerable to down-cutting and scour. To decrease the channel velocities, the design includes grade stabilizer structures. These structures are designed to function by reducing the energy slope along the degradational zone to the point that the stream is no longer capable of scouring the bed. Proper placement of grade stabilizer structures would allow the channel to reach equilibrium, defined as the condition where the amount of sediment deposited is equivalent to the sediment eroded. The Potrero channel design incorporates the calculated post-development equilibrium slope to ensure a dynamically stable condition allowing for more or less equal amounts of erosion and deposition to sustain revegetated riparian and adjacent upland habitat areas.

The geomorphic basis of design is such that Potrero Canyon would be designed to convey sediment under future conditions with a "dynamically stable channel" (neither long-term erosion nor deposition) and to support the proposed native re-vegetation program.

Prior to mitigation, erosion and sedimentation impacts within Potrero Canyon would be significant. The Newhall Ranch Specific Plan EIR identified feasible measures to reduce the effects of the Specific Plan

on floodplains within the Project area. Specifically, Mitigation Measures SP-4.2-1 through SP-4.2-7 (flood control improvement approval from DPW, state and federal permits, CDFG stream bed agreements, FEMA CLOMR, DPW plan and map approvals, DPW-approved permanent erosion controls, DPW SUSMP and SWPPP requirements) are incorporated to reduce these impacts. In addition, Mitigation Measures GRR-1 through GRR-6 (DPW required runoff controls, minimization of bridge and structures, structural durability, hydromodification controls and channel design, sediment and debris control facilities, sediment redistribution) would further reduce these impacts by controlling runoff and sediment delivered through the project reach, minimizing localized impacts from bridge crossings, using erosion resistant materials to ensure the long-term stability of RMDP structures, and ensuring that the Project design provides an equilibrium slope for each affected tributary in the post-development condition. Finally, in order to ensure that the channel functions as intended, Mitigation Measure GRR-7 describes the Geomorphology Monitoring and Management Plan that would be implemented to evaluate compliance with the basis of the design criteria, the triggers for implementing remedial actions (if necessary), the approach for implementing remedial actions, and a description of potential remedial measures. Incorporation and implementation of proper design, regulatory compliance, facility maintenance, and specified mitigation measures would reduce the impact of erosion and/or downstream deposition to a less-than-significant level relative to Significance Criterion 2.

***Lion Canyon.*** The proposed design under Alternative 3 includes the placement of three new road crossings in Lion Canyon. These crossings may constrict the floodplain, resulting in an increase in the velocity of flows, which would be a significant effect prior to mitigation. The basis of design for this drainage is such that Lion Canyon would be designed to be in geomorphic equilibrium in terms of stability and delivery of sediment and water under future conditions. The channel floodplain would be designed to maximize geomorphic stability and ecological function, provide adequate flood conveyance, and avoid hydromodification to the extent possible. In addition, the design would minimize the need for maintenance activities.

Phillip Williams and Associates (PWA, 2007g) evaluated the channel design erosion potential. Post-development condition sediment supplies to the Lion Canyon drainage are predicted to range from 27 percent to 37 percent of the existing condition. The results of the analysis indicate that with the proposed RMDP components, the erosion potential within Lion Canyon would be in equilibrium and that the proposed channel would not aggrade or generate excess sediment from erosion or create a larger than natural downstream impact from sedimentation associated with hydromodification. Mitigation measure SP-4.2-3 (state and federal permits) would require that hydraulic modeling be performed for the final design to assess the effects within Lion Canyon, and that the design would be modified as necessary to reduce any erosion or deposition impacts. The Lion channel design incorporates the calculated post-development equilibrium slope to ensure a dynamically stable condition allowing for more or less equal amounts of erosion and deposition.

Prior to mitigation, erosion and sedimentation impacts within Lion Canyon would be significant. The Newhall Ranch Specific Plan EIR identified feasible measures to reduce the effects of the Specific Plan on floodplains within the Project area. Specifically, Mitigation Measures SP-4.2-1 through SP-4.2-7 (flood control improvement approval from DPW, state and federal permits, CDFG stream bed agreements, FEMA CLOMR, DPW plan and map approvals, DPW-approved permanent erosion controls,

DPW SUSMP and SWPPP requirements) are incorporated to reduce these impacts. In addition, Mitigation Measures GRR-1 through GRR-6 (DPW required runoff controls, minimization of bridge and structures, structural durability, hydromodification controls and channel design, sediment and debris control facilities, sediment redistribution) would further reduce these impacts by controlling runoff and sediment delivered through the project reach, minimizing localized impacts from bridge crossings, using erosion resistant materials to ensure the long-term stability of RMDP structures, and ensuring that the Project design provides an equilibrium slope for each affected tributary in the post-development condition. Finally, in order to ensure that the channel functions as intended, Mitigation Measure GRR-7 describes the Geomorphology Monitoring and Management Plan that would be implemented to evaluate compliance with the basis of the design criteria, the triggers for implementing remedial actions (if necessary), the approach for implementing remedial actions, and a description of potential remedial measures. Incorporation and implementation of proper design, regulatory compliance, facility maintenance, and specified mitigation measures will reduce the impact of erosion and/or downstream deposition to a less-than-significant level relative to Significance Criterion 2.

***Minor Drainages*.** Implementation of the proposed RMDP would involve the placement of one new culverted road crossing in Ayers Canyon, a minor drainage on the south side of the River; in addition, the existing six-lane bridge allowing SR-126 to cross the Castaic Creek drainage would be expanded to eight lanes.

The other drainages to be converted either entirely or partially to underground storm drains include drainages in Homestead Canyon, Off-Haul Canyon, Mid-Martinez Canyon, Humble Canyon, Lion Canyon, Exxon Canyon, Unnamed Canyon B, Unnamed Canyon C, Dead-End Canyon, Unnamed Canyon D, Middle Canyon, Magic Mountain Canyon, Unnamed Canyon 1 and Unnamed Canyon 2.

The conversion of open drainages to buried underground conduits would eliminate the erosion of existing drainage channels and the associated sediment loading from other uplands sources. The impact of underground storm drains would significantly decrease erosion and siltation. Accordingly, construction of the combined 39,075 feet of buried storm drain and 1,992 feet of stabilization (Salt Creek) could result in significant erosion or deposition impacts within the minor drainages.

Prior to mitigation, erosion and sedimentation impacts within the minor tributary drainages would be significant. The Newhall Ranch Specific Plan EIR identified feasible measures to reduce the effects of the Specific Plan on floodplains within the Project area. Specifically, Mitigation Measures SP-4.2-1 through SP-4.2-7 (flood control improvement approval from DPW, state and federal permits, CDFG stream bed agreements, FEMA CLOMR, DPW plan and map approvals, DPW-approved permanent erosion controls, DPW SUSMP and SWPPP requirements) are incorporated to reduce these impacts. In addition, Mitigation Measures GRR-1 through GRR-6 (DPW required runoff controls, minimization of bridge and structures, structural durability, hydromodification controls and channel design, sediment and debris control facilities, sediment redistribution) would further reduce this potential impact to less-than-significant levels within the minor tributary drainages relative to Significant Criterion 2 by controlling runoff and sediment delivered through the project reach, minimizing localized impacts from bridge crossings, using erosion resistant materials to ensure the long-term stability of RMDP structures, and

ensuring that the Project design provides an equilibrium slope for each affected tributary in the post-development condition.

**Tributaries -- Significance Criterion 3: Impacts to Geomorphic Function (Less than Significant).** The tributary drainages incorporate hydromodification controls that reduce potential stormwater-related impacts (intensity and duration) to the River and tributary geomorphic function. The following includes an analysis of the potential impacts to the geomorphic function of the affected tributaries within the Project area.

Alternative 3 proposes that portions of 18 tributary drainages within the RMDP area be graded to accommodate pads for residential and commercial buildings, and that these flows be conveyed by buried storm drains varying in diameter from 30 to 144 inches. In total, approximately 60,010 feet of existing drainage channel would be converted to buried storm drains. The RMDP also proposes four partially-lined open channels on tributaries to the mainstem of the Santa Clara River within the RMDP boundaries. In some cases, streams would be relocated from their current locations and soft-bottom channels would be recreated in different locations generally parallel to the current alignments. The total area affected by the conversion to buried storm drain, reengineering, bank stabilization and/or road crossing for each drainage within the RMDP area is included in **Table 4.2-19**.

**Table 4.2-19**
**Total Impacted Channel Area By Treatment Type**
**Alternative 3 - Tributaries**

| Tributary | Storm Drain Area (acres) | Stabilized and Reengineered Channel Area (acres) | Road Crossings -- Bridges and Culverts (acres) |
|---|---|---|---|
| Ayers Canyon | 0.0 | 0.0 | 0.2 |
| Chiquito Canyon | 1.1 | 15.9 | 1.0 |
| Agricultural Ditch | 1.4 | 0.2 | 0.0 |
| Dead-End Canyon | 1.3 | 0.0 | 0.0 |
| Exxon Canyon | 0.3 | 0.0 | 0.0 |
| Homestead Canyon | 0.6 | 0.0 | 0.0 |
| Humble Canyon | 0.1 | 0.0 | 0.0 |
| Lion Canyon | 3.4 | 3.0 | 0.4 |
| Long Canyon | 0.6 | 4.8 | 0.3 |
| Magic Mountain Canyon | 6.4 | 0.0 | 0.0 |
| Middle Canyon | 5.6 | 0.0 | 0.0 |
| Mid-Martinez Canyon | 2.1 | 0.0 | 0.0 |
| Off-Haul Canyon | 5.4 | 0.0 | 0.0 |
| Potrero Canyon | 7.6 | 20.5 | 0.6 |
| Salt Creek Canyon | 0.0 | 6.9 | 0.0 |
| San Martinez Grande Canyon | 0.0 | 2.3 | 0.2 |
| Unnamed Canyon A | 0.0 | 0.0 | 0.0 |
| Unnamed Canyon B | 0.5 | 0.0 | 0.0 |
| Unnamed Canyon C | 0.2 | 0.0 | 0.0 |
| Unnamed Canyon D | 0.7 | 0.0 | 0.0 |
| Unnamed Canyon 1 (Entrada) | 0.3 | 0.0 | 0.0 |
| Unnamed Canyon 2 (Entrada) | 0.5 | 0.0 | 0.0 |
| **TOTAL ALT. 3** | **38.1** | **53.6** | **2.6** |
| **TOTAL ALT. 2** | **38.0** | **62.7** | **2.1** |

Source: RMDP, 2008

Reengineered channel area, installation of bank stabilization, conversion of the existing channels to buried storm drain, and road crossings would result in a total of 94.3 acres of existing channel impacted by the RMDP components, with 53.6 acres altered through reengineering and installation of bank stabilization.

The effects of these changes on the geomorphic function of the tributaries within the Project area can be determined with an evaluation of the hydrologic function metrics of the HARC (see **Section 4.6**,

Jurisdictional Waters and Streams). **Table 4.2-20** compares the total hydrology AW-score units and the total HARC AW-score units calculated for the tributaries.

**Table 4.2-20**
**Summary of Hydrology Metric and Total HARC AW-Scores**
**Existing vs. Alternative 3 -- Tributaries**

| Condition | HARC AW-Total Score | HARC AW-Hydrology |
|---|---|---|
| **Chiquito Canyon** | | |
| Existing | 12.59 | 15.95 |
| Alternative 3 | 14.99 | 15.65 |
| CHANGE | 2.40 | -0.30 |
| **San Martinez Grande Canyon** | | |
| Existing | 2.84 | 3.22 |
| Alternative 3 | 10.32 | 10.27 |
| CHANGE | 7.48 | 7.05 |
| **Long Canyon** | | |
| Existing | 3.22 | 3.55 |
| Alternative 3 | 7.06 | 6.59 |
| CHANGE | 3.84 | 3.04 |
| **Potrero Canyon** | | |
| Existing | 34.50 | 39.08 |
| Alternative 3 | 46.77 | 51.95 |
| CHANGE | 12.27 | 12.87 |
| **Lion Canyon** | | |
| Existing | 5.41 | 5.96 |
| Alternative 3 | 2.44 | 2.63 |
| CHANGE | 3.03 | -3.33 |
| **Minor Drainages*** | | |
| Existing | 21.27 | 21.70 |
| Alternative 3 | 7.91 | 7.49 |
| CHANGE | -13.36 | -14.21 |
| **Salt Creek Canyon** | | |
| Existing | 71.85 | 67.83 |
| Alternative 3 | 97.04 | 91.75 |
| CHANGE | 25.19 | 23.92 |
| **TOTAL CHANGE ALT. 3** | +34.51 | +29.37 |
| **TOTAL CHANGE ALT. 2** | -7.17 | -17.28 |

* "Minor Drainages" are located in the following canyons: Bridge Construction -- Castaic Creek; Buried Storm Drains - Homestead (2), Off-Haul (2), Mid Martinez (1), Humble (1), Exxon (2), Unnamed Canyon B (1), Unnamed Canyon C (1), Dead End (2), Unnamed Canyon D (1), Middle (1) and Magic Mountain (1).

Source: URS 2008

The HARC analysis indicates that, overall, Alternative 3 would result in substantial changes to the geomorphic function of the tributaries with net losses observed for the hydrology process metrics. In total, Alternative 3 would result in a net gain of 29.37 hydrology AW-score units within the tributaries and a gain of 34.51 total HARC AW-score units within the tributaries. The overall increase in HARC AW-score units within the tributaries suggests that Alternative 3 components do not have an overall impact on the geomorphic function of the tributaries. Specifically, net gains in the total HARC AW-score units would be produced in Chiquito, San Martinez Grande, Long, Potrero, Lion, and Salt Creek Canyon indicating that the gain in riparian/wetland function of these tributaries would compensate for any such losses in the other tributaries. Therefore, impacts associated with Alternative 3 would be less than significant relative to Significance Criterion 3 since they would not result in a substantial reduction in geomorphic function.

**Tributaries -- Significance Criterion 4: Construction and Scour Impacts to Riparian Vegetation (Significant but Mitigable).** Impacts to riparian vegetation within the tributaries located within the RMDP boundary are primarily associated with the physical alterations to the stream channels. As described in **Section 2.0**, Project Description, of this EIS/EIR, in some cases where a channel is currently incised and eroding its riparian corridor, it is more feasible to provide the desired degree of ecological function by relocating the channel and creating a stable channel with new vegetative plantings; where the channel is in good condition and has a healthy riparian corridor it is more desirable to preserve the creek in-situ and retrofit with small step-pool structures to protect against future headcuts. Under Alternative 3, approximately 60,010 lf of channel would be converted to buried storm drain. In addition, 67,868 lf of bank stabilization, 188 grade stabilizer structures, and 3 bridges, and 12 culverted road crossings would be constructed as part of Alternative 3. Accordingly, nearly all tributary riparian reaches within the RMDP area would sustain impacts to riparian vegetation resources from grading or installation of RMDP components within the reach. The seven reaches in the Salt Creek drainage are exceptions in this regard; the entire portion of the Salt Creek watershed within the applicant's ownership would be dedicated as permanent open space and no fill of the drainage is proposed, except for habitat restoration or enhancement activities.

Reengineered channel area, installation of bank stabilization, and conversion of the existing channels to buried storm drain would result in a total of 94.3 acres of existing channel impacted by the RMDP components, with 53.6 acres altered through reengineering and installation of bank stabilization. These changes could have a significant effect on riparian vegetation of the tributary drainages. The effects of these changes on the geomorphic function of the tributaries within the Project area can be determined with an evaluation of the hydrologic function metrics of the HARC (see **Section 4.6**, Jurisdictional Waters and Streams).

**Table 4.2-20**, presented above, compares the total hydrology AW-score units and the total HARC AW-score units calculated for the tributaries. In total, Alternative 3 would result in a net gain of 29.37 hydrology AW-score units and net gain of 34.51 total HARC AW-score units within the tributaries. As such, implementation of the Alternative 3 RMDP components would involve a cumulative net gain of riparian area. In reaches where buried bank stabilization is proposed, the temporary impact zone would be revegetated with native riparian plants. In regards to scour of riparian vegetation, Alternative 3 could result in a substantial increase in the frequency and magnitude of scouring of riparian vegetation which, absent mitigation, would be a significant impact.

To mitigate these impacts Mitigation Measures SW-2 and SW-3 presented in **Section 4.6**, Jurisdictional Waters and Streams would provide riparian enhancement through removal of exotic species, restoration of sediment equilibrium, and recontouring of existing, incised banks to increase the extent of Corps and CDFG jurisdictional areas as well as providing avoidance and restoration measures in the Potrero and Salt Creek watershed. In reaches where RMDP components would be constructed, the temporary impact zone would be revegetated with native riparian plants. Specifically Mitigation Measure SW-5 (**Section 4.6**, Jurisdictional Waters and Streams) would be implemented to ensure that all areas where temporary construction impacts affect Corps or CDFG jurisdictional areas are revegetated (generally, these are areas where impacts would occur due to the construction of Project facilities). In addition, riparian habitat restoration activities that would be implemented in conjunction with the RMDP would include revegetation of native plant communities on candidate sites contiguous to existing riparian habitats. Site restoration would also include the maintenance of revegetation sites, including the control of non-native plants and irrigation system maintenance. As described in Mitigation Measures BIO-1, BIO-6, and BIO-7, monitoring of the restoration sites would be conducted to evaluate the success of revegetation efforts. Contingency plans and appropriate remedial measures to be implemented should habitat restoration objectives not be achieved would also be included in tentative map-level habitat restoration plans. **Section 4.5**, Biological Resources, of this EIS/EIR, provides more detail on the restoration methods proposed to be used. Incorporation and implementation of the specified mitigation measures would reduce the impacts relative to riparian scour to less than significant relative to Significance Criterion 4.

**SCP Direct Impacts**

**Significance Criterion 1: Short-Term Impacts from Construction (No Impact).** The proposed SCP is a conservation and permitting plan for an upland plant species (spineflower), and would not authorize any construction activities within the River Corridor or tributaries. Therefore, no direct impacts would result from implementation of the SCP relative to Significance Criterion 1.

**Significance Criterion 2: Erosion and Downstream Deposition (No Impact).** The same analysis for Significance Criterion 1, above, applies to this criterion.

**Significance Criterion 3: Impacts to Geomorphic Function (No Impact).** The same analysis for Significance Criterion 1, above, applies to this criterion.

**Significance Criterion 4: Construction and Scour Impacts to Riparian Vegetation (No Impact).** The same analysis for Significance Criterion 1, above, applies to this criterion.

#### 4.2.5.4.2 Indirect Impacts

**RMDP Indirect Impacts**

**Significance Criterion 1: Short-Term Indirect Impacts from Construction of Newhall Ranch Specific Plan Development (Significant but Mitigable).** Under Alternative 3, indirect impacts associated with construction of the Specific Plan development would be virtually the same as those for Alternative 2 (proposed Project). The indirect impacts from construction associated with the Specific Plan are included as part of the discussion for indirect RMDP impacts for Alternative 2.

Absent mitigation, there would be significant short-term sedimentation impacts during construction with respect to Significance Criterion 1. However, Mitigation Measures SP-4.2-2 (acquire state and federal permits), SP-4.2-3 (CDFG streambed agreements), SP-4.2-5 (DPW plan and map approvals), and SP-4.2-7 (DPW SUSMP and SWPPP requirements) would ensure that regulatory requirements are implemented and short-term impacts are less than significant through proper application of sediment controls and other BMPs required by existing local, state, and federal regulations.

**Significance Criterion 2: Indirect Impacts from Erosion and Downstream Deposition (Significant but Mitigable).** Under Alternative 3, indirect impacts associated with erosion and downstream deposition would be similar to those for Alternative 2 (proposed Project). The developed area of the Specific Plan would be covered with non-erosive surfaces, including pavement and permanent vegetation, which would reduce the sedimentation of site runoff. Alternative 3 proposes to develop 262.9 acres less developed area within the Newhall Ranch Specific Plan area than that proposed by Alternative 2 (proposed Project). Accordingly, less surface runoff would occur under Alternative 3. Permanent erosion control measures that reduce sediment in runoff include check dams to reduce flow velocities in tributary water courses, drainage swales, slope drains, subsurface drains, storm drain inlet/outlet protection, and sediment traps.

The drainage areas in which the Specific Plan site lies would not be completely developed; therefore, storm flows from the upper reaches would contain sediment and vegetative debris. The amount of sediment and debris contained in the storm flows would be dependent upon the size of the area being drained and whether the area had been subject to burning. If this debris enters and clogs on-site drainages, upstream flooding could occur, which would be a significant impact. Because Alternative 3 would result in less surface runoff compared to Alternative 2, this impact would be less than that associated with Alternative 2, but still significant.

In order to prevent sediment and debris from the upper reaches of the drainage areas from entering storm drainage improvements, permanent erosion control measures would be implemented, including the installation of desilting and debris basins, drainage swales, slope drains, storm drain inlet/outlet protection, and sediment traps. (Mitigation Measure SP-4.2-6, DPW-approved permanent erosion controls.) The specific improvements for each drainage area would be designed as part of the final Drainage Plan prepared to DPW standards during the subdivision process. (Mitigation Measure SP-4.2-5, DPW plan and map approvals.) In addition, Mitigation Measure SP-4.2-7, DPW SUSMP and SWPPP requirements would further reduce erosion impacts by requiring that stormwater discharges from open channels or drainage systems discharging to the Santa Clara River in excess of four fps (erosive flows) be controlled to prevent accelerated erosion and protect River habitat. Discharge flows would be regulated using water control features and energy dissipation structures where required to reduce discharge velocities to non-erosive rates. Specifically, implementation of Mitigation Measures GRR-1 and GRR-4, (DPW required runoff controls and hydromodification controls and channel design respectively) would further control the rate of stormwater runoff to minimize downstream erosion through construction of BMPs, and channels would be designed to incorporate the calculated post-development equilibrium slope to ensure a dynamically stable condition allowing for more or less equal amounts of erosion and deposition.

With installation of these temporary and permanent erosion/sedimentation control measures, the Specific Plan would not result in significant sedimentation or debris-related impacts either on the RMDP site or downstream of the site. Instead, the Specific Plan would have a beneficial post-construction impact on downstream sedimentation because, as the site builds out, some steep slopes would be graded to flatter slopes, and many of the areas of the site that have been subject to the vegetation-denuding effects of grazing and burning would be covered with vegetation and other non-erodible surfaces.

Similar to Alternative 2, the changes to the site would reduce site under Alternative 3 sedimentation to below existing levels and reduce debris volume generation throughout the tributary watershed, although to a lesser degree than under Alternative 2. This would, in turn, have beneficial downstream deposition impacts because burned and bulked flows from the site would be substantially reduced, resulting in lower flood flow rates. With implementation of the Project-incorporated Mitigation Measures SP-4.2-5, SP-4.2-6, and SP-4.2-7 (DPW plan and map approvals, DPW-approved erosion controls, and DPW SUSMP and SWPPP requirements, respectively) erosion and deposition impacts resulting from build-out of the Specific Plan development are considered less than significant, even before mitigation. However, implementation of Project-specific mitigation measures GRR-1 and GRR-4 (DPW required runoff controls and hydromodification controls and channel design, respectively) would further reduce these impacts. Accordingly, erosion and downstream deposition impacts would be less than significant relative to Significance Criterion 2.

**Significance Criterion 3: Indirect Impacts to Geomorphic Function (Significant but Mitigable).** Potential indirect hydromodification impacts to the Santa Clara River include stream corridor disturbances from Specific Plan build-out and associated increased runoff intensity from the urbanized tributary drainages. Alternative 3 proposes to develop 262.9 acres less building pad area within the Newhall Ranch Specific Plan area than that proposed by Alternative 2 (proposed Project). Accordingly, less surface runoff would occur under Alternative 3. The indirect impacts to geomorphic function associated with the Specific Plan are included as part of the discussion for indirect RMDP impacts for Alternative 2. Since Alternative 3 would result in less surface runoff than Alternative 2, the impacts to the geomorphic function of the Santa Clara River and tributaries would also be less under this alternative, but would still be significant. Each of the tributary drainages is designed with hydromodification control components in accordance with DPW design standards to ensure that soft-bottom waterways maintain an equilibrium between sediment supply to the waterway and sediment transport through the waterway.

Implementation of Mitigation Measures SP-4.2-5 (DPW plan and map approvals) would ensure that no significant erosion or sedimentation impacts would occur as a result of the Project. The additional implementation of Mitigation Measures GRR-1 through GRR-6 (DPW required runoff controls, minimization of bridge and structures, structural durability, hydromodification controls and channel design, sediment and debris control facilities, sediment redistribution) would ensure that no substantial reductions in geomorphic function would occur in the RMDP area tributaries. Accordingly, the impacts are considered less than significant relative to Significance Criterion 3.

**Significance Criterion 4: Indirect Construction and Scour Impacts to Riparian Vegetation (Less than Significant).** Implementation of the Alternative 3 RMDP component would indirectly facilitate the build-out of the Specific Plan sites. The confluence of the tributaries to the Santa Clara River are all

maintained within the SMA/SEA 23 boundaries and are preserved in a largely natural state. As indicated above, no significant increases in velocity, erosion, or sedimentation would occur in the Santa Clara River because of the proposed build-out.

Implementation of the Specific Plan would result in the loss of riparian vegetation along the RMDP area drainages. Losses of riparian vegetation during construction are addressed in **Section 4.5**, Biological Resources. The impacts to riparian vegetation can be evaluated with the use of the HARC analysis. As discussed in the preceding sections, the number of AW-score units ultimately describes the value of a particular reach, and the number of AW-score units impacted versus preserved will show the impacts of the proposed Project and alternatives on wetland and riparian resources (*i.e.*, post-Project HARC scores serve as a surrogate indicator of potential increases in the frequency and magnitude of scour of riparian vegetation [refer to **Subsection 4.2.5.1.4**, Scour Impacts to Riparian Vegetation]). Conceptually, the alternative with the fewest lost AW-score units would be the least damaging alternative. However, an alternative with a greater loss of HARC AW-score units may be mitigated by producing AW-score units in another location within the Project area through wetland/riparian restoration or creation (see **Section 4.6**, Jurisdictional Waters and Streams, for further discussion on the HARC assessment methods). **Table 4.2-20**, presented above, compares the total hydrology AW-score units and the total HARC AW-score units calculated for the tributaries.

The HARC analysis indicates that, overall, Alternative 3 would result in substantial changes to the hydrologic function of the tributaries. In total, Alternative 3 would result in a net gain of 29.37 hydrology AW-score units and a net gain of and 34.51 total HARC AW-score units within the tributaries. The overall increase in HARC AW-score units within the tributaries suggests that Alternative 3 components do not have an overall impact on the geomorphic function of the tributaries. Specifically, net gains in the total HARC AW-score units would be produced in Chiquito, San Martinez Grande, Long, Potrero, Lion, and Salt Creek Canyon, indicating that the gain in riparian/wetland function of these tributaries would compensate for any such losses in the other tributaries. Therefore, impacts would be less than significant relative to Significance Criterion 4.

**Significance Criterion 5: Impacts to Riparian Resources Supported by the Middle Canyon Spring (Significant but Mitigable).** Although Alternative 3 would result in less development in Middle Canyon compared to Alternative 2, the potential impacts of Alternative 3 on the groundwater hydrology associated with the Middle Canyon Spring are similar to those discussed in the impact analysis for Alternative 2. Accordingly, Alternative 3 has the potential to result in a significant impact to riparian resources supported by the Middle Canyon Spring. However, implementation of Mitigation Measures BIO-74 and BIO-77 would reduce these impacts to less than significant relative to Significance Criterion 5. Mitigation Measure BIO-74 requires the installation of fencing and signage around the spring prior to construction, during construction, and following construction to restrict access and protect the spring area. Mitigation Measure BIO-77 includes the development of the Middle Canyon Spring HMP in consultation with CDFG and implementation of HMP following approval by CDFG.

**SCP Indirect Impacts**

**Significance Criterion 1: Short-Term Impacts from Construction Newhall Ranch Specific Plan, VCC, and Entrada Developments (Significant but Mitigable).** Implementation of the Alternative 3 SCP component would indirectly facilitate the build-out of the Specific Plan, VCC, and a portion of the Entrada site. Construction impacts associated with the build-out facilitated by Alternative 3 would be virtually the same as those associated with the build-out facilitated by Alternative 2. Short-term construction impacts to geomorphology associated with construction of the Specific Plan development are included among the indirect impacts of the RMDP component, and are discussed in the preceding subsections on Alternative 2. The indirect impacts associated with the build-out of the VCC and Entrada developments are included among the indirect impacts of the SCP Project component, and are discussed in the preceding subsections on Alternative 2.

No previously adopted mitigation measures exist for the VCC or Entrada planning areas. Therefore, the geomorphology-related mitigation measures required by this EIS/EIR in those planning areas include the measures previously adopted by Los Angeles County for the Specific Plan site in addition to new measures proposed by the Corps and CDFG. Accordingly, with the implementation of Mitigation Measures SP-4.2-5, SP 4.2-6, and SP 4.2-7 (DPW plan and map approvals, DPW-approved permanent erosion controls, and DPW SUSMP and SWPPP requirements), short-term impacts from the build-out of the Specific Plan site are considered significant but mitigable to less than significant relative to Significance Criterion 1 through proper design and BMP implementation.

**Significance Criterion 2: Indirect Impacts from Erosion and Downstream Deposition (Significant but Mitigable).** Implementation of the Alternative 3 SCP component would indirectly facilitate the build-out of the Specific Plan, VCC, and a portion of the Entrada site. Indirect impacts of erosion and downstream deposition associated with build-out of the Specific Plan development are included among the indirect impacts of the RMDP Project component, and are discussed in the preceding subsections on Alternative 2. The indirect impacts associated with the build-out of the VCC and Entrada developments are included among the indirect impacts of the SCP Project component, and are discussed in the preceding subsections on Alternative 2.

Alternative 3 proposes to develop 46.8 acres less area within the VCC and Entrada planning areas than that proposed by Alternative 2 (proposed Project). Accordingly, less surface runoff would occur under Alternative 3. Because Alternative 3 would result in less surface runoff compared to Alternative 2, this impact would be less than that associated with Alternative 2, but still significant.

With implementation of Mitigation Measures SP-4.2-5, SP 4.2-6, and SP 4.2-7 (DPW plan and map approvals, DPW-approved permanent erosion controls, and DPW SUSMP and SWPPP requirements, respectively) the erosion and downstream deposition impacts of the Newhall Ranch Specific Plan, VCC, and Entrada developments would be reduced to a less-than-significant level relative to Significance Criterion 2.

**Significance Criterion 3: Indirect Impacts to Geomorphic Function (Significant but Mitigable).** Implementation of the Alternative 3 SCP component would indirectly facilitate the build-out of the Specific Plan, VCC, and a portion of the Entrada site. Indirect hydromodification impacts associated with

build-out of the Specific Plan development are included among the indirect impacts of the RMDP Project component, and are discussed in the preceding subsections on Alternative 2. The indirect impacts associated with the build-out of the VCC and Entrada developments are included among the indirect impacts of the SCP Project component, and are discussed in the preceding subsections on Alternative 2. Alternative 3 proposes to develop 46.8 acres less area within the VCC and Entrada planning areas than that proposed by Alternative 2 (proposed Project). Accordingly, less surface runoff would occur under Alternative 3. Because Alternative 3 would result in less surface runoff compared to Alternative 2, this impact would be less than that associated with Alternative 2, but still potentially significant.

Mitigation Measures GRR-1, GRR-2, and GRR-4 (DPW required runoff controls, minimization of bridge and structures, and hydromodification controls and channel design) would be implemented to reduce impacts to the geomorphic function of the tributaries resulting from the build-out of the proposed developments. These measures would ensure that erosion and deposition impacts are reduced to less-than-significant levels. Accordingly, with mitigation, impacts resulting from the build-out of the Specific Plan, VCC, and Entrada planning areas are considered less than significant relative to Significance Criterion 3.

**Significance Criterion 4: Indirect Construction and Scour Impacts to Riparian Vegetation (Significant but Mitigable).** Implementation of the Alternative 3 SCP component would indirectly facilitate the build-out of the Specific Plan, VCC, and a portion of the Entrada site. Indirect impacts to riparian vegetation associated with build-out of the Newhall Ranch Specific Plan development are included among the indirect impacts of the RMDP Project component, and are discussed in the preceding subsections on Alternative 2. The indirect impacts associated with the build-out of the VCC and Entrada developments are included among the indirect impacts of the SCP Project component, and are discussed in the preceding subsections on Alternative 2. Alternative 3 proposes to develop 46.8 acres less area in the VCC and Entrada planning areas than that proposed by Alternative 2 (proposed Project). Accordingly, less surface runoff would occur under Alternative 3. Because Alternative 3 would result in less surface runoff compared to Alternative 2, this impact would be less than that associated with Alternative 2. With the implementation of Mitigation Measures SW-1 through SW-3 as proposed in **Section 4.6**, Jurisdictional Waters and Streams, the impacts to the riparian vegetation along the tributaries resulting from the Specific Plan, VCC, and Entrada planning areas would be less than significant relative to Significance Criterion 4.

#### 4.2.5.4.3 Secondary Impacts

**RMDP and SCP Secondary Impacts**

**Significance Criterion 6: Impacts to the "Dry Gap" (Less than Significant).** The potential impacts associated with the Newhall Ranch WRP for Alternative 3 would be similar to those described in the impact analysis for Alternative 2. As discussed in that analysis, the potential impacts of the Newhall Ranch WRP to the Dry Gap are considered less than significant relative to Significance Criterion 6 since they will not substantially lengthen the duration of seasonal flow in the Dry Gap. This significance finding is based on the fact that discharge from the Newhall Ranch WRP w occur in the winter and would be small relative to the overall flow in the Santa Clara River, and the existing data shows that increases in base flow due to discharges from the Valencia WRP and the Saugus WRP since the 1960s have not led to a substantial change in the duration of seasonal flow in the Dry Gap.

**Significance Criterion 7: Impacts to Ventura County Beaches (Less than Significant).** The effects of Alternative 3 components on beach replenishment are a function of the sediment load delivered through the Project reach. As discussed in **Subsection 4.2.3.1.3**, Beach Replenishment, above, the Santa Clara River contributes approximately 60 percent of beach sand within Ventura County. However, the reduction of area subject to erosion due to project components and the build-out of the Specific Plan, VCC, and Entrada areas under Alternative 3 could result in a relative reduction of floodwater sediment, which could negatively impact beaches, as incrementally less sediment would be available for their replenishment.

The RMDP component of Alternative 3 that would have the most effect on sediment supply in the tributaries is the conversion of tributary drainage to buried storm drain. For this analysis, it is assumed that the area converted to buried storm drain results in a net loss of sediment supplied by the affected area. As detailed in **Subsection 4.2.3.1.3**, Beach Replenishment, roughly 1,170 tons per square mile per year of suspended sediment originates from the area upstream of the Los Angeles County/Ventura County line. Approximately 38.1 acres (0.06 square miles) within the tributaries that could potentially contribute to sediment supply would be converted to buried storm drain; this could result in a net reduction of 70 tons of sediment per year in the tributaries.

In order to estimate the impacts to sediment supply associated with the RMDP components within the Santa Clara River floodplain, it is assumed that the floodplain areas subject to velocities greater than four fps contribute to the sediment supply within the Project reach during the capital flood event. Accordingly, Alternative 3 would result in a maximum reduction of 169.1 acres (0.26 square miles) of floodplain area subject to velocities greater than four fps during the capital flood event (see **Table 4.2-17**). Therefore, Alternative 3 would result in a maximum net reduction of about 169.1 acres (0.26 square miles) of channel area that could potentially contribute to sediment supply. Given this estimate, the reduction of 169.1 acres (0.26 square miles) would result in a maximum direct reduction of approximately 310 tons of sediment per year delivered through the Project reach. In total, Alternative 3 could result in a reduction of 380 tons of sediment per year delivered through the Project reach.

The build-out of the Specific Plan would have greater effects to the sediment supplied to the River system. The build-out of the Specific Plan under Alternative 3 would convert approximately 4,479 acres (7.0 square miles) to non-erodible surfaces, including pavement and permanent vegetation that would reduce the sedimentation of site runoff. Accordingly, this would result in the reduction of roughly 8,130 tons of sediment per year.

The drainage areas in which the VCC and Entrada sites lie would not be completely developed; therefore, storm flows from the upper reaches would contain sediment and vegetative debris. The VCC planning area is approximately 321.3 acres. The approved land uses include 177.6 acres of industrial/commercial development (including associated public facilities), and 143.6 acres of open space. The Entrada planning area consists of approximately 316.1 acres. The proposed land uses consist of approximately 176.3 acres as open space and the remaining 139.8 acres as residential, commercial, and recreational uses and public facilities. Combined, the build-out of the VCC and Entrada sites would result in approximately 317.4 acres (0.5 square miles) of non-erosive surfaces, including pavement and permanent vegetation that would reduce the sedimentation of site runoff. The reduction of 364.2 acres (0.57 square miles) of sediment-generating area would result in a direct reduction of roughly 667 tons of sediment per year.

As detailed in **Subsection 4.2.3.1.3**, Beach Replenishment, the Santa Clara River exports an estimated 4.08 million tons per year from its mouth into the Santa Barbara Channel. In total, the RMDP and SCP would result in the net reduction of 8,797 tons of sediment per year, or approximately 0.2 percent reaching the Santa Barbara Channel, which would be a less-than-significant impact. In order to minimize this reduction in sediment delivery to Ventura County beaches, Mitigation Measure GRR-6 specifies that sediment from upland sources, such as debris basins and other sediment retention activities, would be redistributed in permitted upland and/or riparian locations along the Santa Clara River to reintroduce sediment for beach replenishment purposes. This sediment management activity would lessen the adverse effect of debris and sediment reduction on downstream beach erosion.

Based on this analysis, the reduction of sediment delivered to Ventura County beaches due to the RMDP components and build-out of the Specific Plan, VCC and Entrada planning areas would be less than significant relative to Significance Criterion 7 since the decrease in average annual sediment transported to the beaches would be less than 1 percent.

### 4.2.5.5 Impacts of Alternative 4 (Elimination of Planned Potrero Bridge and Addition of VCC Spineflower Preserve)

As described in **Section 2.0**, Project Description, of this EIS/EIR, Alternative 4 is comprised of different configurations of RMDP infrastructure and spineflower preserves within the Project area. Under Alternative 4, infrastructure would be constructed in and adjacent to the Santa Clara River and tributary drainages within the Project area. A summary of the RMDP infrastructure authorized under the RMDP component of Alternative 4 is presented in **Table 4.2-21a**. The proposed RMDP components are described and illustrated in **Section 3.0**, Description of Alternatives, and **Figure 3.0-12**, Alternatives 3 & 4 - RMDP Santa Clara River Features.

**Table 4.2-21a**
**Alternative 4 Santa Clara River Major RMDP Infrastructure**

| Santa Clara River Location | Bank Stabilization (lf) | Outlets (No.) | Bridges | | | |
|---|---|---|---|---|---|---|
| | | | Length (lf) | Width (lf) | Piers (No.) | Vertical Clearance (ft) |
| **Bridges** | | | | | | |
| Commerce Center Drive Bridge | - | - | 1,200 | 100 | 9 | 22 |
| Long Canyon Road Bridge | - | - | 980 | 100 | 9 | 31-40 |
| Potrero Canyon Road Bridge | - | - | - | - | - | - |
| **Banks** | | | - | - | - | - |
| North River Bank | 19,119 | 22 | - | - | - | - |
| South River Bank | 7,632 | 3 | - | - | - | - |
| **Total** | **26,751** | **25** | - | - | - | - |

Source: RMDP, 2008.

Implementation of Alternative 4 would result in the reduction of approximately 251 acres of developable area on Newhall Ranch when compared to the build-out potential of the proposed RMDP. This alternative

also would result in a decrease of 46.8 acres of developable area for the Entrada planning area. The VCC project would not be constructed under this alternative, removing 177.6 acres of developable area. The reduction of developable space would occur due to preservation of streams and riparian areas, designation of spineflower preserves, proximity to unstabilized drainages, and reduction of access to isolated parcels.

**Santa Clara River. Figure 3.0-12** (**Section 3.0**, Description of Alternatives), depicts the locations of both the Alternatives 3 and 4 RMDP Santa Clara River features relative to river jurisdictional areas. As shown, one proposed bridge, Long Canyon Road Bridge, and one previously approved bridge, Commerce Center Drive Bridge, would be located across the main stem of the Santa Clara River, resulting in permanent impacts due to bridge crossings.[15] Like Alternative 3, no bridge is proposed under Alternative 4 at the mouth of Potrero Canyon (Potrero Canyon Road Bridge).[16] As shown, buried bank stabilization would be installed mostly in upland areas along approximately one-half of the north bank and one-third of the south bank of the Santa Clara River. The WRP outfall to the Santa Clara River also would be constructed. As shown, permanent bank stabilization impact areas exist on the north and south banks of the Santa Clara River. The geofabric utility corridor bank protection also is proposed on the north side of the Santa Clara River between San Martinez Grande Canyon and Chiquito Canyon. Refer to **Figure 3.0-12** (**Section 3.0**, Description of Alternatives) for locations of bank protection and stabilization features and bridge locations/impact areas relative to jurisdictional areas under this alternative.

**Table 4.2-21a** summarizes the characteristics of the major RMDP infrastructure along the Santa Clara River, including north side (19,119 lf) and south side (7,632 lf), for a total of 26,751 lf of buried bank stabilization to be constructed along the Santa Clara River. Like Alternative 3, this table shows 22 storm drain outlets along the north bank and three such outlets on the south bank of the Santa Clara River (25 storm drain outlets). In addition, the table documents the length, width, and vertical clearance of the two bridges, as well as the number of piers supporting the bridges.

**Tributary Drainages. Figure 3.0-19** (**Section 3.0**, Description of Alternatives) illustrates the modified, converted, and preserved tributary drainages within the Project area under Alternative 4. Proposed drainage treatments in Chiquito Canyon and San Martinez Grande Canyon for Alternative 4 are as described previously for the proposed Project (Alternative 2) in **Subsection 3.4.2.1.1**.

Under Alternative 4, there are five major tributary drainages that would be partially regraded or modified but remain in a soft-bottom channel condition: Chiquito Canyon, San Martinez Grande Canyon, Potrero Canyon, Long Canyon, and Lion Canyon. Significant portions of several small, tributary drainages would be graded and replaced with storm drains or other appropriate conveyance facilities, including: Magic Mountain Canyon, Middle Canyon, Dead-End Canyon, Exxon Canyon, Mid-Martinez Canyon, Off-Haul Canyon, Homestead Canyon, the Chiquito Canyon agricultural ditch, Unnamed Canyon B, Unnamed Canyon C, Unnamed Canyon D, Unnamed Canyon 1 and Unnamed Canyon 2.

[15] The Commerce Center Drive Bridge was previously analyzed in the Final EIS/EIR prepared and approved by the Corps and CDFG in connection with previously adopted NRMP (SCH No. 1997061090, August 1998).

[16] The Potrero Canyon Road Bridge was approved by Los Angeles County as part of the Specific Plan on May 27, 2003.

**Long Canyon.** In Long Canyon, Alternative 4 would leave the upper 25 percent of the drainage in a natural, unstabilized (preserved) condition as shown on **Figure 3.0-20** Long Canyon Alternative Detail - Alternatives 4 & 5 Proposed RMDP Tributary Treatments (**Section 3.0**, Description of Alternatives). The lower 75 percent of the existing channel would be graded, and the drainage would be relocated and lined with buried bank stabilization. Two proposed culvert road crossings would cross the drainage approximately 500 and 2,000 feet upstream of the Santa Clara River confluence. A third crossing (Magic Mountain Parkway) would be constructed near the eastern end of the drainage as shown on **Figure 3.0-20**. Under Alternative 4, Long Canyon would involve the placement of 6,813 lf of buried bank stabilization along the west bank and 6,689 lf of buried bank stabilization along the east bank of Long Canyon. In addition, approximately 961 lf of drainage would be converted to buried storm drain. The proposed RMDP components are further described and illustrated in **Section 3.0**, Description of Alternatives.

**Potrero Canyon.** In Potrero Canyon, Alternative 4 would require the construction of a soft-bottom channel lined with buried bank stabilization between the upstream end of the lower mesic meadow and a point approximately four-fifths of the way up the drainage as shown on **Figure 3.0-21** (**Section 3.0**, Description of Alternatives). This channel would not correspond to the existing location of the drainage, and would require the drainage to be relocated. Downstream of this channel, the mesic meadow area would remain unstabilized and the drainage would be left in its current state. Upstream of this channel, 10,918 lf of the drainage would be graded and buried storm drains would convey flow. Two new bridges and two culvert road crossings would be constructed at approximately even intervals between the upstream end of the mesic meadow and the upstream end of the saltgrass meadow, allowing roadways to cross the lined, soft-bottom channel. A fifth culvert road crossing would cross the channel farther upstream, just downstream of the point where the drainage begins to branch (**Figure 3.0-21**, **Section 3.0**, Description of Alternatives). Alternative 4 would involve the installation of 27,751 lf of buried bank stabilization, 97 grade control structures, two bridges, and three culvert road crossings in Potrero Canyon. Refer to **Figure 3.0-21** (**Section 3.0**, Description of Alternatives) for locations of newly created drainage, preserved drainage area, permanent drainage impact areas, side drainage bank stabilization areas, drainage to storm drain conversion areas, and bridge and road crossing locations/impact areas relative to jurisdictional areas. The proposed RMDP components are described and illustrated in **Section 3.0**, Description of Alternatives, Proposed Potrero Tributary Treatments -- Alternative 4.

**Lion Canyon.** Proposed drainage treatments in Lion Canyon for Alternative 4 include approximately 6,316 lf of drainage converted to buried storm drain in the western, central, and eastern portions of Lion Canyon, as shown on **Figure 3.0-9** (**Section 3.0**, Description of Alternatives). One culverted road crossing would be constructed to allow Specific Plan roadways to cross the Lion Canyon drainage at the locations shown on **Figure 3.0-9** (**Section 3.0**, Description of Alternatives). **Table 4.2-21b**, below, describes the Alternative 4 tributary drainage RMDP infrastructure characteristics, including the Lion Canyon modified drainage. The proposed RMDP components are described and illustrated in **Section 3.0**, Description of Alternatives, Lion Canyon Detail Alternative 4 Proposed RMDP Tributary Treatments.

**Table 4.2-21b**
**Alternative 4 Tributary Drainage RMDP Infrastructure**

| Drainage Location | Drainage Modified (lf) | Drainage Converted to Buried Storm Drain (lf) | Bank Stabilization[1] (lf) | | Preserved Drainage (lf) | Road Crossings | |
|---|---|---|---|---|---|---|---|
| | | | West Bank | East Bank | | Bridges | Culverts |
| **Modified Drainages** | | | | | | | |
| Chiquito Canyon | 8,563 | 2,598 | 7,420 | 7,296 | 898 | 0 | 3 |
| Lion Canyon | 5,614 | 6,316 | 0 | 0 | 0 | 0 | 1 |
| Long Canyon | 7,289 | 961 | 6,813 | 6,689 | 2,329 | 0 | 3 |
| Potrero Canyon | 15,497 | 10,918 | 14,469 | 13,281 | 13,277 | 2 | 3 |
| San Martinez Grande Canyon | 5,048 | 0 | 4,279 | 4,287 | 122 | 0 | 2 |
| Subtotal | 42,011 | 20,793 | 32,981 | 31,553 | 16,626 | 2 | 12 |
| **Unimproved/Converted Drainages** | | | | | | | |
| Agricultural Ditch | 317 | 1,479 | 0 | 0 | 0 | 0 | 0 |
| Ayers Canyon | 147 | 0 | 0 | 0 | 2,318 | 0 | 1 |
| Dead-End Canyon | 0 | 1,931 | 0 | 0 | 0 | 0 | 0 |
| Exxon Canyon | 0 | 1,276 | 0 | 0 | 2,265 | 0 | 0 |
| Homestead Canyon | 0 | 609 | 0 | 0 | 0 | 0 | 0 |
| Humble Canyon | 0 | 421 | 0 | 0 | 5,116 | 0 | 0 |
| Middle Canyon | 0 | 7,439 | 0 | 0 | 148 | 0 | 0 |
| Mid-Martinez Canyon | 22 | 4,541 | 0 | 0 | 250 | 0 | 0 |
| Off-Haul Canyon | 0 | 7,593 | 0 | 0 | 1,185 | 0 | 0 |
| Salt Canyon | 7,290 | 0 | 0 | 1,992 | 101,470 | 0 | 0 |
| Magic Mountain Canyon | 0 | 6,111 | 0 | 0 | 0 | 0 | 0 |
| Unnamed Canyon 1 | 0 | 4,647 | 0 | 0 | 0 | 0 | 0 |
| Unnamed Canyon 2 | 2 | 390 | 0 | 0 | 24 | 0 | 0 |
| Unnamed Canyon A | 0 | 0 | 0 | 0 | 1,293 | 0 | 0 |
| Unnamed Canyon B | 0 | 1,004 | 0 | 0 | 568 | 0 | 0 |
| Unnamed Canyon C | 0 | 402 | 0 | 0 | 869 | 0 | 0 |
| Unnamed Canyon D | 0 | 1,232 | 0 | 0 | 260 | 0 | 0 |
| Subtotal | 7,778 | 39,075 | 0 | 1,992 | 115,765 | 0 | 0 |
| **Totals** | **49,789** | **59,868** | **32,981** | **33,546** | **132,392** | **2** | **13** |

Notes:
[1] The lf of bank stabilization does not necessarily reflect impacts to jurisdictional areas; it only provides the linear feet of bank protection to be installed along various tributary drainages.

Source: RMDP, 2008.

**Minor Tributaries and Drainages.** One culverted road crossing would be constructed across the mouth of the Ayers Canyon drainage. No other drainage facilities would be constructed in Ayers Canyon. Three culverts would be constructed within the Magic Mountain Canyon, Unnamed Canyon 1, and Unnamed Canyon 2. In addition, the existing six-lane bridge allowing SR-126 to cross the Castaic Creek drainage would be expanded to eight lanes. Approximately 39,075 lf of existing drainage within the minor tributaries would be converted to buried storm drain and approximately 115,765 lf of minor tributary drainage would be preserved under Alternative 4. **Table 4.2-21b**, above, describes the Alternative 4 tributary drainage RMDP infrastructure characteristics, including the converted and preserved drainages..

#### 4.2.5.5.1 Direct Impacts

**RMDP Direct Impacts**

**Santa Clara River -- Significance Criterion 1: Short-Term Impacts from Construction of Bridges, Bank Stabilization, and Turf Reinforcement Mats (Significant but Mitigable).** Installation of bank stabilization features and bridge piers and abutments would directly impact elements of Santa Clara River geomorphology. Bridge piers and abutments would have localized effects on channel alignment. This would be a significant impact prior to mitigation. Under Alternative 4, the Potrero Canyon Road Bridge is not proposed and the associated bridge pier and abutment features are not required and fewer linear feet of bank stabilization would be constructed. Therefore, Alternative 4 would have less of a direct effect on the Santa Clara River geomorphology than Alternative 2, although still significant. Specifically, Alternative 4 would result in approximately 10 percent less floodplain area temporarily disturbed during the construction of RMDP components within the Santa Clara River and terrace areas along the edge of the riverbed. Direct construction impacts associated with build-out of the proposed RMDP development are included among the direct impacts of the RMDP Project component, and are discussed in the preceding subsections on Alternative 2.

Implementation of Mitigation Measure SP-4.2-2 (acquire state and federal permits), SP-4.2-3 (CDFG streambed agreements), SP-4.2-5 (DPW plan and map approvals), and SP-4.2-7 (DPW SUSMP and SWPPP requirements) would reduce the short-term impacts to the Santa Clara River geomorphology. Specifically, construction of the RMDP components would be subject to CWA section 402(p), which regulates construction, municipal, and industrial stormwater discharges under the NPDES program. The Project proposes to implement a regional stormwater mitigation plan (**Appendix 4.4**, Geosyntec, 2008) to comply with NPDES permit requirements. Pursuant to NPDES regulations for permitting of stormwater discharges, SWRCB has issued a statewide general Permit and Waste Discharge Requirements for stormwater discharges from construction sites. Under this Construction General Permit, discharges of stormwater from construction sites with a disturbed area of one or more acres are required to either obtain individual NPDES permits for stormwater discharges or be covered by the Construction General Permit. Coverage under the Construction General Permit is accomplished by completing and filing a Notice of Intent with SWRCB and implementing a SWPPP. This plan requires the implementation of BMPs to reduce or eliminate pollutants in stormwater discharges. Therefore, short-term sedimentation impacts with respect to Significance Criterion 1 during construction would be reduced to a less than significant through the implementation of existing regulatory requirements and obtaining required permits from the State and County.

Absent mitigation, there would be significant short-term sedimentation impacts during construction with respect to Significance Criterion 1. However, Mitigation Measures SP-4.2-2 (acquire state and federal permits), SP-4.2-3 (CDFG streambed agreements), SP-4.2-5 (DPW plan and map approvals), and SP-4.2-7 (DPW SUSMP and SWPPP requirements) would ensure that regulatory requirements are implemented and short-term impacts related to construction of RMDP components are less than significant through proper application of sediment controls and other BMPs required by existing local, state, and federal regulations.

**Santa Clara River -- Significance Criterion 2: Erosion and Downstream Deposition (Significant but Mitigable).** Implementation of the RMDP improvements and facilities, particularly site clearing and grading operations, would have the potential to increase sediment flows downstream during storm events, which may result in substantial erosion and deposition and could result in significant impacts downstream

As discussed in **Subsection 4.2.5.1**, Impact Assessment Methods, a representative velocity of 4.0 fps was determined to be the appropriate indicator for potential erosion. Direct impacts associated with erosion could result if the RMDP improvements resulted in an increase of the two- to 100-year and capital flood floodplain area subject to velocities greater than four fps. **Table 4.2-22** includes the change in the total area of floodplain, delineated by vegetation type, where velocities exceed four fps for each return interval.

The total floodplain area subject to potentially erosive velocities would be decreased as a result of Alternative 4 for all return intervals with the exception of the 10-year return period. However, the additional 0.3 acres subject to velocities greater than four fps during the 10-year return interval is not considered to be significant relative to the substantial decrease in area subject to erosive velocities during two-, 20-, 50-, 100-year, and capital flood events as a result of the RMDP components. In some areas, velocities greater than four fps correspond with outlet structures, access ramps, or bridge abutments, which could result in a significant erosion impact. **Appendix 4.1**, Newhall Ranch Resource Management & Development Plan: River & Tributaries Drainage Analysis, Santa Clara River (PACE, 2008A) identifies locations of potential erosion within Santa Clara River riparian areas.

Where necessary to minimize erosion and structural damage to such structures, erosion resistant materials such as concrete, soil cement, or secured rip-rap would be used according to the standards, criteria, and specifications developed by the DPW to ensure long-term stability (Mitigation Measure GRR-3). The specific improvements for each drainage area would be designed as part of the final drainage plans prepared to DPW standards during the subdivision process. (Mitigation Measures SP-4.2-5 and SP-4.2-6.) No impacts to velocity would be realized upstream or downstream of the proposed Project.

Downstream deposition characteristics and potential erosion of the soils covering the buried soil cement would be approximately the same under both Alternatives 2 and 4 since the location of the buried bank stabilization is approximately the same for both alternatives. Accordingly, erosion and downstream deposition impacts resulting from Alternative 4 are expected to be significant but mitigable. Specifically, to minimize erosion and structural damage to such structures, erosion resistant materials such as concrete, soil cement or secured rip-rap would be used according to the standards, criteria, and specifications developed by the DPW to ensure long-term stability (Mitigation Measure GRR-3). The

**Table 4.2-22**
**Change in Floodplain Area (By Vegetation Type) Where Velocity > 4 fps**
**Alternative 4 -- Santa Clara River**

| Vegetation Type | Change in Flood Plain Area (Acres) | | | | | | |
|---|---|---|---|---|---|---|---|
| | 2-Year | 5-Year | 10-Year | 20-Year | 50-Year | 100-Year | CAP |
| Agriculture | 0.0 | -0.1 | -0.6 | -2.4 | -65.0 | -107 | -149.2 |
| Alluvial Scrub | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 0.0 |
| Arroweed Scrub | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 0.0 | -0.2 |
| Big Sagebrush Scrub | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| California Annual Grassland | 0.0 | 0.0 | 0.0 | 0.0 | 0.2 | 0.1 | -0.1 |
| Undifferentiated Chaparral | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| California Sagebrush | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -0.1 |
| California Sagebrush-California Buckwheat | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| California Sagebrush-Undifferentiated Chaparral | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| California Sagebrush-Purple Sage | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 0.1 | 0.2 |
| Cottonwood Willow Riparian Forest | -0.5 | 0.0 | 0.5 | 0.2 | 0.4 | -3.4 | -1.1 |
| Burned California Sagebrush | 0.0 | 0.0 | 0.0 | 0.0 | -0.1 | 0.0 | 0.0 |
| Disturbed Cottonwood Willow Riparian Forest | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 0.0 | 0.0 |
| Developed | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Disturbed Land | 0.0 | 0.0 | 0.0 | -0.4 | -3.4 | -8.0 | -15.3 |
| Disturbed Riparian Scrub | 0.0 | 0.0 | 0.0 | 0.0 | -0.2 | 0.0 | 0.0 |
| Disturbed Southern Willow Scrub | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Giant Reed | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 0.0 | 0.0 |
| Herbaceous Wetlands | -0.4 | 0.1 | 0.1 | 0.9 | -1.5 | -1.4 | 0.0 |
| Live Oak Woodland | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Mulefat Scrub | 0.0 | 0.0 | 0.0 | -0.4 | -0.2 | -1.8 | -3.5 |
| Open Channel | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Southern Coast Live Oak Riparian Forest | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Ornamental | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| River Wash | 0.0 | -0.2 | 0.6 | 0.3 | 1.6 | -1.0 | 0.0 |
| Southern Willow Scrub | 0.0 | 0.0 | -0.3 | -0.2 | -1.2 | -1.8 | 0.1 |
| Tamarisk Scrub | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 |
| Valley Oak Woodland | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **TOTAL CHANGE** | **-0.9** | **-0.2** | **0.3** | **-2.0** | **-69.1** | **-124** | **-169.1** |

Source: PACE, 2008A.

specific improvements for each drainage area would also be designed as part of the final drainage plans prepared to DPW standards during the subdivision process. (Mitigation Measures SP-4.2-5, DPW plan and map approvals and SP-4.2-6, DPW-approved permanent erosion controls.). Incorporation and implementation of proper design, regulatory compliance, facility maintenance, and specified mitigation measures would reduce the impact of erosion and/or downstream deposition to less than significant relative to Significance Criterion 2.

**Santa Clara River -- Significance Criterion 3: Impacts to Geomorphic Function (Less than Significant).** The RMDP improvements and facilities associated with Alternative 4 would have limited and localized hydromodification impacts to the Santa Clara River. Under moderate storm runoff events, localized increases in flow quantity and velocity would be present at drainage outlet facilities along the banks of the Santa Clara River. In selected locations along the northern and southern banks of the Santa Clara River, the existing floodplain would be protected by buried soil cement and be inaccessible to infrequent flood flows (50- and 100-year events). Similar to Alternative 2, Santa Clara River flows of lower than the 50-year event would utilize the existing floodplain under the Alternative 4 condition. Bridge piers and abutments would have localized effects on channel alignment. Under Alternative 4, Potrero Canyon Road Bridge is not proposed and the associated bridge pier and abutment features are not required. Therefore, Alternative 4 would have a lesser direct effect on Santa Clara River geomorphic function than Alternative 2.

**Table 4.2-23** provides general hydraulic characteristics of the River channel for the two-, five-, 10-, 20-, 50-, and 100-year events, comparing the existing conditions to those resulting from Alternative 4. Included in these characteristics are: maximum river flow depth measured in feet, average flow velocity measured in fps, friction slope (a measure of flow erodibility), flow area measured in sf, channel top width measured in feet, and total shear (a measure of friction caused by the weight of water on the River bottom, and an indicator of scour/erosion potential) measured in pounds per square foot. As shown, with Alternative 4 most of these characteristics increase in magnitude with an increase in storm intensity (return interval). Relative to existing conditions, Alternative 4 results in an increase in the maximum flow depth of less than one foot during the 50- and 100-year storm events. During the 20-year return interval, Alternative 4 would result in minor increases in average velocity, with essentially no change or a decrease in velocities for the two-, five-, 10-, and 50-year events and a decrease in average velocity during the 100-year event. Average friction slopes remain relatively unchanged as a result of Alternative 4, with minor increases during the 50- and 100-year return intervals. Alternative 4 would result in minor increases in the top width during the two- and five-year events, with a decrease in average top width observed during the 10-, 20-, 50-, and 100-year events due primarily to channel constrictions at bridge crossings. Lastly, Alternative 4 would have a nominal effect on the total shear during the two-, five-, and 10-year events with minor increases observed during the less frequent 20-, 50-, and 100-year events.

**Table 4.2-23**
**Summary of Average Channel Hydraulic Parameters**
**Existing vs. Alternative 4 -- Santa Clara River**

| Condition | Return Interval (years) | Max. Flow Depth (ft) | Average Velocity (fps) | Friction Slope (--) | Flow Area (sq. ft.) | Top Width (ft) | Total Shear (psf) |
|---|---|---|---|---|---|---|---|
| Existing | 2 | 3.34 | 4.46 | 0.0053 | 774.2 | 404.2 | 0.72 |
| Existing | 5 | 5.11 | 5.82 | 0.0053 | 1585.2 | 520.3 | 1.16 |
| Existing | 10 | 6.50 | 6.65 | 0.0052 | 2423.6 | 614.0 | 1.48 |
| Existing | 20 | 7.99 | 6.89 | 0.0052 | 3658.7 | 887.0 | 1.60 |
| Existing | 50 | 9.84 | 7.48 | 0.0051 | 5581.5 | 1131.1 | 1.85 |
| Existing | 100 | 11.27 | 8.00 | 0.0051 | 7283.6 | 1236.1 | 2.13 |
| Alternative 4 | 2 | 3.30 | 4.5 | 0.0053 | 771.4 | 404.5 | 0.72 |
| Alternative 4 | 5 | 5.06 | 5.9 | 0.0053 | 1574.9 | 520.6 | 1.1 |
| Alternative 4 | 10 | 6.45 | 6.67 | 0.0052 | 2404.3 | 610.2 | 1.47 |
| Alternative 4 | 20 | 7.93 | 7.09 | 0.0052 | 3550.3 | 805.9 | 1.66 |
| Alternative 4 | 50 | 10.14 | 7.43 | 0.0052 | 5633.6 | 1006.1 | 2.06 |
| Alternative 4 | 100 | 11.79 | 7.84 | 0.0052 | 7470.2 | 1114.4 | 2.39 |
| Alternative 2 | 100 | 11.87 | 7.8 | 0.0051 | 7489.4 | 1093.4 | 2.43 |

Source: PACE, 2008A.

The estimated change in hydraulic characteristics under the Alternative 4 RMDP would be relatively minor. For the high frequency floods (two-, five-, and 10-year), the proposed floodplain modifications would not increase erosion potential, hinder flows or substantially reduce the floodplain area. Instead, these flows would spread across the River channel, unaffected by the bank protection because the River would have sufficient width to allow these flows to meander and spread out as under pre-Project conditions. Compared with Alternative 2, during the 100-year event, the RMDP components proposed by Alternative 4 would result in minor reductions in the maximum flow depth flow area, and total shear, with an increase in top width. As with Alternative 2, Alternative 4 river flows would be impacted by proposed improvements as wide as the buried soil cement during more infrequent 20- and 100-year discharges. This would limit the area of the floodplain during these infrequent flood events, causing inundation over a smaller area because the bank protection would be developed under the Specific Plan for various land uses, including residential, commercial, industrial, and parks. Given the low frequency and duration of such conditions, the potential impacts to geomorphic function in the Santa Clara River relative to Significance Criterion 3 are considered less than significant.

The HARC analysis indicates that the Alternative 4 would result in only minor changes to the hydrologic function of the Santa Clara River with small decreases in the source water and floodplain connection metrics. In total, Alternative 4 would result in a net gain of 22.89 hydrology AW-score units and would increase the total HARC AW-score units by 66.43. The overall increase in HARC AW-score units is

primarily attributed to the benefits provided by Alternative 4 to riparian habitat as discussed in **Section 4.6**, Jurisdictional Waters and Streams. In general, the HARC analysis supports the conclusion that the relatively minor impacts to the hydrologic processes of the Santa Clara River do not have an overall negative effect on the geomorphic function, *e.g.*, ability to support riparian habitat. Therefore, impacts associated with Alternative 4 would be less than significant relative to Significance Criterion 3 since they would not result in a substantial reduction in geomorphic function.

**Santa Clara River -- Significance Criterion 4: Construction and Scour Impacts to Riparian Vegetation (Less than Significant).** Most of the areas along the River corridor within the Project site consist of agricultural fields, and to a lesser extent, disturbed and upland habitat areas with limited riparian habitat. (PACE, 2008A.) Alternative 4 includes the construction of 26,751 lf of soil cement, which is necessary to protect the Specific Plan's residential and commercial development and the bridges at Commerce Center Drive and Long Canyon Road. The analysis of the impacts of installing bank protection, bridge piers and abutments, and erosion protection to vegetation along the Santa Clara River are primarily related to Alternative 4's hydrologic and hydraulic impacts on the Santa Clara River, as detailed below.

**Impacts on Velocity.** An increase in flow velocities in the River could result in significant impacts to riparian vegetation if the increase causes: (1) widespread and chronic scouring of the channel bed that removes a significant amount of aquatic wetland and riparian habitats from the River channel; and/or (2) substantial modification of the relative amounts of these different habitats in the River, essentially altering the quality of the riverine environment.

Impacts associated with erosion and sediment deposition and, therefore, streambed modification within the River are evaluated as a function of in-stream velocities, which are indicators for potential riverbed scouring. As discussed in **Subsection 4.2.5.1**, Impact Assessment Methods, a representative velocity of four fps was determined to be the appropriate indicator for potential erosion. **Table 4.2-22**, presented above, includes the change of Alternative 4, from existing conditions, in the total area of floodplain, delineated by vegetation type, where velocities exceed four fps for each return interval.

The total floodplain area subject to potentially erosive velocities would be decreased as a result of Alternative 4 for all return intervals with the exception of the 10-year return period. However, an additional 0.4 acres subject to velocities greater than four fps during the 10-year return interval is not considered to be significant relative to the substantial decrease in area subject to erosive velocities during two-, 20-, 50-, 100-year, and capital flood events as a result of the RMDP components. In addition, no impacts to velocity would be realized upstream or downstream of the Project reach. (PACE, 2008A.) The impacts relating to habitat removal and disturbance as a result of changes to River velocity are presented in **Section 4.5**, Biological Resources, of this EIS/EIR.

Based on these results, the bank stabilization, bridges, and turf-reinforced mats would not cause significant scouring, and, therefore, would not alter the amount and pattern of riparian habitats along the River within the Project area. The current pattern of scouring due to high velocities would remain intact and the proposed Project would not substantially alter the frequency and magnitude of scouring of

riparian vegetation. Based on this information, no significant impacts would occur due to changes in velocity relative to Significance Criterion 4.

**Impacts on Water Depth.** An increase in water depth in the River could result in significant impacts to riparian habitat if the additional water depth causes greater "shear forces" (*i.e.*, friction caused by the weight of water) on the river bottom, and thereby increasing scouring of the channel bed and removal of vegetation. This effect could reduce the extent of aquatic, wetland, and riparian habitats in the River.

**Table 4.2-23** provides the general hydrologic characteristics of the River channel for the two-, five-, 10-, 20-, 50-, and 100-year events, both with and without Alternative 4 project components. The results of the hydraulic analysis indicate that water depths and, correspondingly, total shear in the River would not increase significantly due to Alternative 4 improvements. The additional riparian vegetation area subject to inundation would be increased slightly during the two- and five-year flood events (0.3 and 0.5 acres, respectively), but would be reduced by approximately 4.9, 65.2, 114.5, 109.6, and 197.6 acres as a result of Alternative 4 during the 10-, 20-, 50-, 100-year, and capital flood events, respectively. (PACE, 2008A.) **Figures 4.2-11** and **4.2-12** show the area of inundation and velocity distribution for the 10- and 100-year flow events for both existing conditions and Alternative 4. As shown in these figures, the decrease in inundated area (by percentage and acreage) would primarily affect areas of currently disturbed, agricultural land. Accordingly, impacts to riparian habitat would be limited such that water flow depths, velocities, and total shear for all return events would not be significantly different in riparian habitat between existing and proposed conditions at the Project site. Since there would not be a significant change in flow depths or total shear in existing riparian habitat, the impacts to the amount and pattern of aquatic, wetland, and riparian habitats in the River are expected to be less than significant relative to Significance Criterion 4.

**Impacts of Modification.** The reinforced concrete and riprap bridge abutments, in addition to the soil cement proposed by Alternative 4, would encroach into the existing 100-year floodplain in some areas. Encroachment impacts can be analyzed on the basis of depth and velocity, as described below. Additionally, some banks located out of the floodplain need stabilization because of lateral migration of the riverbed, as well as the need to for protection against the capital flood discharge. Long-term impacts would have the potential to occur because soil cement used to stabilize the River's banks places a permanent feature in the existing floodplain.

In other areas, the soil cement would be placed outside the existing River channel, creating additional River channel and riparian habitats. For example, soil cement proposed on the north side of the River near the confluence with Castaic River would be constructed on agricultural land, north of the existing channel. The land located between the existing river bank and the newly created stabilized bank would be excavated to widen the existing channel, which would increase the area available within the channel and increase the capacity of the river to convey the passage of flood flows. Overall, Alternative 4 proposes fewer feet of bank stabilization and fewer bridges within the Santa Clara River and would, therefore, result in fewer impacted/removed acres compared with Alternative 2. Specifically, Alternative 4 would result in 22.2 acres of modified channel, where Alternative 2 would result in 36.9 acres of modified channel within the Santa Clara River floodplain.

The potential impacts from Alternative 4 RMDP improvements to Santa Clara River riparian vegetation are anticipated to be small and localized along the River floodplain. In addition, the frequency and duration of river flow conditions is considered to be episodic. The River, the floodplain, and riparian resources have been subjected to episodic disturbances under natural conditions and only minor changes in overall planform geomorphology occur as described above. As such, impacts of the RMDP to riparian vegetation along the Santa Clara River are considered less than significant relative to Significance Criterion 4.

**Tributaries -- Significance Criterion 1: Short-Term Impacts from Construction of Bridges, Bank Stabilization, Grade Stabilizer Structures, and Buried Storm Drain (Significant but Mitigable).** Installation of bank stabilization features, grade stabilizer structures, buried storm drains, and bridge piers and abutments would directly affect elements of tributary geomorphology which would be a significant impact. Alternative 4 would authorize 8,903 fewer linear feet of buried bank stabilization, 23 linear feet increase of drainage converted to buried storm drain, and 15 fewer grade stabilizer structures when compared with the proposed RMDP. Therefore, Alternative 4 would have overall less of a direct effect on the geomorphology of the tributaries than Alternative 2, although these impacts would still be significant prior to mitigation. As with Alternative 2, short-term sedimentation impacts with respect to Significance Criterion 1 during construction would be reduced to a less than significant through the implementation of existing regulatory requirements and obtaining required permits from the State and County.

Absent mitigation, there would be significant short-term sedimentation impacts during construction with respect to Significance Criterion 1. However, Mitigation Measures SP-4.2-2 (acquire state and federal permits), SP-4.2-3 (CDFG streambed agreements), SP-4.2-5 (DPW plan and map approvals), and SP-4.2-7 (DPW SUSMP and SWPPP requirements) would ensure that regulatory requirements are implemented and short-term impacts related to construction of RMDP components are less than significant through proper application of sediment controls and other BMPs required by existing local, state, and federal regulations.

**Tributaries -- Significance Criterion 2: Erosion and Downstream Deposition (Significant but Mitigable).** Implementation of Alternative 4 RMDP improvements and facilities, particularly site clearing and grading operations, would have the potential to increase sediment flows downstream during storm events. Long-term impacts associated with erosion and sediment deposition are evaluated as a function of geomorphic stability. The basis of design for the five major tributary drainages that would be modified (Chiquito, San Martinez Grande, Long, Lion, and Potrero) is such that the channels would be designed to be in geomorphic equilibrium in terms of stability and delivery of sediment and flows under future conditions. As described in greater detail for Alternative 2, the channel designs will meet the following criteria: geomorphic stability; flood conveyance; ecological function; hydromodification control; low level maintenance. The preliminary channel designs under Alternative 4 for each tributary are described below.

**Chiquito Canyon.** The proposed design in Chiquito Canyon under Alternative 4 would significantly decrease the width of the floodplain in Chiquito Canyon, which would increase the velocity of flows, resulting in a significant effect prior to mitigation. In order to minimize impacts, the Project would be designed to reduce Project effects to the geomorphic stability (*i.e.*, erosion and deposition) within

Chiquito Canyon. Specifically, where the channel is not degraded and less extensive development would take place in the watershed, grade control structures would be used to maintain the existing slope. The reengineered channel would be designed to meet the specified basis of design criteria using the following approach:

1. Develop existing condition floodplain and creek hydraulic characteristics using a hydraulic model such as HEC-RAS.
2. Minimize impacts to existing condition floodplain. As a result of reducing the development impacts to the floodplain, the amount of environmental and hydraulic impacts (*e.g.*, resulting in substantial erosion or sediment deposition) from the proposed development would be minimized.
3. Creek bank flood protection (soil cement, rip rap or other suitable method) would be located to provide for bank erosion protection and to provide flood protection from the DPW Capital design flood event. In most cases, the bank protection would be buried with soil at a 3:1 slope over the hard bank protection. The soil backfill slope would vary from flatter to steeper and may be totally eliminated in some areas where necessary such as at structures, storm drain outlets or other pinch points.
4. Chiquito Canyon would not include a re-grading of the creek invert although the Ep of the proposed condition will be validated during the design phase. For Chiquito Canyon, the invert stabilization method would be as follows:
    a. Creek bed grade control structures at 200 to 400 foot spacing along the creek corridor would be included.
    b. These grade control structures would be designed to be located at points along the creek where proposed project grading impacts would already be disturbing the creek bed and banks.
    c. The grade control structures would be constructed with soil cement, rip rap or other grade stabilization methods acceptable to DPW.
    d. The grade control structures would be at grade or below the existing grade and invert of the creek bed.
    e. The grade control structures would be designed to function as a drop structure in the event the creek bed slope flattens overtime.
5. Chiquito Canyon top and toe elevation would be established based upon DPW standards.

The overall design approach would allow the tributary to naturally fluctuate between the stabilized existing condition and estimated equilibrium slope while providing suitable erosion and flood protection for public safety. Based upon the proposed design and use of DPW standards for bank protection top and toe, Chiquito Canyon would meet the minimal required design objectives provided by DPW. As such, the geomorphic basis of design would inherently minimize erosion and deposition.

The channel confluence with the Santa Clara River would largely be controlled by the aggradation or degradation in the Santa Clara River, as well as episodic River hydraulic events in the form of backwater effects. The influence of the Santa Clara River on long-term bed stability at the creek channel outlet is expected to exceed that of the Project channel modifications. The upstream channel inlet (near the beginning of the defined channel) is generally in a natural state and no currently planned improvements are to be made in the upstream portion of the channel; as a result, no effects on channel stability in this area are expected.

Prior to mitigation, erosion and sedimentation impacts within Chiquito Canyon would be significant. The Newhall Ranch Specific Plan EIR identified feasible measures to reduce the effects of the Specific Plan on floodplains within the Project area. Specifically, Mitigation Measures SP-4.2-1 through SP-4.2-7 (flood control improvement approval from DPW, state and federal permits, CDFG stream bed agreements, FEMA CLOMR, DPW plan and map approvals, DPW-approved permanent erosion controls, DPW SUSMP and SWPPP requirements) are incorporated to reduce these impacts. In addition, Mitigation Measures GRR-1 through GRR-6 (DPW required runoff controls, minimization of bridge and structures, structural durability, hydromodification controls and channel design, sediment and debris control facilities, sediment redistribution) would further reduce these impacts by controlling runoff and sediment delivered through the project reach, minimizing localized impacts from bridge crossings, using erosion resistant materials to ensure the long-term stability of RMDP structures, and ensuring that the Project design provides an equilibrium slope for each affected tributary in the post-development condition. Finally, in order to ensure that the channel functions as intended, Mitigation Measure GRR-7 describes the Geomorphology Monitoring and Management Plan that would be implemented to evaluate compliance with the basis of the design criteria, the triggers for implementing remedial actions (if necessary), the approach for implementing remedial actions, and a description of potential remedial measures. Incorporation and implementation of proper design, regulatory compliance, facility maintenance, and specified mitigation measures would reduce the impact of erosion and/or downstream deposition to less than significant relative to Significance Criterion 2.

**San Martinez Grande.** The proposed design in San Martinez Grande Canyon under Alternative 4 would significantly decrease the width of the floodplain in the tributary, which would increase the velocity of flows, resulting in a significant effect prior to mitigation. In order to minimize impacts, the Project would be designed to reduce Project effects to the geomorphic stability (*i.e.*, erosion and deposition) within San Martinez Grande Canyon. Specifically, where the channel is not degraded and less extensive development would take place in the watershed, grade control structures would be used to maintain the existing slope. The reengineered channel would be designed to meet the specified basis of design criteria using the following approach:

1. Develop existing condition floodplain and creek hydraulic characteristics using a hydraulic model such as HEC-RAS.
2. Minimize impacts to existing condition floodplain. As a result of reducing the development impacts to the floodplain, the amount of environmental and hydraulic impacts (*e.g.*, resulting in substantial erosion or sediment deposition) from the proposed development would be minimized.

3. Creek bank flood protection (soil cement, rip rap or other suitable method) will be located to provide for bank erosion protection and flood protection from the DPW Capital design flood event. In most cases, the bank protection would be buried with soil at a 3:1 slope over the hard bank protection. The soil backfill slope would vary from flatter to steeper and may be totally eliminated in some areas where necessary such as at structures, storm drain outlets or other pinch points.

4. San Martinez Grande Canyon would not include a re-grading of the creek invert although the Ep of the proposed condition would be validated during the design phase. For San Martinez Grande Canyon, the invert stabilization method would be as follows:

    a. Creek bed grade control structures at 200 to 400 foot spacing along the creek corridor would be included.

    b. These grade control structures would be designed to be located at points along the creek where proposed project grading impacts would already be disturbing the creek bed and banks.

    c. The grade control structures would be constructed with soil cement, rip rap or other grade stabilization methods acceptable to DPW.

    d. The grade control structures would be at grade or below the existing grade and invert of the creek bed.

    e. The grade control structures would be designed to function as a drop structure in the event the creek bed slope flattens overtime.

5. San Martinez Grande Canyon top and toe elevation would be established based upon DPW standards.

The overall design approach would allow the tributary to naturally fluctuate between the stabilized existing condition and estimated equilibrium slope while providing suitable erosion and flood protection for public safety. Based upon the proposed design and use of DPW standards for bank protection top and toe, San Martinez Grande Canyon would meet the minimal required design objectives provided by DPW. As such, the geomorphic basis of design would inherently minimize erosion and deposition.

The channel confluence with the Santa Clara River would largely be controlled by the aggradation or degradation in the Santa Clara River, as well as episodic River hydraulic events in the form of backwater effects. The influence of the Santa Clara River on long-term bed stability at the creek channel outlet is expected to exceed that of the Project channel modifications. The upstream channel inlet (near the beginning of the defined channel) is generally in a natural state and no currently planned improvements are to be made in the upstream portion of the channel; as a result, no effects on channel stability in this area are expected.

Prior to mitigation, erosion and sedimentation impacts within San Martinez Grande Canyon would be significant. The Newhall Ranch Specific Plan EIR identified feasible measures to reduce the effects of the

Specific Plan on floodplains within the Project area. Specifically, Mitigation Measures SP-4.2-1 through SP-4.2-7 (flood control improvement approval from DPW, state and federal permits, CDFG stream bed agreements, FEMA CLOMR, DPW plan and map approvals, DPW-approved permanent erosion controls, DPW SUSMP and SWPPP requirements) are incorporated to reduce these impacts. In addition, Mitigation Measures GRR-1 through GRR-6 (DPW required runoff controls, minimization of bridge and structures, structural durability, hydromodification controls and channel design, sediment and debris control facilities, sediment redistribution) would further reduce these impacts by controlling runoff and sediment delivered through the project reach, minimizing localized impacts from bridge crossings, using erosion resistant materials to ensure the long-term stability of RMDP structures, and ensuring that the Project design provides an equilibrium slope for each affected tributary in the post-development condition. Finally, in order to ensure that the channel functions as intended, Mitigation Measure GRR-7 describes the Geomorphology Monitoring and Management Plan that would be implemented to evaluate compliance with the basis of the design criteria, the triggers for implementing remedial actions (if necessary), the approach for implementing remedial actions, and a description of potential remedial measures. Incorporation and implementation of proper design, regulatory compliance, facility maintenance, and specified mitigation measures would reduce the impact of erosion and/or downstream deposition to less than significant relative to Significance Criterion 2.

***Long Canyon.*** The proposed design in Long Canyon under Alternative 4 would significantly decrease the width of the floodplain in Long Canyon, which would increase the velocity of flows, resulting in a significant effect prior to mitigation. The proposed Project design would combine soil cement bank stabilization along with a soft-bottom channel. The bank stabilization consisting of soil cement, would be emplaced according to the requirements established by the DPW. The basis of design for Long Canyon is such that any increase in flow velocities and shear stress would not exceed the performance specifications of the bank stabilization. However, the soft bottom of the channel is vulnerable to down-cutting and scour. To decrease the channel velocities, the Project design includes grade stabilizer structures. Proper placement of grade stabilizer structures would allow the channel to reach equilibrium, defined as the condition where the amount of sediment deposited is equivalent to the sediment eroded.

The final design approach in accordance with the geomorphic basis of design is to preserve the existing channel as a back channel habitat area while creating an additional new channel sized to accommodate the changes in sediment and water delivery due to the build-out of the Newhall Ranch Specific Plan. The recommended approach for designing the reaches where valley grading is proposed involves breaking the valley into alternating long reaches that are at equilibrium grade and short reaches that are much steeper. This approach involves creating reaches of between 100 and 300 feet length where elevation drops of 10 to 30 feet occur (10 percent gradient). Concentrating the drop in these reaches using sequences of step-pools that convey the capital flood has the advantage of creating a more naturally functioning channel between the drops, and reducing the number and aerial extent of rock structures. The Long Canyon channel design incorporates the calculated post-development equilibrium slope to ensure a dynamically stable condition allowing for more or less equal amounts of erosion and deposition.

Prior to mitigation, erosion and sedimentation impacts within Long Canyon would be significant. The Newhall Ranch Specific Plan EIR identified feasible measures to reduce the effects of the Specific Plan on floodplains within the Project area. Specifically, Mitigation Measures SP-4.2-1 through SP-4.2-7

(flood control improvement approval from DPW, state and federal permits, CDFG stream bed agreements, FEMA CLOMR, DPW plan and map approvals, DPW-approved permanent erosion controls, DPW SUSMP and SWPPP requirements) are incorporated to reduce these impacts. In addition, Mitigation Measures GRR-1 through GRR-6 (DPW required runoff controls, minimization of bridge and structures, structural durability, hydromodification controls and channel design, sediment and debris control facilities, sediment redistribution) would further reduce these impacts by controlling runoff and sediment delivered through the project reach, minimizing localized impacts from bridge crossings, using erosion resistant materials to ensure the long-term stability of RMDP structures, and ensuring that the Project design provides an equilibrium slope for each affected tributary in the post-development condition. Finally, in order to ensure that the channel functions as intended, Mitigation Measure GRR-7 describes the Geomorphology Monitoring and Management Plan that would be implemented to evaluate compliance with the basis of the design criteria, the triggers for implementing remedial actions (if necessary), the approach for implementing remedial actions, and a description of potential remedial measures. Incorporation and implementation of proper design, regulatory compliance, facility maintenance, and specified mitigation measures would reduce the impact of erosion and/or downstream deposition to a less-than-significant level relative to Significance Criterion 2.

***Potrero Canyon.*** The proposed design under Alternative 4 would significantly decrease the width of the floodplain in Potrero Canyon, which would increase the velocity of flows, resulting in a significant effect prior to mitigation. The proposed Project design would combine soil cement bank stabilization along with a soft-bottom channel. The bank stabilization, consisting of soil cement, would be emplaced according to the requirements established by the DPW. The basis of design for Potrero Canyon is such that any increase in flow velocities and shear stress would not exceed the performance specifications of the bank stabilization. However, the soft bottom of the channel is vulnerable to down-cutting and scour. To decrease the channel velocities, the design includes grade stabilizer structures. These structures are designed to function by reducing the energy slope along the degradational zone to the point that the stream is no longer capable of scouring the bed. Proper placement of grade stabilizer structures would allow the channel to reach equilibrium, defined as the condition where the amount of sediment deposited is equivalent to the sediment eroded. The Potrero channel design incorporates the calculated post-development equilibrium slope to ensure a dynamically stable condition allowing for more or less equal amounts of erosion and deposition to sustain revegetated riparian and adjacent upland habitat areas.

The geomorphic basis of design is such that Potrero Canyon would be designed to convey sediment under future conditions with a "dynamically stable channel" (neither long-term erosion nor deposition) and to support the proposed native re-vegetation program.

Prior to mitigation, erosion and sedimentation impacts within Potrero Canyon would be significant. The Newhall Ranch Specific Plan EIR identified feasible measures to reduce the effects of the Specific Plan on floodplains within the Project area. Specifically, Mitigation Measures SP-4.2-1 through SP-4.2-7 (flood control improvement approval from DPW, state and federal permits, CDFG stream bed agreements, FEMA CLOMR, DPW plan and map approvals, DPW-approved permanent erosion controls, DPW SUSMP and SWPPP requirements) are incorporated to reduce these impacts. In addition, Mitigation Measures GRR-1 through GRR-6 (DPW required runoff controls, minimization of bridge and structures, structural durability, hydromodification controls and channel design, sediment and debris

control facilities, sediment redistribution) would further reduce these impacts by controlling runoff and sediment delivered through the project reach, minimizing localized impacts from bridge crossings, using erosion resistant materials to ensure the long-term stability of RMDP structures, and ensuring that the Project design provides an equilibrium slope for each affected tributary in the post-development condition. Finally, in order to ensure that the channel functions as intended, Mitigation Measure GRR-7 describes the Geomorphology Monitoring and Management Plan that would be implemented to evaluate compliance with the basis of the design criteria, the triggers for implementing remedial actions (if necessary), the approach for implementing remedial actions, and a description of potential remedial measures. Incorporation and implementation of proper design, regulatory compliance, facility maintenance, and specified mitigation measures will reduce the impact of erosion and/or downstream deposition to a less-than-significant level relative to Significance Criterion 2.

***Lion Canyon.*** The proposed design under Alternative 4 includes the placement of three new road crossings in Lion Canyon. These crossings may constrict the floodplain, resulting in an increase in the velocity of flows, which would be a significant effect prior to mitigation. The basis of design for this drainage is such that Lion Canyon would be designed to be in geomorphic equilibrium in terms of stability and delivery of sediment and water under future conditions. The channel floodplain would be designed to maximize geomorphic stability and ecological function, provide adequate flood conveyance, and avoid hydromodification to the extent possible. In addition, the design would minimize the need for maintenance activities.

Phillip Williams and Associates (PWA, 2007g) evaluated the channel design erosion potential. Post-development condition sediment supplies to the Lion Canyon drainage are predicted to range from 27 percent to 37 percent of the existing condition. The results of the analysis indicate that with the proposed RMDP components, the erosion potential within Lion Canyon would be in equilibrium and that the proposed channel would not aggrade or generate excess sediment from erosion or create a larger than natural downstream impact from sedimentation associated with hydromodification. Mitigation measure SP-4.2-3 (state and federal permits) would require that hydraulic modeling be performed for the final design to assess the effects within Lion Canyon, and that the design would be modified as necessary to reduce any erosion or deposition impacts. The Lion channel design incorporates the calculated post-development equilibrium slope to ensure a dynamically stable condition allowing for more or less equal amounts of erosion and deposition.

Prior to mitigation, erosion and sedimentation impacts within Lion Canyon would be significant. The Newhall Ranch Specific Plan EIR identified feasible measures to reduce the effects of the Specific Plan on floodplains within the Project area. Specifically, Mitigation Measures SP-4.2-1 through SP-4.2-7 (flood control improvement approval from DPW, state and federal permits, CDFG stream bed agreements, FEMA CLOMR, DPW plan and map approvals, DPW-approved permanent erosion controls, DPW SUSMP and SWPPP requirements) are incorporated to reduce these impacts. In addition, Mitigation Measures GRR-1 through GRR-6 (DPW required runoff controls, minimization of bridge and structures, structural durability, hydromodification controls and channel design, sediment and debris control facilities, sediment redistribution) would further reduce these impacts by controlling runoff and sediment delivered through the project reach, minimizing localized impacts from bridge crossings, using erosion resistant materials to ensure the long-term stability of RMDP structures, and ensuring that the

Project design provides an equilibrium slope for each affected tributary in the post-development condition. Finally, in order to ensure that the channel functions as intended, Mitigation Measure GRR-7 describes the Geomorphology Monitoring and Management Plan that would be implemented to evaluate compliance with the basis of the design criteria, the triggers for implementing remedial actions (if necessary), the approach for implementing remedial actions, and a description of potential remedial measures. Incorporation and implementation of proper design, regulatory compliance, facility maintenance, and specified mitigation measures would reduce the impact of erosion and/or downstream deposition to a less-than-significant level relative to Significance Criterion 2.

**Minor Drainages.** Implementation of the proposed RMDP would involve the placement of one new culverted road crossing in Ayers Canyon, a minor drainage on the south side of the River; in addition, the existing six-lane bridge allowing SR-126 to cross the Castaic Creek drainage would be expanded to eight lanes.

The other drainages to be converted entirely or partially to underground storm drains include drainages in Homestead Canyon, Off-Haul Canyon, Mid-Martinez Canyon, Humble Canyon, Lion Canyon, Exxon Canyon, Unnamed Canyon B, Unnamed Canyon C, Dead-End Canyon, Unnamed Canyon D, Middle Canyon, Magic Mountain Canyon, Unnamed Canyon 1 and Unnamed Canyon 2.

The conversion of open drainages to buried underground conduits would eliminate the erosion of existing drainage channels and the associated sediment loading from other uplands sources. The impact of underground storm drains would significantly decrease erosion and siltation. Accordingly, construction of the combined 39,075 feet of buried storm drain and 1,992 feet of stabilization could result in significant erosion or deposition impacts within the minor drainages.

Prior to mitigation, erosion and sedimentation impacts within the minor tributary drainages would be significant. The Newhall Ranch Specific Plan EIR identified feasible measures to reduce the effects of the Specific Plan on floodplains within the Project area. Specifically, Compliance Measures SP-4.2-1 through SP-4.2-7 (flood control improvement approval from DPW, state and federal permits, CDFG stream bed agreements, FEMA CLOMR, DPW plan and map approvals, DPW-approved permanent erosion controls, DPW SUSMP and SWPPP requirements) are incorporated to reduce these impacts. In addition, Mitigation Measures GRR-1 through GRR-6 (DPW required runoff controls, minimization of bridge and structures, structural durability, hydromodification controls and channel design, sediment and debris control facilities, sediment redistribution) would reduce this potential impact to less-than-significant levels within the minor tributary drainages relative to Significance Criterion 2 by controlling runoff and sediment delivered through the project reach, minimizing localized impacts from bridge crossings, using erosion resistant materials to ensure the long-term stability of RMDP structures, and ensuring that the Project design provides an equilibrium slope for each affected tributary in the post-development condition.

**Tributaries -- Significance Criterion 3: Impacts to Geomorphic Function (Less than Significant).** The tributary drainages incorporate hydromodification controls that reduce potential stormwater-related impacts (intensity and duration) to the River and tributary geomorphic function. The following includes

an analysis of the potential impacts to the geomorphic function of the affected tributaries within the Project area.

Alternative 4 proposes that portions of 18 tributary drainages within the RMDP area be graded to accommodate pads for residential and commercial buildings, and that these flows be conveyed by buried storm drains varying in diameter from 30 to 144 inches. In total, approximately 59,868 feet of existing drainage channel would be converted to buried storm drains. The RMDP also proposes four partially-lined open channels on tributaries to the mainstem of the Santa Clara River within the RMDP boundaries. In some cases, streams would be relocated from their current locations and soft-bottom channels would be recreated in different locations generally parallel to the current alignments. The total area affected by the conversion to buried storm drain, reengineering, and/or bank stabilization for each drainage within the RMDP area is included in **Table 4.2-24**.

Reengineered channel area, installation of bank stabilization, and conversion of the existing channels to buried storm drain would result in a total of 93.2 acres of existing channel impacted by the RMDP components, with 53.1 acres altered through reengineering and installation of bank stabilization.

**Table 4.2-24**
**Total Impacted Channel Area by Treatment Type**
**Alternative 4 -- Tributaries**

| Tributary | Storm Drain Area (acres) | Stabilized and Reengineered Channel Area (acres) | Road Crossings -- Bridges and Culverts (acres) |
|---|---|---|---|
| Ayers Canyon | 0.0 | 0.0 | 0.2 |
| Agricultural Ditch | 1.4 | 0.2 | 0.0 |
| Chiquito Canyon | 1.0 | 16.0 | 1.0 |
| Dead-End Canyon | 1.3 | 0.0 | 0.0 |
| Exxon Canyon | 0.3 | 0.0 | 0.0 |
| Homestead Canyon | 0.6 | 0.0 | 0.0 |
| Humble Canyon | 0.1 | 0.0 | 0.0 |
| Lion Canyon | 3.4 | 3.0 | 0.4 |
| Long Canyon | 0.7 | 3.6 | 0.3 |
| Magic Mountain Canyon | 6.4 | 0.0 | 0.0 |
| Middle Canyon | 5.6 | 0.0 | 0.0 |
| Mid-Martinez Canyon | 2.1 | 0.0 | 0.0 |
| Off-Haul Canyon | 5.4 | 0.0 | 0.0 |
| Potrero Canyon | 7.6 | 20.9 | 0.2 |
| Salt Creek Canyon | 0.0 | 6.9 | 0.0 |
| San Martinez Grande Canyon | 0.0 | 2.4 | 0.1 |
| Unnamed Canyon 1 | 0.3 | 0.0 | 0.0 |
| Unnamed Canyon 2 | 0.5 | 0.0 | 0.0 |
| Unnamed Canyon A | 0.0 | 0.0 | 0.0 |
| Unnamed Canyon B | 0.5 | 0.0 | 0.0 |
| Unnamed Canyon C | 0.2 | 0.0 | 0.0 |
| Unnamed Canyon D | 0.7 | 0.0 | 0.0 |
| **TOTAL ALT. 4** | **38.0** | **53.1** | **2.1** |
| **TOTAL ALT. 2** | **38.0** | **62.7** | **2.1** |

Source: RMDP, 2008

The effects of these changes on the geomorphic function of the tributaries within the Project area can be determined with an evaluation of the hydrologic function metrics of the HARC (see **Section 4.6**, Jurisdictional Waters and Streams). **Table 4.2-25** compares the total hydrology AW-score units and the total HARC AW-score units calculated for the tributaries.

**Table 4.2-25**
**Summary of HARC AW- Total Score and Hydrology**
**Existing vs. Alternative 4 - Tributaries**

| Condition | HARC AW-Total Score | HARC AW-Hydrology |
|---|---|---|
| **Chiquito Canyon** | | |
| Existing | 12.59 | 15.95 |
| Alternative 4 | 10.88 | 11.26 |
| CHANGE | 2.29 | -4.69 |
| **San Martinez Grande Canyon** | | |
| Existing | 2.84 | 3.22 |
| Alternative 4 | 4.65 | 4.46 |
| CHANGE | 1.81 | 1.24 |
| **Long Canyon** | | |
| Existing | 3.22 | 3.55 |
| Alternative 4 | 6.53 | 6.35 |
| CHANGE | 3.31 | 2.80 |
| **Potrero Canyon** | | |
| Existing | 34.50 | 39.08 |
| Alternative 4 | 40.70 | 43.10 |
| CHANGE | 6.20 | 4.02 |
| **Lion Canyon** | | |
| Existing | 5.41 | 5.96 |
| Alternative 4 | 2.44 | 2.63 |
| CHANGE | -2.97 | -3.33 |
| **Minor Drainages*** | | |
| Existing | 21.27 | 21.70 |
| Alternative 4 | 7.29 | 6.85 |
| CHANGE | -13.98 | -14.85 |
| **Salt Creek Canyon** | | |
| Existing | 71.85 | 67.83 |
| Alternative 4 | 96.23 | 91.00 |
| CHANGE | 24.38 | 23.17 |
| **TOTAL CHANGE ALT. 4** | +16.72 | +8.70 |
| **TOTAL CHANGE ALT. 2** | -7.17 | -17.28 |

In total, Alternative 4 would result in a net gain of 8.70 hydrology AW-score units within the tributaries and a net gain of 16.72 total HARC AW-score units within the tributaries. The overall increase in HARC AW-score units within the tributaries suggests that Alternative 4 components do not have an overall impact on the geomorphic function of the tributaries. Specifically, net gains in the total HARC AW-score units would be produced in Chiquito, San Martinez Grande, Long, Potrero, and Salt Creek Canyon, indicating that the gain in riparian/wetland function of these tributaries would compensate for any such losses in the other tributaries. Therefore, impacts associated with Alternative 4 would be less than significant relative to Significance Criterion 3 since they would not result in a substantial reduction in geomorphic function.

**Tributaries -- Significance Criterion 4: Construction and Scour Impacts to Riparian Vegetation (Significant but Mitigable).** Impacts to riparian vegetation within the tributaries located within the RMDP boundary are primarily associated with the physical alterations to the stream channels. As described in **Section 2.0**, Project Description, in some cases where a channel is currently incised and eroding its riparian corridor, it is more feasible to provide the desired degree of ecological function by relocating the channel and creating a stable channel with new vegetative plantings; where the channel is in good condition and has a healthy riparian corridor it is more desirable to preserve the creek in-situ and retrofit with small step-pool structures to protect against future headcuts. Under Alternative 4, approximately 59,868 lf of channel would be converted to buried storm drain. In addition, 66,526 lf of bank stabilization, 174 grade stabilizer structures, 2 bridges and 13 culverts would be constructed as part of Alternative 4. Accordingly, nearly all tributary riparian reaches within the RMDP area would sustain impacts to riparian vegetation resources from grading or installation of RMDP components within the reach. The seven reaches in the Salt Creek drainage are exceptions in this regard; the entire portion of the Salt Creek watershed within the applicant's ownership would be dedicated as permanent open space and no fill of the drainage is proposed, except for habitat restoration or enhancement activities.

Reengineered channel area, installation of bank stabilization, and conversion of the existing channels to buried storm drain would result in a total of 93.2 acres of existing channel impacted by the RMDP components, with 53.1 acres altered through reengineering and installation of bank stabilization. These changes could have a significant effect on riparian vegetation of the tributary drainages. The effects of these changes on the geomorphic function of the tributaries within the Project area can be determined with an evaluation of the hydrologic function metrics of the HARC (see **Section 4.6**, Jurisdictional Waters and Streams).

**Table 4.2-25**, presented above, compares the total hydrology AW-score units and the total HARC AW-score units calculated for the tributaries. In total, Alternative 4 would result in a net gain of 8.70 hydrology AW-score units and net gain of 16.72 total HARC AW-score units within the tributaries. As such, implementation of the Alternative 4 RMDP components would involve a cumulative net gain of riparian area. In reaches where buried bank stabilization is proposed, the temporary impact zone would be revegetated with native riparian plants. In regards to scour of riparian vegetation, Alternative 3 could result in a substantial increase in the frequency and magnitude of scouring of riparian vegetation which, absent mitigation, would be a significant impact.

To mitigate these impacts Mitigation Measures SW-2 and SW-3 presented in **Section 4.6**, Jurisdictional Waters and Streams would provide riparian enhancement through removal of exotic species, restoration of sediment equilibrium, and recontouring of existing, incised banks to increase the extent of Corps and CDFG jurisdictional areas as well as providing avoidance and restoration measures in the Potrero and Salt Creek watershed. In reaches where RMDP components would be constructed, the temporary impact zone would be revegetated with native riparian plants. Specifically, Mitigation Measure SW-5 (**Section 4.6**, Jurisdictional Waters and Streams) would be implemented to ensure that all areas where temporary construction impacts affect Corps or CDFG jurisdictional areas are revegetated (generally, these are areas where impacts would occur due to the construction of Project facilities). In addition, riparian habitat restoration activities that would be implemented in conjunction with the RMDP would include revegetation of native plant communities on candidate sites contiguous to existing riparian habitats. Site

restoration would also include the maintenance of revegetation sites, including the control of non-native plants and irrigation system maintenance. As described in Mitigation Measures BIO-1, BIO-6, and BIO-7, monitoring of the restoration sites would be conducted to evaluate the success of revegetation efforts. Contingency plans and appropriate remedial measures to be implemented should habitat restoration objectives not be achieved would also be included in tentative map-level habitat restoration plans. **Section 4.5**, Biological Resources, provides more detail on the restoration methods proposed to be used. Incorporation and implementation of the specified mitigation measures will reduce the impacts relative to riparian scour to a less-than-significant level in relation to Significance Criterion 4.

**SCP Direct Impacts**

**Significance Criterion 1: Short-Term Impacts from Construction (No Impact).** The proposed SCP is a conservation and permitting plan for an upland plant species (spineflower), and would not authorize any construction activities within the Santa Clara River or tributary corridors. Therefore, no direct impacts would result from implementation of the SCP relative to Significance Criterion 1.

**Significance Criterion 2: Erosion and Downstream Deposition (No Impact).** The same analysis for Significance Criterion 1, above, applies to this criterion.

**Significance Criterion 3: Impacts to Geomorphic Function (No Impact).** The same analysis for Significance Criterion 1, above, applies to this criterion.

**Significance Criterion 4: Construction and Scour Impacts to Riparian Vegetation (No Impact).** The same analysis for Significance Criterion 1, above, applies to this criterion.

#### 4.2.5.5.2 Indirect Impacts

**RMDP Indirect Impacts**

**Significance Criterion 1: Short-Term Indirect Impacts from Construction of Newhall Ranch Specific Plan Development (Significant but Mitigable).** Under Alternative 4, indirect impacts associated with construction of the Specific Plan development would be virtually the same as those for Alternative 2 (proposed Project). The indirect impacts from construction associated with the Specific Plan are included as part of the discussion for indirect RMDP impacts for Alternative 2.

Absent mitigation, there would be significant short-term sedimentation impacts during construction with respect to Significance Criterion 1. However, Mitigation Measures SP-4.2-2 (acquire state and federal permits), SP-4.2-3 (CDFG streambed agreements), SP-4.2-5 (DPW plan and map approvals), and SP-4.2-7 (DPW SUSMP and SWPPP requirements) would ensure that regulatory requirements are implemented and short-term impacts are less than significant through proper application of sediment controls and other BMPs required by existing local, state, and federal regulations.

**Significance Criterion 2: Indirect Impacts from Erosion and Downstream Deposition (Significant but Mitigable).** Under Alternative 4, indirect impacts associated with erosion and downstream deposition would be similar to those for Alternative 2 (proposed Project). The developed area of the Specific Plan

would be covered with non-erosive surfaces, including pavement and permanent vegetation, which would reduce the sedimentation of site runoff. Alternative 4 proposes to develop 251 acres less developed area within the Specific Plan area than that proposed by Alternative 2 (proposed Project). Accordingly, less surface runoff would occur under Alternative 4. Permanent erosion control measures that reduce sediment in runoff include check dams to reduce flow velocities in tributary water courses, drainage swales, slope drains, subsurface drains, storm drain inlet/outlet protection, and sediment traps.

The drainage areas in which the Specific Plan site lies would not be completely developed; therefore, storm flows from the upper reaches would contain sediment and vegetative debris. The amount of sediment and debris contained in the storm flows would be dependent upon the size of the area being drained and whether the area had been subject to burning. If this debris enters and clogs on-site drainages, upstream flooding could occur, which would be a significant impact. Because Alternative 4 would result in less surface runoff compared to Alternative 2, this impact would be less than that associated with Alternative 2, but still significant.

In order to prevent sediment and debris from the upper reaches of the drainage areas from entering storm drainage improvements, permanent erosion control measures would be implemented, including the installation of desilting and debris basins, drainage swales, slope drains, storm drain inlet/outlet protection, and sediment traps. (Compliance Measure SP-4.2-6, DPW-approved permanent erosion controls.) The specific improvements for each drainage area would be designed as part of the final Drainage Plan prepared to DPW standards during the subdivision process. (Compliance Measure SP-4.2-5, DPW plan and map approvals.) In addition, Compliance Measure SP-4.2-7, DPW SUSMP and SWPPP requirements would further reduce erosion impacts by requiring that stormwater discharges from open channels or drainage systems discharging to the Santa Clara River in excess of four fps (erosive flows) be controlled to prevent accelerated erosion and protect River habitat. Discharge flows would be regulated using water control features and energy dissipation structures where required to reduce discharge velocities to non-erosive rates. Specifically, implementation of GRR-1 and GRR-4, (DPW required runoff controls and hydromodification controls and channel design respectively) would further control the rate of stormwater runoff to minimize downstream erosion through construction of BMPs, and channels would be designed to incorporate the calculated post-development equilibrium slope to ensure a dynamically stable condition allowing for more or less equal amounts of erosion and deposition.

With installation of these temporary and permanent erosion/sedimentation control measures, the Specific Plan would not result in significant sedimentation or debris-related impacts either on or downstream of the Specific Plan site. Instead, the Specific Plan would have a beneficial post-construction impact on downstream sedimentation because, as the site builds out, some steep slopes would be graded to flatter slopes, and many of the areas of the site that have been subject to the vegetation-denuding effects of grazing and burning would be covered with vegetation and other non-erodible surfaces.

Similar to Alternative 2, the changes to the site would reduce site under Alternative 4 sedimentation to below existing levels and reduce debris volume generation throughout the tributary watershed, although to a lesser degree than under Alternative 2. This would, in turn, have beneficial downstream deposition impacts because burned and bulked flows from the site would be substantially reduced, resulting in lower flood flow rates. With implementation of the Project-incorporated Mitigation Measures SP-4.2-5, SP-4.2-

6, and SP-4.2-7 (DPW plan and map approvals, DPW-approved erosion controls, and DPW SUSMP and SWPPP requirements, respectively) erosion and deposition impacts resulting from build-out of the Specific Plan development are considered less than significant, even before mitigation. However, implementation of Project-specific mitigation measures GRR-1 and GRR-4 (DPW required runoff controls and hydromodification controls and channel design respectively) would further reduce these impacts. Accordingly, erosion and downstream deposition impacts would be less than significant relative to Significance Criterion 2.

**Significance Criterion 3: Indirect Impacts to Geomorphic Function (Significant but Mitigable).** Potential indirect hydromodification impacts to the Santa Clara River include stream corridor disturbances from Specific Plan build-out and associated increased runoff intensity from the urbanized tributary drainages. Alternative 4 proposes to develop 251 acres less developed area within the Specific Plan area than that proposed by Alternative 2 (proposed Project). Accordingly, less surface runoff would occur under Alternative 4. The indirect impacts to geomorphic function associated with the Specific Plan are included as part of the discussion for indirect RMDP impacts for Alternative 2. Since Alternative 4 would result in less surface runoff than Alternative 2, the impacts to the geomorphic function of the Santa Clara River and tributaries would also be less under this alternative, but would still be significant. Each of the tributary drainages is designed with hydromodification control components in accordance with DPW design standards to ensure that soft-bottom waterways maintain an equilibrium between sediment supply to the waterway and sediment transport through the waterway.

Implementation of Mitigation Measures SP-4.2-5 (DPW plan and map approvals) would ensure that no significant erosion or sedimentation impacts would occur as a result of the Project. The additional implementation of Mitigation Measures GRR-1 through GRR-6 (DPW required runoff controls, minimization of bridge and structures, structural durability, hydromodification controls and channel design, sediment and debris control facilities, sediment redistribution) would ensure that no substantial reductions in geomorphic function would occur in the RMDP area tributaries. Accordingly, with mitigation, the impacts are considered less than significant relative to Significance Criterion 3.

**Significance Criterion 4: Indirect Construction and Scour Impacts to Riparian Vegetation (Less than Significant).** Implementation of the Alternative 4 RMDP component would indirectly facilitate the build-out of the Specific Plan sites. The confluence of the tributaries to the Santa Clara River are all maintained within the SMA/SEA 23 boundaries and are preserved in a largely natural state. As indicated above, no significant increases in velocity, erosion, or sedimentation would occur in the Santa Clara River because of the proposed build-out.

The implementation of the Specific Plan would result in the loss of riparian vegetation along the RMDP area drainages. Losses of riparian vegetation during construction are addressed in **Section 4.5**, Biological Resources. The impacts to riparian vegetation can be evaluated with the use of the HARC analysis. As discussed in the preceding sections, the number of AW-score units ultimately describes the value of a particular reach, and the number of AW-score units impacted versus preserved will show the impacts of the proposed Project and alternatives on wetland and riparian resources (*i.e.*, post-Project HARC scores serve as a surrogate indicator of potential increases in the frequency and magnitude of scour of riparian vegetation [refer to **Subsection 4.2.5.1.4**, Scour Impacts to Riparian Vegetation]). Conceptually, the

alternative with the fewest lost AW-score units would be the least damaging alternative. However, an alternative with a greater loss of HARC AW-score units may be mitigated by producing AW-score units in another location within the Project area through wetland/riparian restoration or creation (see **Section 4.6**, Jurisdictional Waters and Streams, for further discussion on the HARC assessment methods). **Table 4.2-25**, presented above, compares the total hydrology AW-score units and the total HARC AW-score units calculated for the tributaries.

The HARC analysis indicates that, overall, Alternative 4 would result in substantial changes to the hydrologic function of the tributaries with net losses observed for the hydrology process metrics. In total, Alternative 4 would result in a net gain of 8.70 hydrology AW-score units and a net gain of and 16.72 total HARC AW-score units within the tributaries. The overall increase in HARC AW-score units within the tributaries suggests that Alternative 4 components do not have an overall impact on the geomorphic function of the tributaries. Specifically, net gains in the total HARC AW-score units would be produced in Chiquito, San Martinez Grande, Potrero, Long, Potrero, and Salt Creek Canyon, indicating that the gain in riparian/wetland function of these tributaries would compensate for any such losses in the other tributaries. Therefore, impacts would be less than significant relative to Significance Criterion 4.

**Significance Criterion 5: Impacts to Riparian Resources Supported by the Middle Canyon Spring (Significant but Mitigable).** Although Alternative 4 would result in less development in Middle Canyon compared to Alternative 2, the potential impacts of Alternative 4 on the groundwater hydrology associated with the Middle Canyon Spring are similar to those discussed in the impact analysis for Alternative 2. Accordingly, Alternative 4 has the potential to result in a significant impact to riparian resources supported by the Middle Canyon Spring. However, implementation of Mitigation Measures BIO-74 and BIO-77 would reduce these impacts to less than significant relative to Significance Criterion 5. Mitigation Measure BIO-74 requires the installation of fencing and signage around the spring prior to construction, during construction, and following construction to restrict access and protect the spring area. Mitigation Measure BIO-77 includes the development of the Middle Canyon Spring HMP in consultation with CDFG and implementation of HMP following approval by CDFG.

**SCP Indirect Impacts**

**Significance Criterion 1: Short-Term Impacts from Construction Newhall Ranch Specific Plan, and Entrada Developments (Significant but Mitigable).** Implementation of the Alternative 4 SCP component would indirectly facilitate the build-out of the Specific Plan and a portion of the Entrada site. The VCC site would not be developed under this alternative. With the exception of the VCC development, construction impacts associated with the build-out facilitated by Alternative 4 would be virtually the same as those associated with the build-out facilitated by Alternative 2. Short-term construction impacts to geomorphology associated with construction of the Specific Plan development are included among the indirect impacts of the RMDP component, and are discussed in the preceding subsections on Alternative 2. The indirect impacts associated with the build-out of the Entrada developments are included among the indirect impacts of the SCP Project component, and are discussed in the preceding subsections on Alternative 2.

No previously adopted mitigation measures exist for the VCC or Entrada planning areas. Therefore, the geomorphology-related mitigation measures required by this EIS/EIR in those planning areas include the

measures previously adopted by Los Angeles County for the Specific Plan site in addition to new measures proposed by the Corps and CDFG. Accordingly, with the implementation of Compliance Measures SP-4.2-5, SP 4.2-6, and SP 4.2-7 (DPW plan and map approvals, DPW-approved permanent erosion controls, and DPW SUSMP and SWPPP requirements), short-term impacts from the build-out of the Specific Plan site are considered significant but mitigable to less than significant relative to Significance Criterion 1 through proper design and BMP implementation.

**Significance Criterion 2: Indirect Impacts from Erosion and Downstream Deposition (Significant but Mitigable).** Implementation of the Alternative 4 SCP component would indirectly facilitate the build-out of the Specific Plan and Entrada sites. The VCC site would not be developed under this alternative. Indirect impacts of erosion and downstream deposition associated with build-out of the Specific Plan development are included among the indirect impacts of the RMDP Project component, and are discussed in the preceding subsections on Alternative 2. The indirect impacts associated with the build-out of the Entrada development are included among the indirect impacts of the SCP Project component, and are discussed in the preceding subsections on Alternative 2.

Alternative 4 proposes to develop 46.8 acres less developed area in the Entrada planning area and 177.6 acres less in the VCC, than that proposed by Alternative 2 (proposed Project). The VCC project would not be constructed under this alternative. Accordingly, less surface runoff would occur under Alternative 4. Because Alternative 4 would result in less surface runoff compared to Alternative 2, this impact would be less than that associated with Alternative 2, but still significant.

With the implementation of Mitigation Measures SP-4.2-5, SP 4.2-6, and SP 4.2-7 (DPW plan and map approvals, DPW-approved permanent erosion controls, and DPW SUSMP and SWPPP requirements respectively) the erosion and downstream deposition impacts of the Specific Plan, VCC, and Entrada planning areas would be reduced to a less-than-significant level relative to Significance Criterion 2.

**Significance Criterion 3: Indirect Impacts to Geomorphic Function (Significant but Mitigable).** Implementation of the Alternative 4 SCP component would indirectly facilitate build-out of the Specific Plan and a portion of the Entrada site. The VCC site would not be developed under this alternative. Indirect hydromodification impacts associated with build-out of the Specific Plan development are included among the indirect impacts of the RMDP Project component, and are discussed in the preceding subsections on Alternative 2. The indirect impacts associated with the build-out of the Entrada development are included among the indirect impacts of the SCP Project component, and are discussed in the preceding subsections on Alternative 2. Alternative 4 proposes to develop 46.8 acres less developed area in the Entrada planning area and 177.6 acres less in the VCC, than that proposed by Alternative 2 (proposed Project). The VCC project would not be constructed under this alternative. Accordingly, less surface runoff would occur under Alternative 4. Because Alternative 4 would result in less surface runoff compared to Alternative 2, this impact would be less than that associated with Alternative 2, but still significant.

Mitigation Measures GRR-1, GRR-2, and GRR-4 (DPW required runoff controls, minimization of bridge and structures, and hydromodification controls and channel design) would be implemented to reduce impacts to the geomorphic function of the tributaries resulting from the build-out of the proposed

developments. These measures would ensure that erosion and deposition impacts are reduced to less than significant. Accordingly, impacts resulting from the build-out of the Specific Plan, VCC, and Entrada planning areas are considered less than significant relative to Significance Criterion 3.

**Significance Criterion 4: Indirect Construction and Scour Impacts to Riparian Vegetation (Less than Significant).** Implementation of the Alternative 4 SCP component would indirectly facilitate the build-out of the Specific Plan and a portion of the Entrada site. The VCC site would not be developed under this alternative. Indirect impacts to riparian vegetation associated with build-out of the Specific Plan development are included among the indirect impacts of the RMDP Project component, and are discussed in the preceding subsections on Alternative 2. The indirect impacts associated with the build-out of the Entrada development are included among the indirect impacts of the SCP Project component, and are discussed in the preceding subsections on Alternative 2. Alternative 4 proposes to develop 224.5 acres less developed area in the Entrada and VCC planning areas than that proposed by Alternative 2 (proposed Project). The VCC project would not be constructed under this alternative. Accordingly, less disturbance to riparian vegetation would occur under Alternative 4. Because Alternative 4 would result in less disturbance to riparian vegetation compared to Alternative 2, this impact would be less than that associated with Alternative 2, and therefore, less than significant relative to Significance Criterion 4.

#### 4.2.5.5.3 Secondary Impacts

**RMDP and SCP Secondary Impacts**

**Significance Criterion 6: Impacts to the "Dry Gap" (Less than Significant).** The potential impacts associated with the Newhall Ranch WRP for Alternative 4 would be similar to those described in the impact analysis for Alternative 2. As discussed in that analysis, the potential impacts of the Newhall Ranch WRP to the Dry Gap are considered less than significant relative to Significance Criterion 6 since they will not substantially lengthen the duration of seasonal flow in the Dry Gap. This significance finding is based on the fact that discharge from the Newhall Ranch WRP would occur in the winter and would be small relative to the overall flow in the Santa Clara River, and the existing data shows that increases in base flow due to discharges from the Valencia WRP and the Saugus WRP since the 1960s have not led to a substantial change in the duration of seasonal flow in the Dry Gap.

**Significance Criterion 7: Impacts to Ventura County Beaches (Less than Significant).** The effects of Alternative 4 components on beach replenishment are a function of the sediment load delivered through the Project reach. As discussed in **Subsection 4.2.3.1.3**, Beach Replenishment, above, the Santa Clara River contributes approximately 60 percent of beach sand within Ventura County. However, the reduction of area subject to erosion due to project components and the build-out of the Specific Plan and Entrada planning area under Alternative 4 could result in a relative reduction of floodwater sediment, which could negatively impact beaches, as incrementally less sediment would be available for their replenishment.

The RMDP component of Alternative 4 that would have the most effect on sediment supply in the tributaries is the conversion of tributary drainage to buried storm drain. For this analysis, it is assumed that the area converted to buried storm drain results in a net loss of sediment supplied by the affected area. As detailed in **Subsection 4.2.3.1.3**, Beach Replenishment, roughly 1,170 tons per square mile per year of suspended sediment originates from the area upstream of the Los Angeles County/Ventura County line.

Approximately 38 acres (0.6 square miles) within the tributaries there could potentially contribute to sediment supply would be converted to buried storm drain; this could result in a net reduction of 70 tons of sediments per year.

In order to estimate the impacts to sediment supply associated with the RMDP components within the Santa Clara River floodplain, it is assumed that the floodplain areas subject to velocities greater than four fps contribute to the sediment supply within the Project reach during the capital flood event. Accordingly, Alternative 4 would result in a maximum reduction of 169.1 acres (0.26 square miles) of floodplain area subject to velocities greater than four fps during the capital flood event (see **Table 4.2-22**). Therefore, Alternative 4 would result in a maximum net reduction of about 169.1 acres (0.26 square miles) of channel area in the Santa Clara River that could potentially contribute to sediment supply. Given this estimate, the reduction of 169.1 acres (0.26 square miles) would result in a maximum direct reduction of approximately 310 tons of sediment per year from the Santa Clara River Corridor. In total, Alternative 4 could result in a reduction of 380 tons of sediment per year delivered through the Project reach.

The build-out of the Specific Plan would have greater effects to the sediment supplied to the River system. The build-out of the Specific Plan under Alternative 4 would convert approximately 4,736.5 acres (7.4 square miles) to non-erodible surfaces, including pavement and permanent vegetation that would reduce the sedimentation of site runoff. Accordingly, this would result in the reduction of roughly 8,659 tons of sediment per year.

The drainage areas in which the Entrada site lies would not be completely developed; therefore, storm flows from the upper reaches would contain sediment and vegetative debris. The 177.6 acres of commercial development in the VCC planning area would not be developed under this alternative. The Entrada planning area consists of approximately 316.1 acres. Development of the Entrada site would result in approximately 184.4 acres (0.3 square miles) of non-erosive surfaces, including pavement and permanent vegetation that would reduce the sedimentation of site runoff which would result in a direct reduction of roughly 337 tons of sediment per year.

As detailed in **Subsection 4.2.3.1.3**, Beach Replenishment, the Santa Clara River exports an estimated 4.08 million tons per year from its mouth into the Santa Barbara Channel. In total, the RMDP and SCP would result in the net reduction of 8,996 tons of sediment per year, or approximately 0.2 percent reaching the Santa Barbara Channel, which would be a less-than-significant impact. In order to minimize this reduction in sediment delivery to Ventura County beaches, Mitigation Measure GRR-6 specifies that sediment from upland sources, such as debris basins and other sediment retention activities, would be redistributed in permitted upland and/or riparian locations along the Santa Clara River to reintroduce sediment for beach replenishment purposes. This sediment management activity would lessen the adverse effect of debris and sediment reduction on downstream beach erosion.

Based on this analysis, the reduction of sediment delivered to Ventura County beaches due to the RMDP components and build-out of the Specific Plan, VCC and Entrada planning areas would be less than significant relative to Significance Criterion 7 since the decrease in average annual sediment transported to the beaches would be less than 1 percent.

### 4.2.5.6 Impacts of Alternative 5 (Widen Tributary Drainages and Addition of VCC Spineflower Preserve)

**Santa Clara River. Figure 3.0-24** (**Section 3.0**, Description of Alternatives) depicts the locations of the Alternative 5 proposed RMDP Santa Clara River features relative to river jurisdictional areas. As shown, two proposed bridges, Potrero Canyon Road bridge and Long Canyon Road bridge, and one previously approved bridge, Commerce Center Drive Bridge, would be located across the main stem of the Santa Clara River, resulting in permanent impacts due to bridge crossings.[17] As shown, buried bank stabilization would be installed along approximately one-half of the north bank and one-third of the south bank of the Santa Clara River within the RMDP study area. Most of the bank stabilization would be constructed in upland areas. Bank stabilization would be installed upstream of Chiquito Canyon and downstream of San Martinez Grande Canyon on the north bank and between Long and Potrero Canyons on the south bank of the Santa Clara River. The WRP outfall to the Santa Clara River also would be installed as part of the approved Newhall Ranch WRP. As shown, geofabric utility corridor bank protection also is proposed on the north side of the Santa Clara River between San Martinez Grande Canyon and Chiquito Canyon. Permanent bank stabilization impact areas exist on the north and south banks of the Santa Clara River. In total, this alternative proposes to construct 26,952 lf of buried bank stabilization and three bridges in the Santa Clara River Corridor. Like Alternatives 3, and 4 this table shows 22 storm drain outlets along the north bank and three such outlets on the south bank of the Santa Clara River (25 storm drain outlets). In addition, the WRP outfall to the Santa Clara River would be constructed. A summary of the RMDP infrastructure authorized under the RMDP component of Alternative 5 is presented in **Table 4.2-26a**. The proposed RMDP components are described and illustrated in **Section 3.0**, Description of Alternatives, Alternative 5 -- RMDP Santa Clara River Features.

**Table 4.2-26a**
**Alternative 5 Santa Clara River Major RMDP Infrastructure**

| Santa Clara River Location | Bank Stabilization (lf) | Outlets (No.) | Bridges | | | |
|---|---|---|---|---|---|---|
| | | | Length (lf) | Width (lf) | Piers (No.) | Vertical Clearance (ft) |
| **Bridges** | | | | | | |
| Commerce Center Drive Bridge | - | - | 1,200 | 100 | 9 | 22 |
| Long Canyon Road Bridge | - | - | 980 | 100 | 9 | 31-40 |
| Potrero Canyon Road Bridge | - | - | 2,265 | 84 | 21 | 20-24 |
| **Banks** | | | - | - | - | - |
| North River Bank | 19,300 | 22 | - | - | - | - |
| South River Bank | 7,652 | 3 | - | - | - | - |
| **Total** | **26,952** | **25** | **-** | **-** | **-** | **-** |

Source: RMDP, 2008.

[17] The Commerce Center Drive Bridge was previously analyzed in the Final EIS/EIR prepared and approved by the Corps and CDFG in connection with previously adopted NRMP (SCH No. 1997061090, August 1998).

Alternative 5 would involve the designation of 127.7 acres of Newhall Ranch as spineflower preserve, in addition to the 64.3 acres of previously designated conservation easements which, when combined with the Entrada and VCC preserves, total 338.6 acres. Implementation of Alternative 5 would result in the reduction of approximately 339 acres of developable area in the Newhall Ranch Specific Plan area compared to the build-out potential of the proposed RMDP. This alternative also would result in a decrease of 52 acres of developable area for the Entrada planning area. The 177.6 acres of commercial/industrial development of the VCC project would not be constructed under this alternative. The reduction of developable area would occur due to preservation of streams and riparian areas, designation of spineflower preserves, close proximity to unstabilized drainages, and reduction of access to isolated parcels.

**Tributary Drainages. Figure 3.0-25** (**Section 3.0**, Description of Alternatives) illustrates the modified, converted, and preserved tributary drainages within the Project area under Alternative 5. Under Alternative 5, there are five major tributary drainages that would be partially regraded or modified but remain in a soft-bottom channel condition: Chiquito Canyon, San Martinez Grande Canyon, Potrero Canyon, Long Canyon, and Lion Canyon. Significant portions of several small tributary drainages would be graded and replaced with storm drains or other appropriate conveyance facilities, including: Magic Mountain Canyon, Middle Canyon, Dead-End Canyon, Exxon Canyon, Mid-Martinez Canyon, Off-Haul Canyon, Homestead Canyon, the Chiquito Canyon agricultural ditch, Unnamed Canyon B, Unnamed Canyon C, Unnamed Canyon D, Unnamed Canyon 1 and Unnamed Canyon 2.

**Chiquito Canyon.** In Chiquito Canyon, bank stabilization would be placed along the entire length of the eastern side of the drainage except for the cottonwood/willow woodland at the northern Project area boundary as shown on **Figure 3.0-26** (**Section 3.0**, Description of Alternatives). Approximately one-third of this stabilization would be placed in upland areas. Buried bank stabilization would be placed along the western edge of the drainage with the exception of an 800-foot segment approximately halfway up the drainage, which would remain unstabilized (preserved). Upstream of this unstabilized area, bank protection would be installed in uplands. One new bridge is proposed under this alternative, just upstream of SR-126. In addition, two culvert road crossings are proposed approximately halfway between SR-126 and the northern Project area boundary. In addition, the existing two-lane bridge allowing SR-126 to cross the drainage would be widened to four lanes. Approximately 6,843 lf of buried bank stabilization would be installed along the west bank, and 6,059 lf of buried bank stabilization installed on the east bank of Chiquito Canyon. In addition, approximately 2,624 lf of drainage would be converted to buried storm drain. **Figure 3.0-26** (**Section 3.0**, Description of Alternatives) refers to the locations of the proposed side drainage bank stabilization alignments, newly created drainage, impacted drainages, and development areas in and along Chiquito Canyon. **Table 4.2-26b** describes the Alternative 5 tributary drainage RMDP infrastructure characteristics, including the Chiquito Canyon modified drainage. The proposed RMDP components are described and illustrated in **Section 3.0**, Description of Alternatives, Proposed Chiquito Canyon Tributary Treatments -- Alternative 5.

**Table 4.2-26b**
**Alternative 5 Tributary Drainage RMDP Infrastructure**

| Drainage Location | Drainage Modified (lf) | Drainage Converted to Buried Storm Drain (lf) | Bank Stabilization[1] (lf) | | Preserved Drainage (lf) | Road Crossings | |
|---|---|---|---|---|---|---|---|
| | | | West Bank | East Bank | | Bridges | Culverts |
| **Modified Drainages** | | | | | | | |
| Chiquito Canyon | 8,537 | 2,624 | 6,843 | 6,059 | 898 | 1 | 2 |
| Lion Canyon | 5,614 | 6,316 | 0 | 0 | 0 | 0 | 1 |
| Long Canyon | 7,627 | 961 | 6,813 | 6,689 | 1,991 | 0 | 3 |
| Potrero Canyon | 15,938 | 11,909 | 14,108 | 15,448 | 11,846 | 4 | 1 |
| San Martinez Grande Canyon | 3,050 | 0 | 1,669 | 3,085 | 2,120 | 2 | 0 |
| Subtotal | 40,766 | 21,810 | 29,433 | 31,281 | 16,854 | 7 | 7 |
| **Unimproved/Converted Drainages** | | | | | | | |
| Agricultural Ditch | 317 | 1,479 | 0 | 0 | 0 | 0 | 0 |
| Ayers Canyon | 148 | 0 | 0 | 0 | 2,317 | 0 | 1 |
| Dead-End Canyon | 0 | 1,931 | 0 | 0 | 0 | 0 | 0 |
| Exxon Canyon | 0 | 1,276 | 0 | 0 | 2,265 | 0 | 0 |
| Homestead Canyon | 0 | 609 | 0 | 0 | 0 | 0 | 0 |
| Humble Canyon | 0 | 421 | 0 | 0 | 5,116 | 0 | 0 |
| Middle Canyon | 0 | 7,439 | 0 | 0 | 148 | 0 | 0 |
| Mid-Martinez Canyon | 25 | 4,541 | 0 | 0 | 247 | 0 | 0 |
| Off-Haul Canyon | 0 | 7,593 | 0 | 0 | 1,185 | 0 | 0 |
| Salt Canyon | 7,290 | 0 | 0 | 1,992 | 101,470 | 0 | 0 |
| Magic Mountain Canyon | 0 | 6,111 | 0 | 0 | 0 | 0 | 0 |
| Unnamed Canyon 1 | 0 | 4,647 | 0 | 0 | 0 | 0 | 0 |
| Unnamed Canyon 2 | 0 | 416 | 0 | 0 | 0 | 0 | 0 |
| Unnamed Canyon A | 0 | 0 | 0 | 0 | 1,293 | 0 | 0 |
| Unnamed Canyon B | 0 | 1,004 | 0 | 0 | 568 | 0 | 0 |
| Unnamed Canyon C | 0 | 402 | 0 | 0 | 869 | 0 | 0 |
| Unnamed Canyon D | 0 | 1,004 | 0 | 0 | 487 | 0 | 0 |
| Subtotal | 7,779 | 38,873 | 0 | 1,992 | 115,966 | 0 | 1 |
| **Totals** | **48,545** | **60,683** | **29,433** | **33,273** | **132,820** | **7** | **8** |

Notes:
[1] The lf of bank stabilization does not necessarily reflect impacts to jurisdictional areas; it only provides the linear feet of bank protection to be installed along various tributary drainages.
Source: RMDP, 2008.

**San Martinez Grande Canyon**. In San Martinez Grande Canyon, Alternative 5 would require bank stabilization to be constructed in upland areas along approximately two-thirds of the east bank, and along approximately one-fourth of the west bank as shown on **Figure 3.0-27** (**Section 3.0**, Description of Alternatives). A bridge would be constructed approximately two-thirds of the way between SR-126 and the northern Project area boundary, and another is proposed just upstream of SR-126 (**Figure 3.0-27**, **Section 3.0**, Description of Alternatives). In total, this alternative would involve the placement of 1,669 lf of buried bank stabilization on the west side and 3,085 lf of buried bank stabilization on the east side of the drainage, along with grade stabilization structures, as depicted on **Figure 3.0-27** (**Section 3.0**, Description of Alternatives). In addition, the existing bridge allowing SR-126 to cross the drainage would be widened. **Table 4.2-26b** describes the Alternative 5 tributary drainage RMDP infrastructure characteristics, including the San Martinez Grande Canyon modified drainage. The proposed RMDP components are described and illustrated in **Section 3.0**, Description of Alternatives, Proposed San Martinez Grande Tributary Treatments -- Alternative 5.

**Long Canyon.** Under Alternative 5, Long Canyon would involve the placement of 6,813 lf of buried bank stabilization along the west bank and 6,689 lf of bank stabilization on along the east bank of Long Canyon. In addition, approximately 961 lf of drainage would be converted to buried storm drain. The proposed RMDP components are described and illustrated in **Figure 3.0-20** (**Section 3.0**, Description of Alternatives, Long Canyon Tributary Treatments - Alternative 5).

**Potrero Canyon**. In Potrero Canyon, Alternative 5 would feature buried bank stabilization constructed in upland areas along both banks downstream of the point where the drainage begins to branch as shown on **Figure 3.0-28** (**Section 3.0**, Description of Alternatives). One road culvert crossing and three bridge crossings would be constructed at approximately even intervals between the upstream end of the mesic meadow and the upstream end of the cismontane alkali marsh. A fourth bridge crossing would cross the drainage farther upstream, just downstream of the point where the stream begins to branch. (**Figure 3.0-28**, **Section 3.0**, Description of Alternatives). Upstream of the branching point, the drainage would be graded and diverted into buried storm drain as shown on **Figure 3.0-28** (**Section 3.0**, Description of Alternatives). In total, Alternative 5 would involve the placement of 14,108 lf of buried bank stabilization on the west side and 15,448 lf of buried bank stabilization on the east side of the drainage, along with 95 grade stabilization structures and approximately 11,909 lf converted to buried storm drain, as depicted on **Figure 3.0-28** (**Section 3.0**, Description of Alternatives). The proposed RMDP components described and illustrated in **Section 3.0**, Description of Alternatives, Proposed Potrero Tributary Treatments -- Alternative 5.

**Lion Canyon** Proposed drainage treatments in Lion Canyon for Alternative 5 include approximately 6,316 lf of drainage would be converted to buried storm drain in the western, central, and eastern portions of Lion Canyon, as shown on **Figure 3.0-9** (**Section 3.0**, Description of Alternatives). One culverted road crossing would be constructed to allow Specific Plan roadways to cross the Lion Canyon drainage at the locations shown on **Figure 3.0-9** (**Section 3.0**, Description of Alternatives). **Table 4.2-26b**, above, describes the Alternative 5 tributary drainage RMDP infrastructure characteristics, including the Lion Canyon modified drainage. The proposed RMDP components are described and illustrated in **Section 3.0**, Description of Alternatives, Lion Canyon Alternative 5 Proposed RMDP Tributary Treatments.

**Minor Tributaries and Drainages.** One culverted road crossing would be constructed across the mouth of the Ayers Canyon drainage. No other drainage facilities would be constructed in Ayers Canyon. Approximately 38,873 lf of existing minor tributary drainage would be converted into buried storm drain. In addition, the existing six-lane bridge allowing SR-126 to cross the Castaic Creek drainage would be expanded to eight lanes.

#### 4.2.5.6.1 Direct Impacts

**RMDP Direct Impacts**

**Santa Clara River -- Significance Criterion 1: Short-Term Impacts from Construction of Bridges, Bank Stabilization, and Turf Reinforcement Mats (Significant but Mitigable).** Installation of bank stabilization features and bridge piers and abutments would directly impact elements of Santa Clara River geomorphology. Bridge piers and abutments would have localized effects on channel alignment. This would be a significant impact prior to mitigation. Under Alternative 5, fewer linear feet of bank stabilization would be constructed. Therefore, Alternative 5 would have less of a direct effect on the Santa Clara River geomorphology than Alternative 2, although still significant. Specifically, Alternative 5 would result in approximately eight percent less floodplain area temporarily disturbed during the construction of RMDP components within the Santa Clara River and terrace areas along the edge of the riverbed, in proximity to the proposed Potrero Canyon Road bridge location. The primary difference between Alternative 2 and Alternative 5 is that the northern bridge abutment under Alternative 5 is setback further from the riparian resources within and along the Santa Clara River. Direct construction impacts associated with build-out of the proposed RMDP development are included among the direct impacts of the RMDP Project component, and are discussed in the preceding subsections on Alternative 2.

Implementation of Mitigation Measure SP-4.2-2 (acquire state and federal permits), SP-4.2-3 (CDFG streambed agreements), SP-4.2-5 (DPW plan and map approvals), and SP-4.2-7 (DPW SUSMP and SWPPP requirements) would reduce the short-term impacts to the Santa Clara River geomorphology. Specifically, construction of the RMDP components would be subject to CWA section 402(p), which regulates construction, municipal, and industrial stormwater discharges under the NPDES program. The Project proposes to implement a regional stormwater mitigation plan (**Appendix 4.4**, Geosyntec, 2008) to comply with NPDES permit requirements. Pursuant to NPDES regulations for permitting of stormwater discharges, SWRCB has issued a statewide general Permit and Waste Discharge Requirements for stormwater discharges from construction sites. Under this Construction General Permit, discharges of stormwater from construction sites with a disturbed area of one or more acres are required to either obtain individual NPDES permits for stormwater discharges or be covered by the Construction General Permit. Coverage under the Construction General Permit is accomplished by completing and filing a Notice of Intent with SWRCB and implementing a SWPPP. This plan requires the implementation of BMPs to reduce or eliminate pollutants in stormwater discharges. Therefore, short-term sedimentation impacts with respect to Significance Criterion 1 during construction would be reduced to a less than significant through the implementation of existing regulatory requirements and obtaining required permits from the State and County.

Absent mitigation, there would be significant short-term sedimentation impacts during construction with respect to Significance Criterion 1. However, Mitigation Measures SP-4.2-2 (acquire state and federal permits), SP-4.2-3 (CDFG streambed agreements), SP-4.2-5 (DPW plan and map approvals), and SP-4.2-7 (DPW SUSMP and SWPPP requirements) would ensure that regulatory requirements are implemented and short-term impacts related to construction of RMDP components are less than significant through proper application of sediment controls and other BMPs required by existing local, state, and federal regulations.

**Santa Clara River -- Significance Criterion 2: Erosion and Downstream Deposition (Significant but Mitigable).** Implementation of the RMDP improvements and facilities, particularly site clearing and grading operations, would have the potential to increase sediment flows downstream during storm events, which may result in substantial erosion and deposition and could result in significant impacts downstream.

As discussed in **Subsection 4.2.5.1**, Impact Assessment Methods, a representative velocity of 4.0 fps was determined to be the appropriate indicator for potential erosion. Direct impacts associated with erosion could result if the RMDP improvements resulted in an increase of the two- to 100-year and capital flood floodplain area subject to velocities greater than four fps. **Table 4.2-27** includes the change in the total area of floodplain, delineated by vegetation type, where velocities exceed four fps for each return interval of Alternative 5 from existing conditions.

The total floodplain area subject to potentially erosive velocities would be decreased as a result of Alternative 5 for all return intervals. In some areas, velocities greater than four fps correspond with outlet structures, access ramps, or bridge abutments, which could result in a significant erosion impact. **Appendix 4.1**, Newhall Ranch Resource Management & Development Plan: River & Tributaries Drainage Analysis, Santa Clara River (PACE, 2008A) identifies locations of potential erosion within Santa Clara River riparian areas.

Where necessary to minimize erosion and structural damage to such structures, erosion resistant materials such as concrete, soil cement, or secured rip-rap would be used according to the standards, criteria, and specifications developed by the DPW to ensure long-term stability (Mitigation Measure GRR-3). The specific improvements for each drainage area would be designed as part of the final drainage plans prepared to DPW standards during the subdivision process. (Mitigation Measures SP-4.2-5 and SP-4.2-6.). No impacts to velocity would be realized upstream or downstream of the Project.

Downstream deposition characteristics and potential erosion of the soils covering the buried soil cement would be approximately the same under both Alternatives 2 and 5 since the location of the buried bank stabilization is approximately the same for both alternatives. Accordingly, erosion and downstream deposition impacts resulting from Alternative 5 are expected to be significant but mitigable. Specifically, to minimize erosion and structural damage to such structures, erosion resistant materials such as concrete, soil cement or secured rip-rap would be used according to the standards, criteria, and specifications developed by the DPW to ensure long-term stability (Mitigation Measure GRR-3). The specific improvements for each drainage area would also be designed as part of the final drainage plans

**Table 4.2-27**
**Change in Floodplain Area (By Vegetation Type) Where Velocity > 4 fps**
**Alternative 5 -- Santa Clara River**

| Vegetation Type | Change in Flood Plain Area (Acres) | | | | | | |
|---|---|---|---|---|---|---|---|
| | 2-Year | 5-Year | 10-Year | 20-Year | 50-Year | 100-Year | CAP |
| Agriculture | -0.1 | -0.1 | -0.6 | -10.8 | -69.8 | -111 | -156.7 |
| Alluvial Scrub | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Arroweed Scrub | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 0.1 | -0.9 |
| Big Sagebrush Scrub | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| California Annual Grassland | 0.0 | 0.0 | 0.0 | 0.0 | -0.3 | 0.8 | -0.1 |
| Undifferentiated Chaparral | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| California Sagebrush | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -0.1 |
| California Sagebrush-California Buckwheat | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| California Sagebrush-Undifferentiated Chaparral | 0.0 | 0.0 | 0.0 | -0.1 | 0.0 | 0.0 | 0.0 |
| California Sagebrush-Purple Sage | 0.0 | 0.0 | 0.0 | 0.0 | 2.3 | 0.1 | 0.1 |
| Cottonwood Willow Riparian Forest | -0.4 | 0.0 | -0.1 | -1.2 | 0.0 | 1.9 | -0.7 |
| Burned California Sagebrush | 0.0 | 0.0 | 0.0 | 0.0 | -0.1 | 0.2 | 0.0 |
| Disturbed Cottonwood Willow Riparian Forest | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 0.0 | 0.0 |
| Developed | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -0.3 |
| Disturbed Land | -0.1 | 0.0 | 0.0 | -0.2 | -3.5 | -8.5 | -16.5 |
| Disturbed Riparian Scrub | 0.0 | 0.0 | 0.0 | 0.0 | -0.2 | 0.0 | 0.0 |
| Disturbed Southern Willow Scrub | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Giant Reed | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | -0.1 | 0.0 |
| Herbaceous Wetlands | -1.0 | 0.1 | -0.3 | -1.3 | -1.0 | -0.2 | 0.1 |
| Live Oak Woodland | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Mulefat Scrub | 0.0 | 0.0 | 0.0 | -0.4 | -0.5 | -2.1 | -4.7 |
| Open Channel | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Southern Coast Live Oak Riparian Forest | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Ornamental | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| River Wash | 0.4 | -0.3 | 0.0 | -2.0 | 0.2 | 0.5 | 0.0 |
| Southern Willow Scrub | 0.0 | 0.0 | -0.3 | -0.2 | -1.2 | -1.6 | 0.2 |
| Tamarisk Scrub | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Valley Oak Woodland | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **TOTAL CHANGE** | **-1.2** | **-0.3** | **-1.3** | **-16.2** | **-73.8** | **-119.9** | **-179.6** |

Source: PACE, 2008A.

prepared to DPW standards during the subdivision process. (Mitigation Measures SP-4.2-5, DPW plan and map approvals and SP-4.2-6, DPW-approved permanent erosion controls.). Incorporation and implementation of proper design, regulatory compliance, facility maintenance, and specified mitigation measures will reduce the impact of erosion and/or downstream deposition to a less-than-significant level in relation to Significance Criterion 2.

**Santa Clara River -- Significance Criterion 3: Impacts to Geomorphic Function (Less than Significant).** The RMDP improvements and facilities associated with Alternative 5 would have limited and localized hydromodification impacts to the Santa Clara River. Under moderate storm runoff events, localized increases in flow quantity and velocity would be present at drainage outlet facilities along the banks of the Santa Clara River. In selected locations along the northern and southern banks of the Santa Clara River, the existing floodplain would be protected by buried soil cement and be inaccessible to infrequent flood flows (50- and 100-year events). Similar to Alternative 2, Santa Clara River flows of lower than the 50-year event would utilize the existing floodplain under the Alternative 5 condition. Bridge piers and abutments would have localized effects on channel alignment. To reduce impacts to the stream channel relative to Alternative 2, the north bank abutment of the Potrero Bridge has been pulled back from the River and the south bank abutment has been removed.

**Table 4.2-28** provides general hydraulic characteristics of the River channel for the two-, five-, 10-, 20-, 50-, and 100-year events, comparing the existing conditions to those resulting from Alternative 5. Included in these characteristics are: maximum river flow depth measured in feet, average flow velocity measured in fps, friction slope (a measure of flow erodibility), flow area measured in square feet (sf), channel top width measured in feet, and total shear (a measure of friction caused by the weight of water on the River bottom, and an indicator of scour/erosion potential) measured in pounds per square foot. As shown, with Alternative 5 most of these characteristics increase in magnitude with an increase in storm intensity (return interval). Relative to existing conditions, Alternative 5 results in an increase in the maximum flow depth of less than one foot during the 50- and 100-year storm events (results for the two-, five, 10-, and 20-year events are essentially the same for the existing and Alternative 5 condition). During the 20- and 100-year return interval, Alternative 5 would result in minor increases in average velocity, with essentially no change or a decrease in velocities for the two-, five-, 10-, and 50-year events. Average friction slopes remain relatively unchanged as a result of Alternative 5 with minor increases during the 50- and 100-year return intervals. Alternative 5 would result in minor increases in the top width during the two- and five-year events, with essentially no change observed during the 20-year event. A decrease in the top width would occur during the 20-, 50-, and 100-year events, due primarily to channel constrictions at bridge crossings. Lastly, Alternative 5 would have a nominal effect on the total shear during the 2-, 5-, and 10-year events, with minor increases observed during the less frequent 20-, 50-, and 100-year events.

**Table 4.2-28**
**Summary of Average Channel Hydraulic Parameters**
**Existing vs. Alternative 5 -- Santa Clara River**

| Condition | Return Interval | Max. Flow Depth | Average Velocity | Friction Slope | Flow Area | Top Width | Total Shear |
|---|---|---|---|---|---|---|---|
| | (years) | (ft) | (fps) | -- | (sq. ft.) | (ft) | (psf) |
| Existing | 2 | 3.34 | 4.46 | 0.0053 | 774.2 | 404.2 | 0.72 |
| Existing | 5 | 5.11 | 5.82 | 0.0053 | 1585.2 | 520.3 | 1.16 |
| Existing | 10 | 6.50 | 6.65 | 0.0052 | 2423.6 | 614.0 | 1.48 |
| Existing | 20 | 7.99 | 6.89 | 0.0052 | 3658.7 | 887.0 | 1.60 |
| Existing | 50 | 9.84 | 7.48 | 0.0051 | 5581.5 | 1131.1 | 1.85 |
| Existing | 100 | 11.27 | 8.00 | 0.0051 | 7283.6 | 1236.1 | 2.13 |
| Alternative 5 | 2 | 3.36 | 4.45 | 0.0053 | 777.7 | 406.7 | 0.73 |
| Alternative 5 | 5 | 5.10 | 5.83 | 0.0053 | 1583.5 | 524.3 | 1.14 |
| Alternative 5 | 10 | 6.48 | 6.66 | 0.0052 | 2419.0 | 614.1 | 1.47 |
| Alternative 5 | 20 | 8.00 | 7.08 | 0.0052 | 3563.2 | 790.3 | 1.69 |
| Alternative 5 | 50 | 10.24 | 7.34 | 0.0052 | 5690.4 | 995.8 | 2.05 |
| Alternative 5 | 100 | 11.75 | 7.99 | 0.0051 | 7280.9 | 1065.2 | 2.38 |
| Alternative 2 | 100 | 11.87 | 7.8 | 0.0051 | 7489.4 | 1093.4 | 2.43 |

Source**:** PACE, 2008A.

The estimated change in hydraulic characteristics under the Alternative 5 RMDP would be relatively minor. For the high frequency floods (two- and five-year), the proposed floodplain modifications would not increase erosion potential, hinder flows or substantially reduce the floodplain area. Instead, these flows would spread across the River channel, unaffected by the bank protection because the river would have sufficient width to allow these flows to meander and spread out as under pre-Project conditions. Compared with Alternative 2, during the 100-year event, the RMDP components proposed by Alternative 5 would result in minor reductions in the maximum flow depth, flow area, top width, and total shear, with an increase in average velocity. As with Alternative 2, Alternative 5 river flows would be impacted by proposed improvements to the width of the buried soil cement during more infrequent 20- and 100-year discharges. This would limit the area of the floodplain during these infrequent flood events, causing inundation over a smaller area because the bank protection would be developed under the Specific Plan to protect the various land uses, including residential, commercial, industrial, and parks. Given the low frequency and duration of the lower frequency events, the potential impacts to geomorphic function in the Santa Clara River relative to Significance Criterion 3 are considered less than significant.

The HARC analysis indicates that the Alternative 5 would result in only minor changes to the hydrologic function of the Santa Clara River with small decreases in the source water and floodplain connection metrics. In total, Alternative 5 would result in a net gain of 10.74 hydrology AW-score units and would increase the total HARC AW-score units by 52.74. The overall increase in HARC AW-score units is primarily attributed to the benefits provided by Alternative 5 to riparian habitat as discussed in **Section**

**4.6**, Jurisdictional Waters and Streams. In general, the HARC analysis supports the conclusion that the relatively minor impacts to the hydrologic processes of the Santa Clara River do not have an overall negative effect on the geomorphic function, *e.g.*, ability to support riparian habitat. Therefore, impacts associated with Alternative 5 would be less than significant relative to Significance Criterion 3 since they would not result in a substantial reduction in geomorphic function.

**Santa Clara River -- Significance Criterion 4: Construction and Scour Impacts to Riparian Vegetation (Less than Significant).** Most of the areas along the River corridor within the Project site consist of agricultural fields, and to a lesser extent, disturbed and upland habitat areas with limited riparian habitat. (PACE, 2008A.) Alternative 5 includes the construction of 26,952 lf of soil cement, which is necessary to protect the Specific Plan's residential and commercial development and the bridges at Commerce Center Drive and Long Canyon Road. The analysis of the impacts of installing bank protection, bridge piers and abutments, and erosion protection to vegetation along the River are primarily related to Alternative 5's hydrologic and hydraulic impacts on the Santa Clara River, as detailed below.

**Impacts on Velocity.** An increase in flow velocities in the River could result in significant impacts to riparian vegetation if the increase causes: (1) widespread and chronic scouring of the channel bed that removes a significant amount of aquatic wetland and riparian habitats from the River channel; and/or (2) substantial modification of the relative amounts of these different habitats in the River, essentially altering the quality of the riverine environment.

Impacts associated with erosion and sediment deposition and, therefore, streambed modification within the River are evaluated as a function of in-stream velocities, which are indicators for potential riverbed scouring. As discussed in **Subsection 4.2.5.1**, Impact Assessment Methods, a representative velocity of four fps was determined to be the appropriate indicator for potential erosion. **Table 4.2-27**, presented above, includes the change of Alternative 5, from existing conditions, in the total area of floodplain, delineated by vegetation type, where velocities exceed four fps for each return interval.

The total floodplain area subject to potentially erosive velocities would be decreased as a result of Alternative 5 for all return intervals. In addition, no impacts to velocity would be realized upstream or downstream of the Project reach. (PACE, 2008A.) The impacts relating to habitat removal and disturbance as a result of changes to River velocity are presented in **Section 4.5**, Biological Resources.

Based on these results, the bank stabilization, bridges, and turf-reinforced mats would not cause significant scouring, and, therefore, would not alter the amount and pattern of riparian habitats along the River within the Project area. The current pattern of scouring due to high velocities would remain intact and the Project would not substantially alter the frequency and magnitude of scouring of riparian vegetation. Based on this information, no significant impacts relative to Significance Criterion 4 would occur due to changes in velocity.

**Impacts on Water Depth**. An increase in water depth in the River could result in significant impacts to riparian habitat if the additional water depth causes greater "shear forces" (*i.e.*, friction caused by the weight of water) on the river bottom, and thereby increasing scouring of the channel bed and removal of vegetation. This effect could reduce the extent of aquatic, wetland, and riparian habitats in the River.

**Table 4.2-28** provides the general hydrologic characteristics of the River channel for the two-, five-, 10-, 20-, 50-, and 100-year events, both with and without Alternative 5 project components. The results of the hydraulic analysis indicate that water depths and, correspondingly, total shear in the River would not increase significantly due to Alternative 5 improvements. The additional riparian vegetation area subject to inundation would be increased slightly during the two-year flood event by 0.8 acres, but would be reduced by approximately 0.1, 5.4, 87.2, 122.7, 156.6, and 213 acres as a result of Alternative 5 during the five-, 10-, 20-, 50-, 100-year, and capital flood events, respectively. (PACE, 2008A.) **Figures 4.2-13** and **4.2-14** show the area of inundation and velocity distribution for the 10- and 100-year flow events for both existing conditions and Alternative 5. As shown in these figures, the decrease in inundated area (by percentage and acreage) would primarily affect areas of currently disturbed, agricultural land. Accordingly, impacts to riparian habitat would be limited such that water flow depths, velocities, and total shear for all return events would not be significantly different in riparian habitat between existing and proposed conditions at the Project site. Since there will not be a significant change in flow depths or total shear in existing riparian habitat, the impacts to the amount and pattern of aquatic, wetland, and riparian habitats in the River are expected to be less-than-significant relative to Significance Criterion 4.

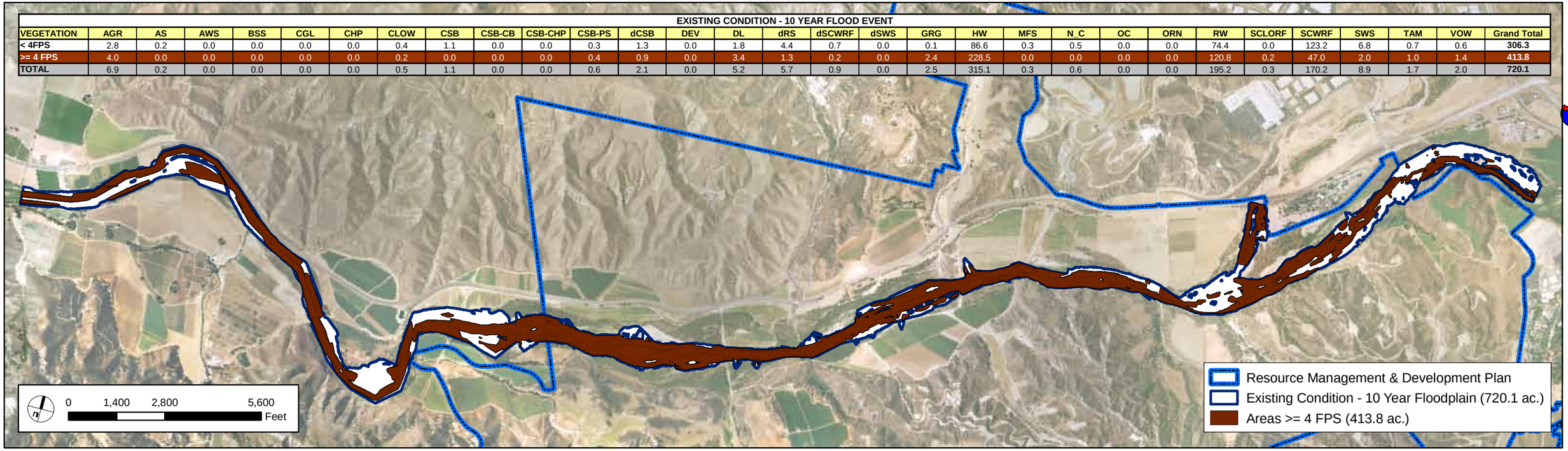
**Impacts of Modification.** The reinforced concrete and riprap bridge abutments, in addition to the soil cement proposed by Alternative 5, would encroach into the existing 100-year floodplain in some areas. Encroachment impacts can be analyzed on the basis of depth and velocity, as described below. Additionally, some banks located out of the floodplain need stabilization because of lateral migration of the riverbed, as well as the need for protection against the capital flood discharge. Long-term impacts would have the potential to occur because soil cement used to stabilize the River's banks places a permanent feature in the existing floodplain.

In other areas, the soil cement would be placed outside the existing River channel, creating additional River channel and riparian habitats. For example, soil cement proposed on the north side of the River near the confluence with Castaic River would be constructed on agricultural land, north of the existing channel. The land located between the existing river bank and the newly created stabilized bank would be excavated to widen the existing channel, which would increase the area available within the channel and increase the capacity of the River to convey the passage of flood flows. Overall, Alternative 5 proposes fewer feet of bank stabilization within the Santa Clara River and would, therefore result in fewer impacted/removed acres compared with Alternative 2. Specifically, Alternative 5 would result in 36.0 acres of modified channel, where Alternative 2 would result in 36.9 acres of modified channel within the Santa Clara River floodplain.

The potential impacts from Alternative 5 RMDP improvements to Santa Clara River riparian vegetation are anticipated to be small and localized along the River floodplain. In addition, the frequency and duration of river flow conditions is considered to be episodic. The River, the floodplain, and riparian resources have been subjected to episodic disturbances under natural conditions and only minor changes in overall planform geomorphology occur as described above. As such, impacts of the RMDP to riparian vegetation along the Santa Clara River relative to Significance Criterion 4 are considered less than significant.

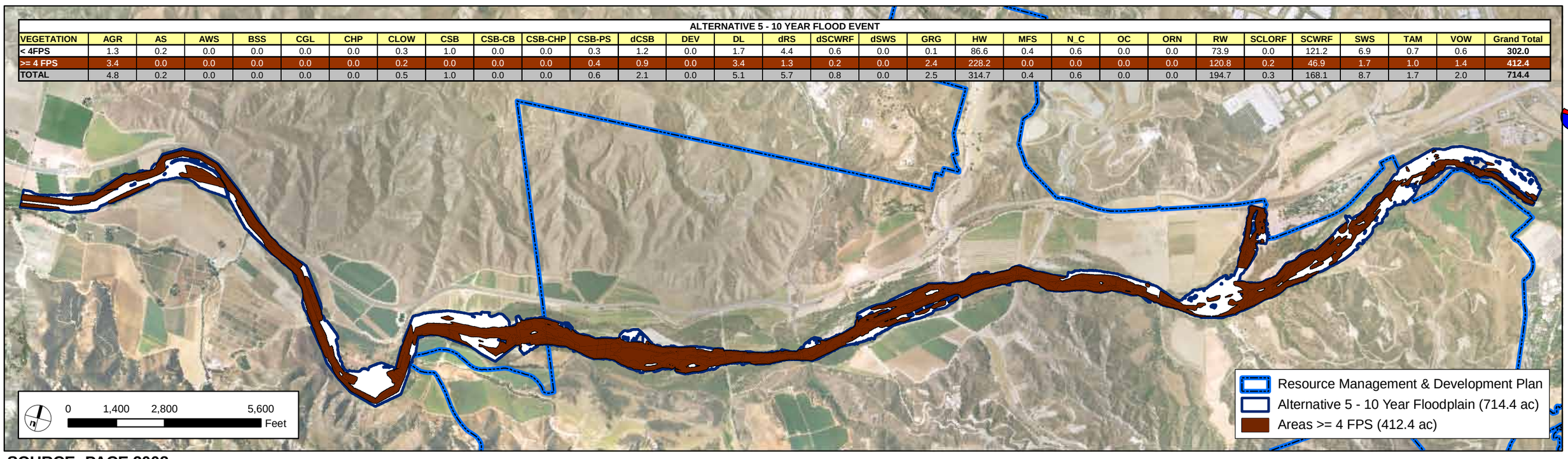
**EXISTING CONDITION - 10 YEAR FLOOD EVENT**

| VEGETATION | AGR | AS | AWS | BSS | CGL | CHP | CLOW | CSB | CSB-CB | CSB-CHP | CSB-PS | dCSB | DEV | DL | dRS | dSCWRF | dSWS | GRG | HW | MFS | N_C | OC | ORN | RW | SCLORF | SCWRF | SWS | TAM | VOW | Grand Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| < 4FPS | 2.8 | 0.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.4 | 1.1 | 0.0 | 0.0 | 0.3 | 1.3 | 0.0 | 1.8 | 4.4 | 0.7 | 0.0 | 0.1 | 86.6 | 0.3 | 0.5 | 0.0 | 0.0 | 74.4 | 0.0 | 123.2 | 6.8 | 0.7 | 0.6 | **306.3** |
| >= 4 FPS | 4.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.2 | 0.0 | 0.0 | 0.0 | 0.4 | 0.9 | 0.0 | 3.4 | 1.3 | 0.2 | 0.0 | 2.4 | 228.5 | 0.0 | 0.0 | 0.0 | 0.0 | 120.8 | 0.2 | 47.0 | 2.0 | 1.0 | 1.4 | **413.8** |
| TOTAL | 6.9 | 0.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.5 | 1.1 | 0.0 | 0.0 | 0.6 | 2.1 | 0.0 | 5.2 | 5.7 | 0.9 | 0.0 | 2.5 | 315.1 | 0.3 | 0.6 | 0.0 | 0.0 | 195.2 | 0.3 | 170.2 | 8.9 | 1.7 | 2.0 | **720.1** |




**ALTERNATIVE 5 - 10 YEAR FLOOD EVENT**

| VEGETATION | AGR | AS | AWS | BSS | CGL | CHP | CLOW | CSB | CSB-CB | CSB-CHP | CSB-PS | dCSB | DEV | DL | dRS | dSCWRF | dSWS | GRG | HW | MFS | N_C | OC | ORN | RW | SCLORF | SCWRF | SWS | TAM | VOW | Grand Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| < 4FPS | 1.3 | 0.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.3 | 1.0 | 0.0 | 0.0 | 0.3 | 1.2 | 0.0 | 1.7 | 4.4 | 0.6 | 0.0 | 0.1 | 86.6 | 0.4 | 0.6 | 0.0 | 0.0 | 73.9 | 0.0 | 121.2 | 6.9 | 0.7 | 0.6 | **302.0** |
| >= 4 FPS | 3.4 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.2 | 0.0 | 0.0 | 0.0 | 0.4 | 0.9 | 0.0 | 3.4 | 1.3 | 0.2 | 0.0 | 2.4 | 228.2 | 0.0 | 0.0 | 0.0 | 0.0 | 120.8 | 0.2 | 46.9 | 1.7 | 1.0 | 1.4 | **412.4** |
| TOTAL | 4.8 | 0.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.5 | 1.0 | 0.0 | 0.0 | 0.6 | 2.1 | 0.0 | 5.1 | 5.7 | 0.8 | 0.0 | 2.5 | 314.7 | 0.4 | 0.6 | 0.0 | 0.0 | 194.7 | 0.3 | 168.1 | 8.7 | 1.7 | 2.0 | **714.4** |




**SOURCE: PACE 2008**

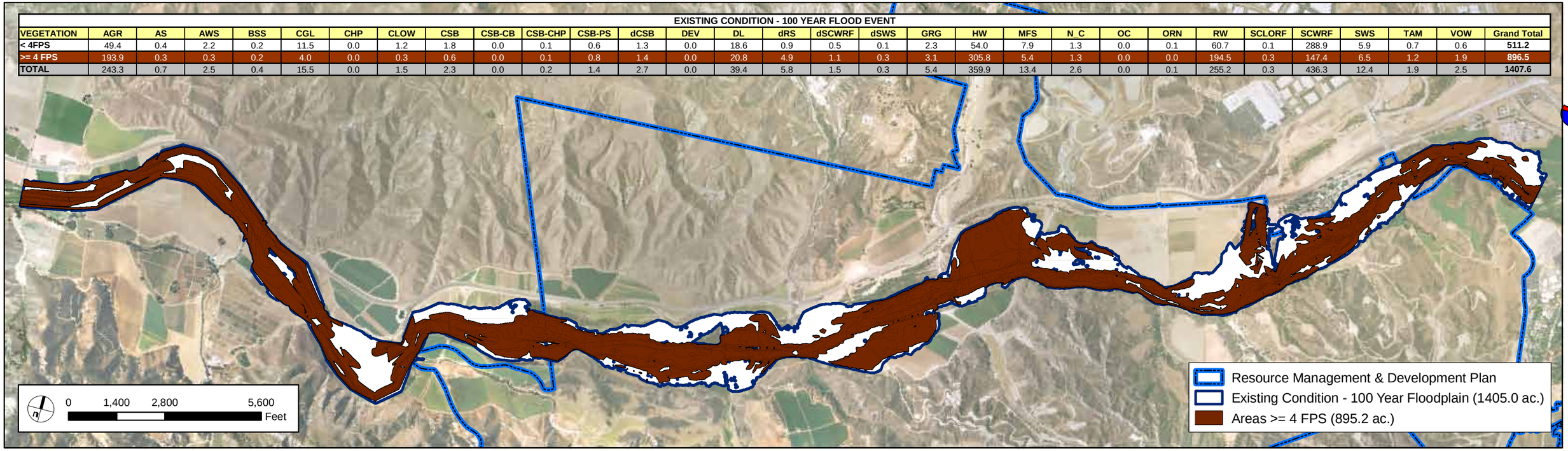
FIGURE 4.2-13

EXISTING CONDITION AND ALTERNATIVE 5
10-YEAR FLOOD INUNDATION AND VELOCITY DISTRIBUTION - SANTA CLARA RIVER

P:\8238E\GIS\mxds\EIR_2008\Section4_2\8238E_FIGURE-4-2-13_RiparianScourVelocityAnalysisAlt5_10Yr_082108.mxd

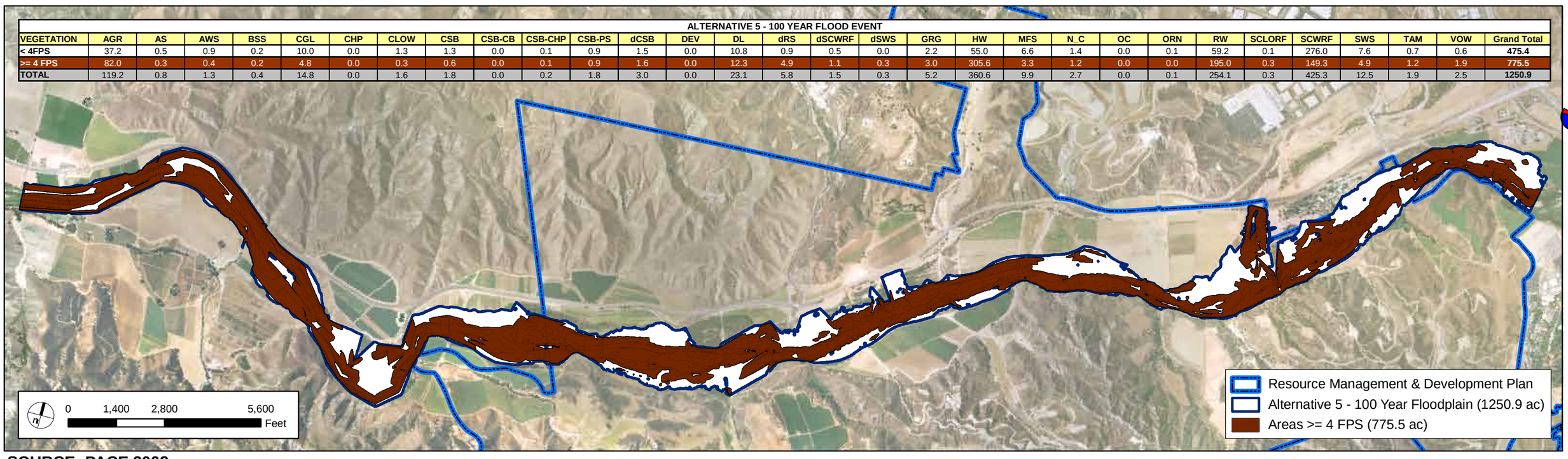
**EXISTING CONDITION - 100 YEAR FLOOD EVENT**

| VEGETATION | AGR | AS | AWS | BSS | CGL | CHP | CLOW | CSB | CSB-CB | CSB-CHP | CSB-PS | dCSB | DEV | DL | dRS | dSCWRF | dSWS | GRG | HW | MFS | N_C | OC | ORN | RW | SCLORF | SCWRF | SWS | TAM | VOW | Grand Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| < 4FPS | 49.4 | 0.4 | 2.2 | 0.2 | 11.5 | 0.0 | 1.2 | 1.8 | 0.0 | 0.1 | 0.6 | 1.3 | 0.0 | 18.6 | 0.9 | 0.5 | 0.1 | 2.3 | 54.0 | 7.9 | 1.3 | 0.0 | 0.1 | 60.7 | 0.1 | 288.9 | 5.9 | 0.7 | 0.6 | **511.2** |
| >= 4 FPS | 193.9 | 0.3 | 0.3 | 0.2 | 4.0 | 0.0 | 0.3 | 0.6 | 0.0 | 0.1 | 0.8 | 1.4 | 0.0 | 20.8 | 4.9 | 1.1 | 0.3 | 3.1 | 305.8 | 5.4 | 1.3 | 0.0 | 0.0 | 194.5 | 0.3 | 147.4 | 6.5 | 1.2 | 1.9 | **896.5** |
| TOTAL | 243.3 | 0.7 | 2.5 | 0.4 | 15.5 | 0.0 | 1.5 | 2.3 | 0.0 | 0.2 | 1.4 | 2.7 | 0.0 | 39.4 | 5.8 | 1.5 | 0.3 | 5.4 | 359.9 | 13.4 | 2.6 | 0.0 | 0.1 | 255.2 | 0.3 | 436.3 | 12.4 | 1.9 | 2.5 | **1407.6** |




**ALTERNATIVE 5 - 100 YEAR FLOOD EVENT**

| VEGETATION | AGR | AS | AWS | BSS | CGL | CHP | CLOW | CSB | CSB-CB | CSB-CHP | CSB-PS | dCSB | DEV | DL | dRS | dSCWRF | dSWS | GRG | HW | MFS | N_C | OC | ORN | RW | SCLORF | SCWRF | SWS | TAM | VOW | Grand Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| < 4FPS | 37.2 | 0.5 | 0.9 | 0.2 | 10.0 | 0.0 | 1.3 | 1.3 | 0.0 | 0.1 | 0.9 | 1.5 | 0.0 | 10.8 | 0.9 | 0.5 | 0.0 | 2.2 | 55.0 | 6.6 | 1.4 | 0.0 | 0.1 | 59.2 | 0.1 | 276.0 | 7.6 | 0.7 | 0.6 | **475.4** |
| >= 4 FPS | 82.0 | 0.3 | 0.4 | 0.2 | 4.8 | 0.0 | 0.3 | 0.6 | 0.0 | 0.1 | 0.9 | 1.6 | 0.0 | 12.3 | 4.9 | 1.1 | 0.3 | 3.0 | 305.6 | 3.3 | 1.2 | 0.0 | 0.0 | 195.0 | 0.3 | 149.3 | 4.9 | 1.2 | 1.9 | **775.5** |
| TOTAL | 119.2 | 0.8 | 1.3 | 0.4 | 14.8 | 0.0 | 1.6 | 1.8 | 0.0 | 0.2 | 1.8 | 3.0 | 0.0 | 23.1 | 5.8 | 1.5 | 0.3 | 5.2 | 360.6 | 9.9 | 2.7 | 0.0 | 0.1 | 254.1 | 0.3 | 425.3 | 12.5 | 1.9 | 2.5 | **1250.9** |




**SOURCE: PACE 2008**

FIGURE 4.2-14

EXISTING CONDITION AND ALTERNATIVE 5
100-YEAR FLOOD INUNDATION AND VELOCITY DISTRIBUTION - SANTA CLARA RIVER

P:\8238E\GIS\mxds\EIR_2008\Section4_2\8238E_FIGURE-4-2-14_RiparianScourVelocityAnalysisAlt5_100Yr_082108.mxd

**Tributaries -- Significance Criterion 1: Short-Term Impacts from Construction of Bridges, Bank Stabilization, Grade Stabilizer Structures, and Buried Storm Drain (Significant but Mitigable).** Installation of bank stabilization features, grade stabilizer structures, buried storm drains, and bridge piers and abutments would directly affect elements of tributary geomorphology which would be a significant impact. Alternative 5 would authorize 12,723 fewer linear feet of buried bank stabilization, and 838 more linear feet of drainage converted to buried storm drain, and 16 fewer grade stabilizer structures when compared with the proposed RMDP. Therefore, Alternative 5 would have an overall less direct effect on the geomorphology of the tributaries than Alternative 2, although these impacts would still be significant prior to mitigation.

Absent mitigation, there would be significant short-term sedimentation impacts during construction with respect to Significance Criterion 1. However, Mitigation Measures SP-4.2-2 (acquire state and federal permits), SP-4.2-3 (CDFG streambed agreements), SP-4.2-5 (DPW plan and map approvals), and SP-4.2-7 (DPW SUSMP and SWPPP requirements) would ensure that regulatory requirements are implemented and short-term impacts related to construction of RMDP components are less than significant through proper application of sediment controls and other BMPs required by existing local, state, and federal regulations.

**Tributaries -- Significance Criterion 2: Erosion and Downstream Deposition (Significant but Mitigable).** Implementation of Alternative 5 RMDP improvements and facilities, particularly site clearing and grading operations, would have the potential to increase sediment flows downstream during storm events. Long-term impacts associated with erosion and sediment deposition are evaluated as a function of in-geomorphic stability. The basis of design for the five major tributary drainages that would be modified (Chiquito, San Martinez Grande, Long, Lion, and Potrero) is such that the channels would be designed to be in geomorphic equilibrium in terms of stability and delivery of sediment and flows under future conditions. As described in greater detail for Alternative 2, the channel designs will meet the following criteria: geomorphic stability; flood conveyance; ecological function; hydromodification control; low level maintenance. The preliminary channel designs under Alternative 5 for each tributary are described in the following paragraphs.

**Chiquito Canyon.** The proposed design in Chiquito Canyon under Alternative 5 would significantly decrease the width of the floodplain in Chiquito Canyon, which would increase the velocity of flows, resulting in a significant effect prior to mitigation. In order to minimize impacts, the Project will be designed to mitigate Project effects to the geomorphic stability (*i.e.,* erosion and deposition) within Chiquito Canyon. Specifically, where the channel is not degraded and less extensive development will take place in the watershed, grade control structures will be used to maintain the existing slope. The reengineered channel will be designed to meet the specified basis of design criteria using the following approach:

1. Develop existing condition floodplain and creek hydraulic characteristics using a hydraulic model such as HEC-RAS.
2. Minimize impacts to existing condition floodplain. As a result of reducing the development impacts to the floodplain, the amount of environmental and hydraulic impacts (*e.g.,* resulting in substantial erosion or sediment deposition) from the proposed development will be minimized.

3. Creek bank flood protection (soil cement, rip rap or other suitable method) will be located to provide for bank erosion protection and to provide flood protection from the DPW Capital design flood event. In most cases, the bank protection will be buried with soil at a 3:1 slope over the hard bank protection. The soil backfill slope will vary from flatter to steeper and may be totally eliminated in some areas where necessary such as at structures, storm drain outlets or other pinch points.

4. Chiquito Canyon will not include a re-grading of the creek invert although the Ep of the proposed condition will be validated during the design phase. For Chiquito Canyon, the invert stabilization method will be as follows:

    a. Creek bed grade control structures at 200 to 400 foot spacing along the creek corridor will be included.

    b. These grade control structures will designed to be located at points along the creek where proposed project grading impacts will already be disturbing the creek bed and banks.

    c. The grade control structures will be constructed with soil cement, rip rap or other grade stabilization methods acceptable to DPW.

    d. The grade control structures will be at grade or below the existing grade and invert of the creek bed.

    e. The grade control structures will be designed to function as a drop structure in the event the creek bed slope flattens overtime.

5. Chiquito Canyon top and toe elevation will be established based upon DPW standards.

The overall design approach will allow the tributary to naturally fluctuate between the stabilized existing condition and estimated equilibrium slope while providing suitable erosion and flood protection for public safety. Based upon the proposed design and use of DPW standards for bank protection top and toe, Chiquito Canyon would meet the minimal required design objectives provided by DPW. As such, the geomorphic basis of design will inherently minimize erosion and deposition.

The channel confluence with the Santa Clara River would largely be controlled by the aggradation or degradation in the Santa Clara River, as well as episodic River hydraulic events in the form of backwater effects. While the banks would be hardened in the proposed Project condition, the influence of the Santa Clara River on long-term bed stability at the creek channel outlet is expected to exceed that of the Project channel modifications. The upstream channel inlet (near the beginning of the defined channel) is generally in a natural state and no currently planned improvements are to be made in the upstream portion of the channel; as a result, no effects on channel stability in this area are expected.

Prior to mitigation, erosion and sedimentation impacts within Chiquito Canyon would be significant. The Newhall Ranch Specific Plan EIR identified feasible measures to lessen the effects of the Specific Plan on floodplains within the Project area. Specifically, Mitigation Measures SP-4.2-1 through SP-4.2-7 (flood control improvement approval from DPW, state and federal permits, CDFG stream bed agreements,

FEMA CLOMR, DPW plan and map approvals, DPW-approved permanent erosion controls, DPW SUSMP and SWPPP requirements) are incorporated as part of the Project design to mitigate these impacts. In addition, Mitigation Measures GRR-1 through GRR-6 (DPW required runoff controls, minimization of bridge and structures, structural durability, hydromodification controls and channel design, sediment and debris control facilities, sediment redistribution) would further mitigate these impacts by controlling runoff and sediment delivered through the project reach, minimizing localized impacts from bridge crossings, using erosion resistant materials to ensure the long-term stability of RMDP structures, and ensuring that the Project design provides an equilibrium slope for each affected tributary in the post-development condition. Finally, in order to ensure that the channel functions as intended, Mitigation Measure GRR-7 describes the Geomorphology Monitoring and Management Plan that will be implemented to evaluate compliance with the basis of the design criteria, the triggers for implementing remedial actions (if necessary), the approach for implementing remedial actions, and a description of potential remedial measures. Incorporation and implementation of proper design, regulatory compliance, facility maintenance, and specified mitigation measures will reduce the impact of erosion and/or downstream deposition to a less-than-significant level in relation to Significance Criterion 2.

**San Martinez Grande.** The proposed design in San Martinez Grande Canyon under Alternative 5 would significantly decrease the width of the floodplain in the tributary, which would increase the velocity of flows, resulting in a significant effect prior to mitigation. In order to minimize impacts, the Project will be designed to mitigate Project effects to the geomorphic stability (*i.e.*, erosion and deposition) within San Martinez Grande Canyon. Specifically, where the channel is not degraded and less extensive development will take place in the watershed, grade control structures will be used to maintain the existing slope. The reengineered channel will be designed to meet the specified basis of design criteria using the following approach:

1. Develop existing condition floodplain and creek hydraulic characteristics using a hydraulic model such as HEC-RAS.
2. Minimize impacts to existing condition floodplain. As a result of reducing the development impacts to the floodplain, the amount of environmental and hydraulic impacts (*e.g.*, resulting in substantial erosion or sediment deposition) from the proposed development will be minimized.
3. Creek bank flood protection (soil cement, rip rap or other suitable method) will be located to provide for bank erosion protection and to provide flood protection from the DPW Capital design flood event. In most cases, the bank protection will be buried with soil at a 3:1 slope over the hard bank protection. The soil backfill slope will vary from flatter to steeper and may be totally eliminated in some areas where necessary such as at structures, storm drain outlets or other pinch points.
4. San Martinez Grande Canyon will not include a re-grading of the creek invert although the Ep of the proposed condition will be validated during the design phase. For San Martinez Grande Canyon, the invert stabilization method will be as follows:
    a. Creek bed grade control structures at 200 to 400 foot spacing along the creek corridor will be included.

b. These grade control structures will designed to be located at points along the creek where proposed project grading impacts will already be disturbing the creek bed and banks.

c. The grade control structures will be constructed with soil cement, rip rap or other grade stabilization methods acceptable to DPW.

d. The grade control structures will be at grade or below the existing grade and invert of the creek bed.

e. The grade control structures will be designed to function as a drop structure in the event the creek bed slope flattens overtime.

5. San Martinez Grande Canyon top and toe elevation will be established based upon DPW standards.

The overall design approach will allow the tributary to naturally fluctuate between the stabilized existing condition and estimated equilibrium slope while providing suitable erosion and flood protection for public safety. Based upon the proposed design and use of DPW standards for bank protection top and toe, San Martinez Grande Canyon would meet the minimal required design objectives provided by DPW. As such, the geomorphic basis of design will inherently minimize erosion and deposition.

The channel confluence with the Santa Clara River would largely be controlled by the aggradation or degradation in the Santa Clara River, as well as episodic River hydraulic events in the form of backwater effects. While the banks would be hardened in the proposed Project condition, the influence of the Santa Clara River on long-term bed stability at the creek channel outlet is expected to exceed that of the Project channel modifications. The upstream channel inlet (near the beginning of the defined channel) is generally in a natural state and no currently planned improvements are to be made in the upstream portion of the channel; as a result, no effects on channel stability in this area are expected.

Prior to mitigation, erosion and sedimentation impacts within San Martinez Grande Canyon would be significant. The Newhall Ranch Specific Plan EIR identified feasible measures to lessen the effects of the Specific Plan on floodplains within the Project area. Specifically, Mitigation Measures SP-4.2-1 through SP-4.2-7 (flood control improvement approval from DPW, state and federal permits, CDFG stream bed agreements, FEMA CLOMR, DPW plan and map approvals, DPW-approved permanent erosion controls, DPW SUSMP and SWPPP requirements) are incorporated as part of the Project design to mitigate these impacts. In addition, Mitigation Measures GRR-1 through GRR-6 (DPW required runoff controls, minimization of bridge and structures, structural durability, hydromodification controls and channel design, sediment and debris control facilities, sediment redistribution) would further mitigate these impacts by controlling runoff and sediment delivered through the project reach, minimizing localized impacts from bridge crossings, using erosion resistant materials to ensure the long-term stability of RMDP structures, and ensuring that the Project design provides an equilibrium slope for each affected tributary in the post-development condition. Finally, in order to ensure that the channel functions as intended, Mitigation Measure GRR-7 describes the Geomorphology Monitoring and Management Plan that will be implemented to evaluate compliance with the basis of the design criteria, the triggers for implementing remedial actions (if necessary), the approach for implementing remedial actions, and a

description of potential remedial measures. Incorporation and implementation of proper design, regulatory compliance, facility maintenance, and specified mitigation measures will reduce the impact of erosion and/or downstream deposition to a less-than-significant level in relation to Significance Criterion 2.

***Long Canyon.*** The proposed design in Long Canyon under Alternative 5 would significantly decrease the width of the floodplain in Long Canyon, which would increase the velocity of flows, resulting in a significant effect prior to mitigation. The proposed Project design would combine soil cement bank stabilization along with a soft-bottom channel. The basis of design for Long Canyon is such that any increase in flow velocities and shear stress would not exceed the performance specifications of the bank stabilization. However, the soft bottom of the channel is vulnerable to down-cutting and scour. To decrease the channel velocities, the Project design includes grade stabilizer structures. Proper placement of grade stabilizer structures would allow the channel to reach equilibrium, defined as the condition where the amount of sediment deposited is equivalent to the sediment transported from the channel.

The final design approach in accordance with the geomorphic basis of design is to preserve the existing channel as a back channel habitat area while creating an additional new channel sized to accommodate the changes in sediment and water delivery due to the build-out of the Newhall Ranch Specific Plan. The recommended approach for designing the reaches where valley grading is proposed involves breaking the valley into alternating long reaches that are at equilibrium grade and short reaches that are much steeper. This approach involves creating reaches of between 100 and 300 feet length where elevation drops of 10 to 30 feet occur (10 percent gradient). Concentrating the drop in these reaches using sequences of step-pools that convey the capital flood has the advantage of creating a more naturally functioning channel between the drops, and reducing the number and aerial extent of rock structures. The Long Canyon channel design incorporates the calculated post-development equilibrium slope to ensure a dynamically stable condition allowing for more or less equal amounts of erosion and deposition.

Prior to mitigation, erosion and sedimentation impacts within Long Canyon would be significant. The Newhall Ranch Specific Plan EIR identified feasible measures to lessen the effects of the Specific Plan on floodplains within the Project area. Specifically, Mitigation Measures SP-4.2-1 through SP-4.2-7 (flood control improvement approval from DPW, state and federal permits, CDFG stream bed agreements, FEMA CLOMR, DPW plan and map approvals, DPW-approved permanent erosion controls, DPW SUSMP and SWPPP requirements) are incorporated as part of the Project design to mitigate these impacts. In addition, Mitigation Measures GRR-1 through GRR-6 (DPW required runoff controls, minimization of bridge and structures, structural durability, hydromodification controls and channel design, sediment and debris control facilities, sediment redistribution) would further mitigate these impacts by controlling runoff and sediment delivered through the project reach, minimizing localized impacts from bridge crossings, using erosion resistant materials to ensure the long-term stability of RMDP structures, and ensuring that the Project design provides an equilibrium slope for each affected tributary in the post-development condition. Finally, in order to ensure that the channel functions as intended, Mitigation Measure GRR-7 describes the Geomorphology Monitoring and Management Plan that will be implemented to evaluate compliance with the basis of the design criteria, the triggers for implementing remedial actions (if necessary), the approach for implementing remedial actions, and a description of potential remedial measures. Incorporation and implementation of proper design,

regulatory compliance, facility maintenance, and specified mitigation measures will reduce the impact of erosion and/or downstream deposition to a less-than-significant level in relation to Significance Criterion 2.

***Potrero Canyon.*** The proposed design under Alternative 5 would significantly decrease the width of the floodplain in Potrero Canyon, which would increase the velocity of flows, resulting in a significant effect prior to mitigation. The design for the proposed Project would combine soil cement bank stabilization along with a soft-bottom channel. The bank stabilization consisting of soil cement would be emplaced according to the requirements established by the DPW. The basis of design for Potrero Canyon is such that any increase in flow velocities and shear stress would not exceed the performance specifications of the bank stabilization. However, the soft bottom of the channel is vulnerable to down-cutting and scour. To decrease the channel velocities, the design includes grade stabilizer structures. These structures are designed to function by reducing the energy slope along the degradational zone to the point that the stream is no longer capable of scouring the bed. Proper placement of grade stabilizer structures would allow the channel to reach its equilibrium, defined as the condition where the amount of sediment deposited is equivalent to the sediment eroded. The Potrero channel design incorporates the calculated post-development equilibrium slope to ensure a dynamically stable condition allowing for more or less equal amounts of erosion and deposition to sustain revegetated riparian and adjacent upland habitat areas.

The geomorphic basis of design is such that Potrero Canyon would be designed to convey sediment under future conditions with a "dynamically stable channel" (neither long-term erosion nor deposition) and to support the proposed native re-vegetation program.

Prior to mitigation, erosion and sedimentation impacts within Potrero Canyon would be significant. The Newhall Ranch Specific Plan EIR identified feasible measures to lessen the effects of the Specific Plan on floodplains within the Project area. Specifically, Mitigation Measures SP-4.2-1 through SP-4.2-7 (flood control improvement approval from DPW, state and federal permits, CDFG stream bed agreements, FEMA CLOMR, DPW plan and map approvals, DPW-approved permanent erosion controls, DPW SUSMP and SWPPP requirements) are incorporated as part of the Project design to mitigate these impacts. In addition, Mitigation Measures GRR-1 through GRR-6 (DPW required runoff controls, minimization of bridge and structures, structural durability, hydromodification controls and channel design, sediment and debris control facilities, sediment redistribution) would further mitigate these impacts by controlling runoff and sediment delivered through the project reach, minimizing localized impacts from bridge crossings, using erosion resistant materials to ensure the long-term stability of RMDP structures, and ensuring that the Project design provides an equilibrium slope for each affected tributary in the post-development condition. Finally, in order to ensure that the channel functions as intended, Mitigation Measure GRR-7 describes the Geomorphology Monitoring and Management Plan that will be implemented to evaluate compliance with the basis of the design criteria, the triggers for implementing remedial actions (if necessary), the approach for implementing remedial actions, and a description of potential remedial measures. Incorporation and implementation of proper design, regulatory compliance, facility maintenance, and specified mitigation measures will reduce the impact of erosion and/or downstream deposition to a less-than-significant level in relation to Significance Criterion 2.

***Lion Canyon.*** The proposed design under Alternative 5 includes the placement of three new road crossings in Lion Canyon. These crossings may constrict the floodplain, resulting in an increase in the velocity of flows which would be a significant effect prior to mitigation. The basis of design for this drainage is such that Lion Canyon would be designed to be in geomorphic equilibrium in terms of stability and delivery of sediment and water under future conditions. The channel floodplain will be designed to maximize geomorphic stability and ecological function, provide adequate flood conveyance, and avoid hydromodification to the extent possible. In addition, the design would minimize the need for maintenance activities.

Phillip Williams and Associates (PWA, 2007g) evaluated the channel design erosion potential. Post-development condition sediment supplies to the Lion Canyon drainage are predicted to range from 27 percent to 37 percent of the existing condition. The results of the analysis indicate that with the proposed RMDP components, the erosion potential within Lion Canyon would be in equilibrium and that the proposed channel would not aggrade or generate excess sediment from erosion or create a larger than natural downstream impact from sedimentation associated with hydromodification. Mitigation measure SP-4.2-3 (state and federal permits) would require that hydraulic modeling be performed for the final design to assess the effects within Lion Canyon, and that the design would be modified as necessary to reduce any erosion or deposition impacts. The Lion channel design incorporates the calculated post-development equilibrium slope to ensure a dynamically stable condition allowing for more or less equal amounts of erosion and deposition.

Prior to mitigation, erosion and sedimentation impacts within Lion Canyon would be significant. The Newhall Ranch Specific Plan EIR identified feasible measures to lessen the effects of the Specific Plan on floodplains within the Project area. Specifically, Mitigation Measures SP-4.2-1 through SP-4.2-7 (flood control improvement approval from DPW, state and federal permits, CDFG stream bed agreements, FEMA CLOMR, DPW plan and map approvals, DPW-approved permanent erosion controls, DPW SUSMP and SWPPP requirements) are incorporated as part of the Project design to mitigate these impacts. In addition, Mitigation Measures GRR-1 through GRR-6 (DPW required runoff controls, minimization of bridge and structures, structural durability, hydromodification controls and channel design, sediment and debris control facilities, sediment redistribution) would further mitigate these impacts by controlling runoff and sediment delivered through the project reach, minimizing localized impacts from bridge crossings, using erosion resistant materials to ensure the long-term stability of RMDP structures, and ensuring that the Project design provides an equilibrium slope for each affected tributary in the post-development condition. Finally, in order to ensure that the channel functions as intended, Mitigation Measure GRR-7 describes the Geomorphology Monitoring and Management Plan that will be implemented to evaluate compliance with the basis of the design criteria, the triggers for implementing remedial actions (if necessary), the approach for implementing remedial actions, and a description of potential remedial measures. Incorporation and implementation of proper design, regulatory compliance, facility maintenance, and specified mitigation measures will reduce the impact of erosion and/or downstream deposition to a less-than-significant level in relation to Significance Criterion 2.

**Minor Drainages.** Implementation of the proposed RMDP would involve the placement of one new culverted road crossing in Ayers Canyon, a minor drainage on the south side of the River; in addition, the

existing six-lane bridge allowing SR-126 to cross the Castaic Creek drainage would be expanded to eight lanes.

The other drainages to be converted entirely or partially to underground storm drains include drainages in Homestead Canyon, Off-Haul Canyon, Mid-Martinez Canyon, Humble Canyon, Lion Canyon, Exxon Canyon, Unnamed Canyon B, Unnamed Canyon C, Dead-End Canyon, Unnamed Canyon D, Middle Canyon, Magic Mountain Canyon, Unnamed Canyon 1 and Unnamed Canyon 2.

The conversion of open drainages to buried underground conduits would eliminate the erosion of existing drainage channels and the associated sediment loading from other uplands sources. The impact of underground storm drains would significantly decrease erosion and siltation. Accordingly, construction of the combined 38,873 feet of buried storm drain, 1,992 feet of bank stabilization (Salt Creek), and the new road crossing at Ayers Canyon could result in significant erosion or deposition impacts within the minor drainages.

Prior to mitigation, erosion and sedimentation impacts within the minor tributary drainages would be significant. The Newhall Ranch Specific Plan EIR identified feasible measures to lessen the effects of the Specific Plan on floodplains within the Project area. Specifically, Mitigation Measures SP-4.2-1 through SP-4.2-7 (flood control improvement approval from DPW, state and federal permits, CDFG stream bed agreements, FEMA CLOMR, DPW plan and map approvals, DPW-approved permanent erosion controls, DPW SUSMP and SWPPP requirements) are incorporated as part of the Project design to reduce these impacts. In addition, Mitigation Measures GRR-1 through GRR-6 (DPW required runoff controls, minimization of bridge and structures, structural durability, hydromodification controls and channel design, sediment and debris control facilities, sediment redistribution) would reduce this potential impact to less than significant within the minor tributaries by controlling runoff and sediment delivered through the project reach, minimizing localized impacts from bridge crossings, using erosion resistant materials to ensure the long-term stability of RMDP structures, and ensuring that the Project design provides an equilibrium slope for each affected tributary in the post-development condition.

Erosion and deposition impacts within the tributaries would be significant absent mitigation, but, with the implementation of the Project-specific mitigation measures, would be less-than-significant relative to Significance Criterion 2.

**Tributaries -- Significance Criterion 3: Impacts to Geomorphic Function (Less than Significant).** The tributary drainages incorporate hydromodification controls that lessen potential stormwater-related impacts (intensity and duration) to the River and tributary geomorphic function. The following includes an analysis of the potential impacts to the geomorphic function of the affected tributaries within the Project area.

Alternative 5 proposes that portions of 18 tributary drainages within the RMDP area be graded to accommodate pads for residential and commercial buildings, and that these flows be conveyed by buried storm drains varying in diameter from 30 to 144 inches. In total, approximately 60,683 feet of existing drainage channel would be converted to buried storm drains. The RMDP also proposes four partially-lined open channels on tributaries to the mainstem of the Santa Clara River within the RMDP boundaries. In some cases, streams would be relocated from their current locations and soft-bottom channels would be

recreated in different locations generally parallel to the current alignments. The total area affected by the conversion to buried storm drain, reengineering, and/or bank stabilization for each drainage within the RMDP area is included in **Table 4.2-29**.

Reengineered channel area, installation of bank stabilization, and conversion of the existing channels to buried storm drain would result in a total of 93.0 acres of existing channel impacted by the RMDP components, with 51.6 acres altered through reengineering and installation of bank stabilization.

**Table 4.2-29**
**Total Impacted Channel Area By Treatment Type**
**Alternative 5 -- Tributaries**

| Tributary | Storm Drain Area (acres) | Stabilized and Reengineered Channel Area (acres) | Road Crossings -- Bridges & Culverts (acres) |
|---|---|---|---|
| Ayers Canyon | 0.0 | 0.0 | 0.2 |
| Agricultural Ditch | 1.4 | 0.2 | 0.0 |
| Chiquito Canyon | 1.0 | 16.0 | 1.0 |
| Dead-End Canyon | 1.3 | 0.0 | 0.0 |
| Exxon Canyon | 0.3 | 0.0 | 0.0 |
| Homestead Canyon | 0.6 | 0.0 | 0.0 |
| Humble Canyon | 0.1 | 0.0 | 0.0 |
| Lion Canyon | 3.4 | 3.0 | 0.4 |
| Long Canyon | 0.7 | 3.7 | 0.3 |
| Magic Mountain Canyon | 6.4 | 0.0 | 0.0 |
| Middle Canyon | 5.6 | 0.0 | 0.0 |
| Mid-Martinez Canyon | 2.1 | 0.0 | 0.0 |
| Off-Haul Canyon | 5.4 | 0.0 | 0.0 |
| Potrero Canyon | 8.4 | 20.5 | 0.7 |
| Salt Creek Canyon | 0.0 | 6.9 | 0.0 |
| San Martinez Grande Canyon | 0.0 | 1.2 | 0.1 |
| Unnamed Canyon 1 | 0.3 | 0.0 | 0.0 |
| Unnamed Canyon 2 | 0.5 | 0.0 | 0.0 |
| Unnamed Canyon A | 0.0 | 0.0 | 0.0 |
| Unnamed Canyon B | 0.5 | 0.0 | 0.0 |
| Unnamed Canyon C | 0.2 | 0.0 | 0.0 |
| Unnamed Canyon D | 0.6 | 0.0 | 0.0 |
| **TOTAL ALT. 5** | **38.7** | **51.6** | **2.6** |
| **TOTAL ALT. 2** | **38.0** | **62.7** | **2.1** |

Source: RMDP, 2008

The effects of these changes on the geomorphic function of the tributaries within the Project area can be determined with an evaluation of the hydrologic function metrics of the HARC (see **Section 4.6**,

Jurisdictional Waters and Streams). **Table 4.2-30** compares the total hydrology AW-score units and the total HARC AW-score units calculated for the tributaries.

**Table 4.2-30**
**Summary of HARC AW- Total Score and Hydrology**
**Existing vs. Alternative 5 - Tributaries**

| Condition | HARC AW-Total Score | HARC AW-Hydrology |
|---|---|---|
| **Chiquito Canyon** | | |
| Existing | 12.59 | 15.95 |
| Alternative 5 | 21.33 | 22.30 |
| CHANGE | 8.74 | 6.35 |
| **San Martinez Grande Canyon** | | |
| Existing | 2.84 | 3.22 |
| Alternative 5 | 14.23 | 13.82 |
| CHANGE | 11.39 | 10.60 |
| **Long Canyon** | | |
| Existing | 3.22 | 3.55 |
| Alternative 5 | 6.60 | 6.61 |
| CHANGE | 3.38 | 3.06 |
| **Potrero Canyon** | | |
| Existing | 34.50 | 39.08 |
| Alternative 5 | 75.02 | 78.34 |
| CHANGE | 40.52 | 39.26 |
| **Lion Canyon** | | |
| Existing | 5.41 | 5.96 |
| Alternative 5 | 2.44 | 2.63 |
| CHANGE | -2.97 | -3.33 |
| **Minor Drainages**[1] | | |
| Existing | 21.27 | 21.70 |
| Alternative 5 | 7.12 | 6.85 |
| CHANGE | -14.15 | -14.85 |
| **Salt Creek Canyon** | | |
| Existing | 71.85 | 67.83 |
| Alternative 5 | 95.82 | 90.45 |
| CHANGE | 23.97 | 22.62 |
| **TOTAL CHANGE ALT. 5** | **+70.56** | **+64.04** |
| **TOTAL CHANGE ALT. 2** | **-7.17** | **-17.28** |

Notes:

[1] "Minor Drainages" are located in the following canyons: Bridge Construction -- Castaic Creek; Buried Storm Drains - Homestead (2), Off-Haul (2), Mid Martinez (1), Humble (1), Exxon (2), Unnamed Canyon B (1), Unnamed Canyon C (1), Dead End (2), Unnamed Canyon D (1), Middle (1) and Magic Mountain (1).

Source: URS 2008

In total, Alternative 5 would result in a net gain of 64.04 hydrology AW-score units and a net gain of 70.56 total HARC AW-score units within the tributaries. The overall increase in HARC AW-score units within the tributaries suggests that Alternative 5 components do not have an overall impact on the

geomorphic function of the tributaries. Specifically, net gains in the total HARC AW-score units would be produced in Chiquito, San Martinez Grande, Long, Potrero, and Salt Creek Canyon, indicating that the gain in riparian/wetland function of these tributaries would compensate for any such losses in the other tributaries. Therefore, impacts would be less than significant relative to Significance Criterion 3.

**Tributaries -- Significance Criterion 4: Construction and Scour Impacts to Riparian Vegetation (Significant but Mitigable).** Impacts to riparian vegetation within the tributaries located within the RMDP boundary are primarily associated with the physical alterations to the stream channels. As described in **Section 2.0**, Project Description, in some cases where a channel is currently incised and eroding its riparian corridor, it is more feasible to provide the desired degree of ecological function by relocating the channel and creating a stable channel with new vegetative plantings; where the channel is in good condition and has a healthy riparian corridor it is more desirable to preserve the creek in-situ and retrofit with small step-pool structures to protect against future headcuts. Under Alternative 5, approximately 60,683 lf of channel would be converted to buried storm drain. In addition, 62,706 lf of bank stabilization, 173 grade stabilizer structures, seven bridges and eight culverted road crossings would be constructed as part of Alternative 5. Accordingly, nearly all tributary riparian reaches within the RMDP area would sustain impacts to riparian vegetation resources from grading or installation of RMDP components within the reach. The seven reaches in the Salt Creek drainage are exceptions in this regard; the entire portion of the Salt Creek watershed within the applicant's ownership would be dedicated as permanent open space and no fill of the drainage is proposed, except for habitat restoration or enhancement activities.

Reengineered channel area, installation of bank stabilization, and conversion of the existing channels to buried storm drain would result in a total of 93.0 acres of existing channel impacted by the RMDP components, with 51.6 acres altered through reengineering and installation of bank stabilization. These changes could have a significant effect on riparian vegetation of the tributary drainages. The effects of these changes on the geomorphic function of the tributaries within the Project area can be determined with an evaluation of the hydrologic function metrics of the HARC (see **Section 4.6**, Jurisdictional Waters and Streams).

**Table 4.2-30**, presented above, compares the total hydrology AW-score units and the total HARC AW-score units calculated for the tributaries. In total, Alternative 5 would result in a net gain of 64.04 hydrology AW-score units and net gain of 70.56 total HARC AW-score units within the tributaries. As such, implementation of the Alternative 5 RMDP components would involve a cumulative net gain of riparian area. In reaches where buried bank stabilization is proposed, the temporary impact zone would be revegetated with native riparian plants. In regards to scour of riparian vegetation, Alternative 5 could result in a substantial increase in the frequency and magnitude of scouring of riparian vegetation which, absent mitigation, would be a significant impact.

To mitigate these impacts Mitigation Measures SW-2 and SW-3 presented in **Section 4.6**, Jurisdictional Waters and Streams would provide riparian enhancement through removal of exotic species, restoration of sediment equilibrium, and recontouring of existing, incised banks to increase the extent of Corps and CDFG jurisdictional areas as well as providing avoidance and restoration measures in the Potrero and Salt Creek watershed. In reaches where RMDP components would be constructed, the temporary impact zone

would be revegetated with native riparian plants. Specifically, Mitigation Measure SW-5 (**Section 4.6**, Jurisdictional Waters and Streams) would be implemented to ensure that all areas where temporary construction impacts affect Corps or CDFG jurisdictional areas are revegetated (generally, these are areas where impacts would occur due to the construction of Project facilities). In addition, riparian habitat restoration activities that would be implemented in conjunction with the RMDP would include revegetation of native plant communities on candidate sites contiguous to existing riparian habitats. Site restoration would also include the maintenance of revegetation sites, including the control of non-native plants and irrigation system maintenance. As described in Mitigation Measures BIO-1, BIO-6, and BIO-7, monitoring of the restoration sites would be conducted to evaluate the success of revegetation efforts. Contingency plans and appropriate remedial measures to be implemented should habitat restoration objectives not be achieved would also be included in tentative map-level habitat restoration plans. **Section 4.5**, Biological Resources, provides more detail on the restoration methods proposed to be used. Incorporation and implementation of the specified mitigation measures will reduce the impacts relative to riparian scour to a less-than-significant level in relation to Significance Criterion 4. Accordingly, the impacts of the RMDP to the riparian habitat of the tributaries are considered significant prior to mitigation, but mitigable to a less-than-significant level relative to Significance Criterion 4 through implementation of Mitigation Measures SW-2, SW-3, SW-5, BIO-1, BIO-6, and BIO-7.

**SCP Direct Impacts**

**Significance Criterion 1: Short-Term Impacts from Construction (No Impact).** The SCP is a conservation and permitting plan for an upland plant species (spineflower), and would not authorize any construction activities within the Santa Clara River and tributary corridors. Therefore, no direct impacts would result from implementation of the SCP relative to Significance Criterion 1.

**Significance Criterion 2: Erosion and Downstream Deposition (No Impact).** The same analysis for Significance Criterion 1, above, applies to this criterion.

**Significance Criterion 3: Impacts to Geomorphic Function (No Impact).** The same analysis for Significance Criterion 1, above, applies to this criterion.

**Significance Criterion 4: Construction and Scour Impacts to Riparian Vegetation (No Impact).** The same analysis for Significance Criterion 1, above, applies to this criterion.

#### 4.2.5.6.2 Indirect Impacts

**RMDP Indirect Impacts**

**Significance Criterion 1: Short-Term Indirect Impacts from Construction of Newhall Ranch Specific Plan Development (Significant but Mitigable).** Under Alternative 5, indirect impacts associated with construction of the Specific Plan development would be virtually the same as those for Alternative 2 (proposed Project). The indirect impacts from construction associated with the Specific Plan are included as part of the discussion for indirect RMDP impacts for Alternative 2.

Absent mitigation, there would be significant short-term sedimentation impacts during construction with respect to Significance Criterion 1. However, Mitigation Measures SP-4.2-2 (acquire state and federal permits), SP-4.2-3 (CDFG streambed agreements), SP-4.2-5 (DPW plan and map approvals), and SP-4.2-7 (DPW SUSMP and SWPPP requirements) would ensure that regulatory requirements are implemented and short-term impacts related to construction of RMDP components are less than significant through proper application of sediment controls and other BMPs required by existing local, state, and federal regulations.

**Significance Criterion 2: Indirect Impacts from Erosion and Downstream Deposition (Significant but Mitigable).** Under Alternative 5, indirect impacts associated with erosion and downstream deposition would be similar to those for Alternative 2 (proposed Project). The developed area of the Specific Plan would be covered with non-erosive surfaces, including pavement and permanent vegetation, which would reduce the sedimentation of site runoff. Alternative 5 proposes to develop 338.7 acres less developed area in the Newhall Ranch Specific Plan area than that proposed by Alternative 2 (proposed Project). Accordingly, less surface runoff would occur under Alternative 5. Permanent erosion control measures that reduce sediment in runoff include check dams to reduce flow velocities in tributary water courses, drainage swales, slope drains, subsurface drains, storm drain inlet/outlet protection, and sediment traps.

The drainage areas in which the Specific Plan site lies would not be completely developed; therefore, storm flows from the upper reaches would contain sediment and vegetative debris. The amount of sediment and debris contained in the storm flows would be dependent upon the size of the area being drained and whether or not the area had been subject to burning. If this debris enters and clogs on-site drainages, upstream flooding could occur, which would be a significant impact. Because Alternative 5 would result in less surface runoff compared to Alternative 2, this impact would be less than that associated with Alternative 2, but still significant.

In order to prevent sediment and debris from the upper reaches of the drainage areas from entering storm drainage improvements, permanent erosion control measures will be implemented, including the installation of desilting and debris basins, drainage swales, slope drains, storm drain inlet/outlet protection, and sediment traps. (Mitigation Measure SP-4.2-6, DPW-approved permanent erosion controls.) The specific improvements for each drainage area would be designed as part of the final Drainage Plan prepared to DPW standards during the subdivision process. (Mitigation Measure SP-4.2-5, DPW plan and map approvals.) In addition, Mitigation Measure SP-4.2-7, DPW SUSMP and SWPPP requirements would further reduce erosion impacts by requiring that stormwater discharges from open channels or drainage systems discharging to the Santa Clara River in excess of four fps (erosive flows) be controlled to prevent accelerated erosion and protect River habitat. Discharge flows would be regulated using water control features and energy dissipation structures where required to reduce discharge velocities to non-erosive rates. Specifically, implementation of Mitigation Measures GRR-1 and GRR-4, (DPW required runoff controls and hydromodification controls and channel design respectively) will further control the rate of stormwater runoff to minimize downstream erosion through construction of BMPs, and channels will be designed to incorporate the calculated post-development equilibrium slope to ensure a dynamically stable condition allowing for more or less equal amounts of erosion and deposition.

With installation of these temporary and permanent erosion/sedimentation control measures, the Specific Plan would not result in significant sedimentation or debris-related impacts either on or downstream of the Specific Plan site. Instead, the Specific Plan would have a beneficial post-construction impact on downstream sedimentation because, as the site builds out, some steep slopes would be graded to flatter slopes, and many of the areas of the site that have been subject to the vegetation-denuding effects of grazing and burning would become covered with vegetation and other non-erodible surfaces.

Similar to Alternative 2, the changes to the site would reduce site under Alternative 5 sedimentation to below existing levels and would reduce debris volume generation throughout the tributary watershed, although to a lesser degree than under Alternative 2. This would, in turn, have beneficial downstream deposition impacts because burned and bulked flows from the site would be substantially reduced, resulting in lower flood flow rates. With the implementation of the Project-incorporated Mitigation Measures SP-4.2-5, SP-4.2-6, and SP-4.2-7 (DPW plan and map approvals, DPW-approved erosion controls, and DPW SUSMP and SWPPP requirements respectively) erosion and deposition impacts resulting from build-out of the Newhall Ranch Specific Plan development are considered less than significant prior to mitigation. The implementation of Project-Specific mitigation measures GRR-1 and GRR-4 (DPW required runoff controls and hydromodification controls and channel design respectively) would further reduce these impacts. Accordingly, erosion and downstream deposition impacts would be maintained to less than significant relative to Significance Criterion 2.

**Significance Criterion 3: Indirect Impacts to Geomorphic Function (Significant but Mitigable).** Potential indirect hydromodification impacts to the Santa Clara River include stream corridor disturbances from Specific Plan build-out and associated increased runoff intensity from the urbanized tributary drainages. Losses of riparian vegetation during construction are addressed in **Section 4.5**, Biological Resources. Alternative 5 proposes to develop 338.7 acres less developed area in the Newhall Ranch Specific Plan area than that proposed by Alternative 2 (proposed Project). Accordingly, less surface runoff would occur under Alternative 5. The indirect impacts to geomorphic function associated with the Specific Plan are included as part of the discussion for indirect RMDP impacts for Alternative 2. Since Alternative 5 would result in less surface runoff than Alternative 2, the impacts to the geomorphic function of the Santa Clara River would also be less under this alternative, but would still be significant. Each of the tributary drainages is designed with hydromodification control components in accordance with DPW design standards to ensure that soft-bottom waterways maintain an equilibrium between sediment supply to the waterway and sediment transport through the waterway.

Implementation of Mitigation Measures SP-4.2-5 (DPW plan and map approvals) would ensure that no significant erosion or sedimentation impacts would occur as a result of the Project. The additional implementation of Mitigation Measures GRR-1 through GRR-6 (DPW required runoff controls, minimization of bridge and structures, structural durability, hydromodification controls and channel design, sediment and debris control facilities, sediment redistribution) would ensure that no substantial reductions in geomorphic function would occur in the RMDP area tributaries. Accordingly, the impacts are considered less than significant relative to Significance Criterion 3.

**Significance Criterion 4: Indirect Construction and Scour Impacts to Riparian Vegetation (Less than Significant).** Implementation of the Alternative 5 RMDP component would indirectly facilitate the

build-out of the Specific Plan sites. The confluence of the tributaries to the Santa Clara River are all maintained within the SMA/SEA 23 boundaries and are preserved in a largely natural state. As indicated above, no significant increases in velocity, erosion, or sedimentation would occur in the Santa Clara River because of the proposed build-out.

The implementation of the Specific Plan would result in the loss of riparian vegetation along the RMDP area drainages. Losses of riparian vegetation during construction are addressed in **Section 4.5**, Biological Resources. The impacts to riparian vegetation can be evaluated with the use of the HARC analysis. As discussed in the preceding sections, the number of AW-score units ultimately describes the value of a particular reach, and the number of AW-score units impacted versus preserved will show the impacts of the proposed Project and alternatives on wetland and riparian resources (*i.e.*, post-Project HARC scores serve as a surrogate indicator of potential increases in the frequency and magnitude of scour of riparian vegetation [refer to **Subsection 4.2.5.1.4**, Scour Impacts to Riparian Vegetation]). Conceptually, the alternative with the fewest lost AW-score units would be the least damaging alternative. However, an alternative with a greater loss of HARC AW-score units may be mitigated by producing AW-score units in another location within the Project area through wetland/riparian restoration or creation (see **Section 4.6**, Jurisdictional Waters and Streams, for further discussion on the HARC assessment methods). **Table 4.2-30**, presented above, compares the total hydrology AW-score units and the total HARC AW-score units calculated for the tributaries.

The HARC analysis indicates that, overall, Alternative 5 would result in substantial changes to the hydrologic function of the tributaries with net losses observed for the hydrology process metrics. In total, Alternative 5 would result in a net gain of 64.04 hydrology AW-score units and a net gain of and 70.56 total HARC AW-score units within the tributaries. The overall increase in HARC AW-score units within the tributaries suggests that Alternative 5 components do not have an overall impact on the geomorphic function of the tributaries. Specifically, net gains in the total HARC AW-score units would be produced in Chiquito, San Martinez Grande, Potrero, Long, Potrero, and Salt Creek Canyon, indicating that the gain in riparian/wetland function of these tributaries would compensate for any such losses in the other tributaries. Therefore, impacts would be less than significant relative to Significance Criterion 4.

**Significance Criterion 5: Impacts to Riparian Resources Supported by the Middle Canyon Spring (Significant but Mitigable).** Although Alternative 5 would result in less development in Middle Canyon compared to Alternative 2, the potential impacts of Alternative 5 on the groundwater hydrology associated with the Middle Canyon Spring are similar to those discussed in the impact analysis for Alternative 2. Accordingly, Alternative 5 has the potential to result in a significant impact to riparian resources supported by the Middle Canyon Spring. However, implementation of Mitigation Measures BIO-74 and BIO-77 would reduce these impacts to less than significant relative to Significance Criterion 5. Mitigation Measure BIO-74 requires the installation of fencing and signage around the spring prior to construction, during construction, and following construction to restrict access and protect the spring area. Mitigation Measure BIO-77 includes the development of the Middle Canyon Spring HMP in consultation with CDFG and implementation of HMP following approval by CDFG.

**SCP Indirect Impacts**

**Significance Criterion 1: Short-Term Impacts from Construction Newhall Ranch Specific Plan, VCC, and Entrada Developments (Significant but Mitigable).** Implementation of the Alternative 5 SCP component would indirectly facilitate the build-out of the Newhall Ranch Specific Plan and Entrada sites. The VCC site would not be developed under this alternative. With the exception of the VCC development, construction impacts associated with the build-out facilitated by Alternative 5 would be virtually the same as those associated with the build-out facilitated by Alternative 2. Short-term construction impacts to geomorphology associated with construction of the Specific Plan development are included among the indirect impacts of the RMDP Project component, and are discussed in the preceding subsections on Alternative 2. The indirect impacts associated with the build-out of the Entrada developments are included among the indirect impacts of the SCP Project component, and are discussed in the preceding subsections on Alternative 2.

No previously adopted mitigation measures exist for the VCC or Entrada planning areas. Therefore, the geomorphology-related mitigation measures required by this EIS/EIR in those planning areas include the measures previously adopted by the County for the Specific Plan site in addition to new measures proposed by the Corps and CDFG. Accordingly, with the implementation of Mitigation Measures SP-4.2-5, SP 4.2-6, and SP 4.2-7 (DPW plan and map approvals, DPW-approved permanent erosion controls, and DPW SUSMP and SWPPP requirements), short-term impacts from the build-out of the Newhall Ranch Specific Plan site are considered significant but mitigable to less than significant relative to Significance Criterion 1 through proper design and BMP implementation.

**Significance Criterion 2: Indirect Impacts from Erosion and Downstream Deposition (Significant but Mitigable).** Implementation of the Alternative 5 SCP component would indirectly facilitate the build-out of the Specific Plan and Entrada sites. The VCC site would not be developed under this alternative. Indirect impacts of erosion and downstream deposition associated with build-out of the Specific Plan development are included among the indirect impacts of the RMDP Project component, and are discussed in the preceding subsections on Alternative 2. The indirect impacts associated with the build-out of the Entrada development are included among the indirect impacts of the SCP Project component, and are discussed in the preceding subsections on Alternative 2.

Alternative 5 proposes to develop 52.5 acres less developed area in the Entrada planning area than that proposed by Alternative 2 (proposed Project). The 177.9 acres of commercial/industrial development in the VCC project would not be constructed under this alternative. Accordingly, less surface runoff would occur under Alternative 5. Because Alternative 5 would result in less surface runoff compared to Alternative 2, this impact would be less than that associated with Alternative 2, but still significant.

With the implementation of Mitigation Measures SP-4.2-5, SP 4.2-6, and SP 4.2-7 (DPW plan and map approvals, DPW-approved permanent erosion controls, and DPW SUSMP and SWPPP requirements respectively) the erosion and downstream deposition impacts of the Newhall Ranch Specific Plan, VCC, and Entrada developments would be reduced to a less-than-significant level absent additional mitigation relative to Significance Criterion 2.

**Significance Criterion 3: Indirect Impacts to Geomorphic Function (Significant but Mitigable).** Implementation of the Alternative 5 SCP component would indirectly facilitate the build-out of the Specific Plan and Entrada sites. The VCC site would not be developed under this alternative. Indirect hydromodification impacts associated with build-out of the Specific Plan development are included among the indirect impacts of the RMDP Project component, and are discussed in the preceding subsections on Alternative 2. The indirect impacts associated with the build-out of the VCC and Entrada developments are included among the indirect impacts of the SCP Project component, and are discussed in the preceding subsections on Alternative 2. Alternative 5 proposes to develop 52.2 acres less developed area in the Entrada planning area than that proposed by Alternative 2 (proposed Project). The 177.9 acres of commercial/industrial development in the VCC project would not be developed under this alternative. Accordingly, less surface runoff would occur under Alternative 5. Because Alternative 5 would result in less surface runoff compared to Alternative 2, this impact would be less than that associated with Alternative 2, but still significant.

Mitigation Measures GRR-1, GRR-2, and GRR-4 (DPW required runoff controls, minimization of bridge and structures, and hydromodification controls and channel design) would be implemented to reduce impacts to the geomorphic function of the tributaries resulting from the build-out of the proposed developments. These Mitigation Measures will ensure that erosion and deposition impacts are mitigated to less than significant. Accordingly, impacts resulting from the build-out of the Specific Plan, VCC, and Entrada planning areas are considered to be significant but mitigable to a less-than-significant level relative to Significance Criterion 3.

**Significance Criterion 4: Indirect Construction and Scour Impacts to Riparian Vegetation (Less than Significant).** Implementation of the Alternative 5 SCP component would indirectly facilitate the build-out of the Specific Plan and Entrada sites. The VCC site would not be developed under this alternative. Indirect impacts to riparian vegetation associated with build-out of the Specific Plan development are included among the indirect impacts of the RMDP Project component, and are discussed in the preceding subsections on Alternative 2. The indirect impacts associated with the build-out of the Entrada development are included among the indirect impacts of the SCP Project component, and are discussed in the preceding subsections on Alternative 2. Alternative 5 proposes to develop 52.2 acres less developed area in the Entrada planning area than that proposed by Alternative 2 (proposed Project). The 177.9 acres of commercial/industrial development in the VCC project would not be constructed under this alternative. Accordingly, less disturbance to riparian vegetation would occur under Alternative 5. Because Alternative 5 would result in less disturbance to riparian vegetation compared to Alternative 2, this impact would be less than that associated with Alternative 2, and therefore, less than significant relative to Significance Criterion 4.

#### 4.2.5.6.3 Secondary Impacts

**RMDP and SCP Secondary Impacts**

**Significance Criterion 6: Impacts to the "Dry Gap" (Less than Significant).** The potential impacts associated with the Newhall Ranch WRP for Alternative 5 would be similar to those described in the impact analysis for Alternative 2. As discussed in that analysis, the potential impacts of the Newhall Ranch WRP to the Dry Gap are considered less-than-significant relative to Significance Criterion 6 since

they will not substantially lengthen the duration of seasonal flow in the Dry Gap. This significance finding is based on the fact discharge from the WRP will occur in the winter and will be small relative to the overall flow in the Santa Clara River and the existing data which show that increases in base flow due to discharges from the Valencia WRP and the Saugus WRP since the 1960s have not led to a substantial change in the duration of seasonal flow in the Dry Gap.

**Significance Criterion 7: Impacts to Ventura County Beaches (Less than Significant).** The effects of Alternative 5 components on beach replenishment are a function of the sediment load delivered through the Project reach. As discussed in **Subsection 4.2.3.1.3**, Beach Replenishment, above, the Santa Clara River contributes approximately 60 percent of beach sand within Ventura County. However, the reduction of area subject to erosion due to project components and the build-out of the Specific Plan and Entrada Plan areas under Alternative 5 could result in a relative reduction of floodwater sediment, which could negatively impact beaches, as incrementally less sediment would be available for their replenishment.

The RMDP component of Alternative 5 that would have the most effect on sediment supply in the tributaries is the conversion of tributary drainage to buried storm drains. For this analysis, it is assumed that the area converted to buried storm drain results in a net loss of sediment supplied by the affected area. As detailed in **Subsection 4.2.3.1.3**, Beach Replenishment, roughly 1,170 tons per square mile per year of suspended sediment originates from the area upstream of the Los Angeles County/Ventura County line. Approximately 38.7 acres (0.06 square miles) within the tributaries that could potentially contribute supply would be converted to buried storm drain; this could result in a net reduction of the 70 tons of sediment per year.

In order to estimate the direct impacts to sediment supply associated with the RMDP components within the Santa Clara River floodplain, it is assumed that the floodplain areas subject to velocities greater than four fps contribute to the sediment supply within the Project reach during the capital flood event. Accordingly, Alternative 5 would result in a maximum reduction of 179.6 acres (0.28 square miles) of floodplain area subject to velocities greater than four fps during the capital flood event (see **Table 4.2-27**). Therefore, Alternative 5 would result in a maximum net reduction of about 179.6 acres (0.28 square miles) of channel area that could potentially contribute to sediment supply. Given this estimate, the reduction of 179.6 acres (0.28 square miles) would result in a maximum direct reduction of approximately 330 tons of sediment per year. In total, Alternative 5 could result in the reduction of 400 tons per year delivered through the Project reach.

The build-out of the Specific Plan would have greater effects to the sediment supplied to the River system. The build-out of the Specific Plan under Alternative 5 would convert approximately 4,720.9 acres (7.4 square miles) to non-erodible surfaces, including pavement and permanent vegetation that would reduce the sedimentation of site runoff. Accordingly, this would result in the reduction of roughly 8,628 tons of sediment per year.

The drainage areas in which the Entrada site lies would not be completely developed; therefore, storm flows from the upper reaches would contain sediment and vegetative debris. The VCC planning area would not be developed under this alternative. The Entrada planning area consists of approximately 316.1 acres. Development of the Entrada site would result in approximately 174.6 acres (0.3 square miles) of

non-erosive surfaces, including pavement and permanent vegetation that would reduce the sedimentation of site runoff which would result in a direct reduction of roughly 316 tons of sediment per year.

As detailed in **Subsection 4.2.3.1.3**, Beach Replenishment, the Santa Clara River exports an estimated 4.08 million tons per year from its mouth into the Santa Barbara Channel. In total, the RMDP and SCP would result in the net reduction of 8,944 tons of sediment per year, or approximately 0.2 percent reaching the Santa Barbara Channel, which would be a less-than-significant impact. In order to minimize this reduction in sediment delivery to Ventura County beaches, Mitigation Measure GRR-6 specifies that sediment from upland sources, such as debris basins and other sediment retention activities, would be redistributed in permitted upland and/or riparian locations along the Santa Clara River to reintroduce sediment for beach replenishment purposes. This sediment management activity would lessen the adverse effect of debris and sediment reduction on downstream beach erosion.

Based on this analysis, the reduction of sediment delivered to Ventura County beaches due to the RMDP components and build-out of the Specific Plan, VCC and Entrada planning areas would be less than significant relative to Significance Criterion 7 since the decrease in average annual sediment transported to the beaches would be less than 1 percent.

#### 4.2.5.7 Impacts of Alternative 6 (Elimination of Planned Commerce Center Drive Bridge and Maximum Spineflower Expansion/Connectivity)

Under Alternative 6, infrastructure would be constructed in and adjacent to the Santa Clara River and tributary drainages within the Project area.

**Santa Clara River. Figure 3.0-31** (**Section 3.0**, Description of Alternatives) depicts the locations of the Alternative 6 proposed RMDP Santa Clara River features relative to river jurisdictional areas. As shown, Alternative 6 would involve construction of two bridges across the Santa Clara River; one at the mouth of Potrero Canyon (Potrero Canyon Road Bridge) and one at the mouth of Long Canyon (Long Canyon Road Bridge). The previously approved bridge at Commerce Center Drive would not be constructed under this alternative. The alternative also would involve construction of buried bank stabilization along approximately one-half of the north bank and one-third of the south bank of the Santa Clara River within the RMDP area as shown on **Figure 3.0-31** (**Section 3.0**, Description of Alternatives). Most of the bank stabilization along the Santa Clara River would occur in upland areas. The WRP outfall to the Santa Clara River also would be constructed. In addition, as proposed, geofabric utility corridor bank protection is proposed on the north side of the Santa Clara River between San Martinez Grande Canyon and Chiquito Canyon. **Table 4.2-31a** summarizes the characteristics of the major RMDP infrastructure along the Santa Clara River, including north side (18,927 lf) and south side (7,149 lf), for a total of 26,076 lf of buried bank stabilization to be constructed along the Santa Clara River. Like Alternatives 3, 4, and 5 this table shows 22 storm drain outlets along the north bank and three such outlets on the south bank of the Santa Clara River (25 storm drain outlets). A summary of the RMDP infrastructure authorized under the RMDP component of Alternative 6 is presented in **Table 4.2-31a**. The proposed RMDP components within the Santa Clara River are described and illustrated in **Section 3.0**, Description of Alternatives, Alternative 6 -- RMDP Santa Clara River Features.

**Table 4.2-31a**
**Alternative 6 Santa Clara River Major RMDP Infrastructure**

| Santa Clara River Location | Bank Stabilization (lf) | Outlets (No.) | Bridges | | | |
|---|---|---|---|---|---|---|
| | | | Length (lf) | Length (lf) | Length (lf) | Length (lf) |
| **Bridges** | | | | | | |
| Commerce Center Drive Bridge | - | - | - | - | - | - |
| Long Canyon Road Bridge | - | - | 980 | 100 | 9 | 31-40 |
| Potrero Canyon Road Bridge | - | - | 2,365 | 84 | 22 | 20-24 |
| **Banks** | | | - | - | - | - |
| North River Bank | 18,927 | 22 | - | - | - | - |
| South River Bank | 7,149 | 3 | - | - | - | - |
| **Total** | **26,076** | **25** | **-** | **-** | **-** | **-** |

Source: RMDP, 2008.

Alternative 6 would involve the designation of 645.5 acres of Newhall Ranch as spineflower preserve, in addition to the 64.3 acres of previously designated conservation easements. When combined with the Entrada and VCC preserves, the total spineflower preserves under Alternative 6 total 891 acres. Implementation of Alternative 6 would involve the reduction of approximately 555.6 acres of developable area in the Newhall Ranch Specific Plan area due to preservation of streams and riparian areas, designation of spineflower preserves, close proximity to unstabilized drainages, and reduction of access to isolated parcels. This alternative also would result in a decrease of 78.6 acres of developable area for the Entrada planning area. The 177.6 acre commercial / industrial development in the VCC project would not be constructed under this alternative.

**Tributary Drainages. Figure 3.0-32** (**Section 3.0**, Description of Alternatives) illustrates the modified, converted, and preserved tributary drainages within the Project area under Alternative 6. Under Alternative 6, there are five major tributary drainages that would be partially regraded or modified but remain in a soft-bottom channel condition: Chiquito Canyon, San Martinez Grande Canyon, Potrero Canyon, Long Canyon, and Lion Canyon. Significant portions of several small, tributary drainages would be graded and replaced with storm drains or other appropriate conveyance facilities, including: Magic Mountain Canyon, Middle Canyon, Dead-End Canyon, Exxon Canyon, Mid-Martinez Canyon, Off-Haul Canyon, Homestead Canyon, the Chiquito Canyon agricultural ditch, Unnamed Canyon B, Unnamed Canyon C, Unnamed Canyon 1, and Unnamed Canyon 2.

Alternative 6 would involve the designation of 645.5 acres of Newhall Ranch as spineflower preserve, in addition to the 64.3 acres of previously designated conservation easements. When combined with the Entrada and VCC preserves, the total spineflower preserves under Alternative 6 total 891 acres. Implementation of Alternative 6 would involve the reduction of approximately 555.6 acres of developable area in the Newhall Ranch Specific Plan area due to preservation of streams and riparian areas, designation of spineflower preserves, close proximity to unstabilized drainages, and reduction of access to

isolated parcels. This alternative also would result in a decrease of 78.6 acres of developable area for the Entrada planning area. The 177.6 acre commercial / industrial development in the VCC project would not be constructed under this alternative.

**Tributary Drainages. Figure 3.0-32** (**Section 3.0**, Description of Alternatives) illustrates the modified, converted, and preserved tributary drainages within the Project area under Alternative 6. Under Alternative 6, there are five major tributary drainages that would be partially regraded or modified but remain in a soft-bottom channel condition: Chiquito Canyon, San Martinez Grande Canyon, Potrero Canyon, Long Canyon, and Lion Canyon. Significant portions of several small, tributary drainages would be graded and replaced with storm drains or other appropriate conveyance facilities, including: Magic Mountain Canyon, Middle Canyon, Dead-End Canyon, Exxon Canyon, Mid-Martinez Canyon, Off-Haul Canyon, Homestead Canyon, the Chiquito Canyon agricultural ditch, Unnamed Canyon B, Unnamed Canyon C, Unnamed Canyon 1, and Unnamed Canyon 2.

**Chiquito Canyon.** Proposed drainage treatments in Chiquito Canyon for Alternative 6 are as described previously for Alternative 3 in **Subsection 3.4.3.1.1** and as shown on **Figure 3.0-14** (**Section 3.0**, Description of Alternatives), above. **Table 4.2-31b** describes the Alternative 6 tributary drainage RMDP infrastructure characteristics, including the Chiquito Canyon modified drainage. The proposed RMDP components are described and illustrated in **Section 3.0**, Description of Alternatives, Proposed Chiquito Canyon Tributary Treatments -- Alternatives 3 & 6.

**San Martinez Grande Canyon.** In San Martinez Grande Canyon, bank stabilization would be installed on both the west and east bank in the areas shown on **Figure 3.0-33** (**Section 3.0**, Description of Alternatives). Approximately 1,206 lf of buried bank stabilization along the west bank and 3,248 lf of buried bank stabilization along the east bank would be installed under this alternative. Two proposed bridge crossings would cross the drainage as shown on **Figure 3.0-33** (**Section 3.0**, Description of Alternatives). In addition, the SR-126 bridge crossing San Martinez Grande Canyon would be widened as part of the Caltrans SR-126 widening project (**Figure 3.0-33**, **Section 3.0**, Description of Alternatives). **Table 4.2-31b** describes the Alternative 6 tributary drainage RMDP infrastructure characteristics, including the San Martinez Grande Canyon modified drainage. The proposed RMDP components are described and illustrated in **Section 3.0**, Description of Alternatives, Proposed San Martinez Grande Tributary Treatments -- Alternative 6.

**Long Canyon.** Under Alternative 6, the upper half of the Long Canyon drainage within the Project area would remain unstabilized (preserved) as shown on **Figure 3.34** (**Section 3.0**, Description of Alternatives). The lower portion of the existing drainage would be graded and the drainage relocated to the north and lined with buried bank stabilization. Two new road culvert crossings would cross the drainage within one-half mile of the canyon mouth, and another would be installed approximately one-quarter mile downstream of the Project area boundary near Magic Mountain Parkway; **Figure 3.0-34** (**Section 3.0**, Description of Alternatives). Approximately 4,023 lf of buried bank stabilization along the west bank and 3,898 lf of buried bank stabilization along the east bank would be installed under this

**Table 4.2-31b**
**Alternative 6 Tributary Drainage RMDP Infrastructure**

| Drainage Location | Drainage Modified (lf) | Drainage Converted to Buried Storm Drain (lf) | Bank Stabilization[1] (lf) | | Preserved Drainage (lf) | Road Crossings | |
|---|---|---|---|---|---|---|---|
| | | | West Bank | East Bank | | Bridges | Culverts |
| **Modified Drainages** | | | | | | | |
| Chiquito Canyon | 8,698 | 2,463 | 7,267 | 6,252 | 898 | 0 | 3 |
| Lion Canyon | 5,614 | 6,316 | 0 | 0 | 0 | 0 | 1 |
| Long Canyon | 4,579 | 961 | 4,023 | 3,898 | 5,039 | 0 | 3 |
| Potrero Canyon | 24,323 | 1,012 | 24,772 | 22,744 | 14,358 | 7 | 0 |
| San Martinez Grande Canyon | 563 | 0 | 1,206 | 3,248 | 4,606 | 2 | 0 |
| Subtotal | 43,777 | 10,752 | 37,268 | 36,142 | 24,901 | 9 | 7 |
| **Unimproved/Converted Drainages** | | | | | | | |
| Agricultural Ditch | 317 | 1,479 | 0 | 0 | 0 | 0 | 0 |
| Ayers Canyon | 147 | 0 | 0 | 0 | 2,318 | 0 | 1 |
| Dead-End Canyon | 0 | 939 | 0 | 0 | 991 | 0 | 0 |
| Exxon Canyon | 0 | 1,276 | 0 | 0 | 2,265 | 0 | 0 |
| Homestead Canyon | 0 | 609 | 0 | 0 | 0 | 0 | 0 |
| Humble Canyon | 0 | 388 | 0 | 0 | 5,150 | 0 | 0 |
| Middle Canyon | 0 | 3,209 | 0 | 0 | 4,377 | 0 | 0 |
| Mid-Martinez Canyon | 25 | 4,541 | 0 | 0 | 247 | 0 | 0 |
| Off-Haul Canyon | 0 | 7,593 | 0 | 0 | 1,185 | 0 | 0 |
| Salt Canyon | 7,290 | 0 | 0 | 1,992 | 101,470 | 0 | 0 |
| Magic Mountain Canyon | 0 | 6,111 | 0 | 0 | 0 | 0 | 0 |
| Unnamed Canyon 1 | 0 | 4,647 | 0 | 0 | 0 | 0 | 0 |
| Unnamed Canyon 2 | 6 | 384 | 0 | 0 | 26 | 0 | 0 |
| Unnamed Canyon A | 0 | 0 | 0 | 0 | 1,293 | 0 | 0 |
| Unnamed Canyon B | 0 | 1,004 | 0 | 0 | 568 | 0 | 0 |
| Unnamed Canyon C | 0 | 402 | 0 | 0 | 869 | 0 | 0 |
| Unnamed Canyon D | 0 | 0 | 0 | 0 | 1,492 | 0 | 0 |
| Subtotal | 7,784 | 32,583 | 0 | 1,992 | 122,252 | 0 | 1 |
| **Totals** | **51,561** | **43,334** | **37,268** | **38,134** | **147,153** | **9** | **8** |

Notes:
[1] The lf of bank stabilization does not necessarily reflect impacts to jurisdictional areas; it only provides the linear feet of bank protection to be installed along various tributary drainages.

Source: RMDP, 2008.

alternative. In addition, approximately 961 lf of drainage would be converted to buried storm drain. **Table 4.2-31b** describes the Alternative 6 tributary drainage RMDP infrastructure characteristics, including the Long Canyon modified drainage. The proposed RMDP components are described and illustrated in **Section 3.0**, Description of Alternatives, Proposed Long Canyon Tributary Treatments -- Alternative 6.

**Potrero Canyon.** Under Alternative 6, buried bank stabilization would be installed in upland areas along the full length of both banks of Potrero Canyon between the mouth and the eastern Project boundary as shown on **Figure 3.0-35** (**Section 3.0**, Description of Alternatives). However, the cismontane alkali marsh area at the mouth of Potrero Canyon would remain unstabilized (preserved) on the west side. Four new bridges would be constructed at approximately even intervals between the upstream end of the mesic meadow and the upstream end of the saltgrass meadow. An additional three bridges would be installed in the upstream portion of the drainage, as shown on **Figure 3.0-35** (**Section 3.0**, Description of Alternatives). Approximately 24,772 lf of buried bank stabilization along the west bank and 22,744 lf of buried bank stabilization along the east bank would be installed under this alternative. In addition, approximately 1,012 lf of drainage would be converted to buried storm drain. **Table 4.2-31b** describes the Alternative 6 tributary drainage RMDP infrastructure characteristics, including the Potrero Canyon modified drainage. The proposed RMDP components are described and illustrated in **Section 3.0**, Description of Alternatives, Proposed Potrero Tributary Treatments -- Alternative 6.

**Lion Canyon.** Proposed drainage treatments in Lion Canyon for Alternative 6 include approximately 6,316 lf of drainage would be converted to buried storm drain in the western, central, and eastern portions of Lion Canyon, as shown on **Figure 3.0-9** (**Section 3.0**, Description of Alternatives). One culverted road crossing would be constructed to allow Specific Plan roadways to cross the Lion Canyon drainage at the locations shown on **Figure 3.0-9** (**Section 3.0**, Description of Alternatives). **Table 4.2-31b**, above, describes the Alternative 6 tributary drainage RMDP infrastructure characteristics, including the Lion Canyon modified drainage. The proposed RMDP components are described and illustrated in **Section 3.0**, Description of Alternatives, Lion Canyon Detail Alternative 6 Proposed RMDP Tributary Treatments.

**Minor Tributaries and Drainages.** One culverted road crossing would be constructed across the mouth of the Ayers Canyon drainage. No other drainage facilities would be constructed in Ayers Canyon. Approximately 32,583 lf of existing channel would be converted to buried storm drain. In addition, the existing six-lane bridge allowing SR-126 to cross the Castaic Creek drainage would be expanded to eight lanes. **Table 4.2-31b** describes the Alternative 6 tributary drainage RMDP infrastructure characteristics, including the converted and preserved minor tributary drainages.

#### 4.2.5.7.1 Direct Impacts

**RMDP Direct Impacts**

**Santa Clara River -- Significance Criterion 1: Short-Term Impacts from Construction of Bridges, Bank Stabilization, and Turf Reinforcement Mats (Significant but Mitigable).** Installation of bank stabilization features and bridge piers and abutments would directly impact elements of Santa Clara River geomorphology. Bridge piers and abutments would have localized effects on channel alignment. This would be a significant impact prior to mitigation. Under Alternative 6, the Potrero Canyon Road Bridge is

pulled back on the north bank further than Alternative 5 and the south bank abutment has been removed. The soil cement bank protection has the same alignment as in Alternative 2 except the south bank abutments at Commerce Center Drive and Potrero have been removed, and the north bank abutment at Potrero has been pulled back to avoid permanent impacts. In addition, the Commerce Center Drive Bridge is not proposed and the associated bridge pier and abutment features are not required and fewer linear feet of bank stabilization would be constructed. Therefore, Alternative 6 would have less of a direct effect on the Santa Clara River geomorphology than Alternative 2, although still significant. Specifically, Alternative 6 would result in approximately 10 percent less floodplain area temporarily disturbed during the construction of RMDP components within the Santa Clara River and terraced areas along the edge of the riverbed. Direct construction impacts associated with build-out of the proposed RMDP development are included among the direct impacts of the RMDP Project component, and are discussed in the preceding subsections on Alternative 2.

Implementation of Mitigation Measure SP-4.2-2 (acquire state and federal permits), SP-4.2-3 (CDFG streambed agreements), SP-4.2-5 (DPW plan and map approvals), and SP-4.2-7 (DPW SUSMP and SWPPP requirements) would reduce the short-term impacts to the Santa Clara River geomorphology. Specifically, construction of the RMDP components would be subject to CWA section 402(p), which regulates construction, municipal, and industrial stormwater discharges under the NPDES program. The Project proposes to implement a regional stormwater mitigation plan (**Appendix 4.4**, Geosyntec, 2008) to comply with NPDES permit requirements. Pursuant to NPDES regulations for permitting of stormwater discharges, SWRCB has issued a statewide general Permit and Waste Discharge Requirements for stormwater discharges from construction sites. Under this Construction General Permit, discharges of stormwater from construction sites with a disturbed area of one or more acres are required to either obtain individual NPDES permits for stormwater discharges or be covered by the Construction General Permit. Coverage under the Construction General Permit is accomplished by completing and filing a Notice of Intent with SWRCB and implementing a SWPPP. This plan requires the implementation of BMPs to reduce or eliminate pollutants in stormwater discharges. Therefore, short-term sedimentation impacts with respect to Significance Criterion 1 during construction would be reduced to a less than significant through the implementation of existing regulatory requirements and obtaining required permits from the State and County.

Absent mitigation, there would be significant short-term sedimentation impacts during construction with respect to Significance Criterion 1. However, Mitigation Measures SP-4.2-2 (acquire state and federal permits), SP-4.2-3 (CDFG streambed agreements), SP-4.2-5 (DPW plan and map approvals), and SP-4.2-7 (DPW SUSMP and SWPPP requirements) would ensure that regulatory requirements are implemented and short-term impacts related to construction of RMDP components are less than significant through proper application of sediment controls and other BMPs required by existing local, state, and federal regulations.

**Santa Clara River -- Significance Criterion 2: Erosion and Downstream Deposition (Significant but Mitigable).** Implementation of the RMDP improvements and facilities, particularly site clearing and grading operations, would have the potential to increase sediment flows downstream during storm events, which may result in substantial erosion and deposition and could result in significant impacts downstream.

As discussed in **Subsection 4.2.5.1**, Impact Assessment Methods, a representative velocity of 4.0 fps was determined to be the appropriate indicator for potential erosion. Direct impacts associated with erosion could result if the RMDP improvements resulted in an increase of the two- to 100-year and capital flood floodplain area subject to velocities greater than four fps. **Table 4.2-32** includes the change in the total area of floodplain, delineated by vegetation type, where velocities exceed four fps for each return interval of Alternative 6 from existing conditions.

The total floodplain area subject to potentially erosive velocities would be decreased as a result of Alternative 6 for all return intervals. In some areas, velocities greater than four fps correspond with outlet structures, access ramps, or bridge abutments, which could result in a significant erosion impact. See Refer to **Appendix 4.1**, Newhall Ranch Resource Management & Development Plan: River & Tributaries Drainage Analysis, Santa Clara River (PACE, 2008A) identifies locations of potential erosion within Santa Clara River riparian areas.

Where necessary to minimize erosion and structural damage to such structures, erosion resistant materials such as concrete, soil cement, or secured rip-rap would be used according to the standards, criteria, and specifications developed by the DPW to ensure long-term stability (Mitigation Measure GRR-3). The specific improvements for each drainage area would be designed as part of the final drainage plans prepared to DPW standards during the subdivision process. (Mitigation Measures SP-4.2-5 and SP-4.2-6.). No impacts to velocity would be realized upstream or downstream of the Project reach.

Downstream deposition characteristics and potential erosion of the soils covering the buried soil cement would be approximately the same under both Alternatives 2 and 6 since the location of the buried bank stabilization is approximately the same for both alternatives. Accordingly, erosion and downstream deposition impacts resulting from Alternative 6 are expected to be significant but mitigable. Specifically, to minimize erosion and structural damage to such structures, erosion resistant materials such as concrete, soil cement or secured rip-rap would be used according to the standards, criteria, and specifications developed by the DPW to ensure long-term stability (Mitigation Measure GRR-3). The specific improvements for each drainage area would also be designed as part of the final drainage plans prepared to DPW standards during the subdivision process. (Mitigation Measures SP-4.2-5, DPW plan and map approvals and SP-4.2-6, DPW-approved permanent erosion controls.). Incorporation and implementation of proper design, regulatory compliance, facility maintenance, and specified mitigation measures will reduce the impact of erosion and/or downstream deposition to a less-than-significant level in relation to Significance Criterion 2.

**Table 4.2-32**
**Change in Floodplain Area (By Vegetation Type) Where Velocity > 4 fps**
**Alternative 6 -- Santa Clara River**

| Vegetation Type | Change in Flood Plain Area (Acres) | | | | | | |
|---|---|---|---|---|---|---|---|
| | 2-Year | 5-Year | 10-Year | 20-Year | 50-Year | 100-Year | CAP |
| Agriculture | 0.0 | -0.1 | -0.6 | -9.5 | -68.9 | -111 | -155.7 |
| Alluvial Scrub | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Arroweed Scrub | 0.0 | 0.0 | 0.0 | 0.1 | 0.2 | 0.1 | -0.4 |
| Big Sagebrush Scrub | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| California Annual Grassland | 0.0 | 0.0 | 0.0 | 0.0 | -0.3 | 0.9 | -0.1 |
| Undifferentiated Chaparral | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| California Sagebrush | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| California Sagebrush-California Buckwheat | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| California Sagebrush-Undifferentiated Chaparral | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| California Sagebrush-Purple Sage | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 0.1 |
| Cottonwood Willow Riparian Forest | -0.4 | -0.1 | -0.2 | -1.1 | 2.1 | 3.0 | 4.3 |
| Burned California Sagebrush | 0.0 | 0.0 | 0.0 | 0.0 | -0.1 | 0.2 | 0.0 |
| Disturbed Cottonwood Willow Riparian Forest | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 0.0 | 0.0 |
| Developed | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Disturbed Land | -0.1 | 0.1 | 0.1 | -0.2 | -3.3 | -8.4 | -16.0 |
| Disturbed Riparian Scrub | 0.0 | 0.0 | 0.0 | 0.0 | -0.2 | 0.0 | 0.0 |
| Disturbed Southern Willow Scrub | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Giant Reed | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | -0.1 | 0.0 |
| Herbaceous Wetlands | -0.9 | 0.3 | -0.3 | -1.0 | -1.0 | 0.1 | 0.3 |
| Live Oak Woodland | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Mulefat Scrub | 0.0 | 0.0 | 0.0 | -0.5 | -0.4 | -2.2 | -4.6 |
| Open Channel | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Southern Coast Live Oak Riparian Forest | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Ornamental | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| River Wash | 0.1 | -0.4 | -0.2 | -0.5 | 0.6 | 0.9 | 0.9 |
| Southern Willow Scrub | 0.0 | 0.0 | -0.3 | -0.1 | -1.2 | -1.9 | 0.2 |
| Tamarisk Scrub | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Valley Oak Woodland | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **TOTAL CHANGE** | **-1.3** | **-0.2** | **-1.5** | **-12.8** | **-72.3** | **-118.3** | **-171.0** |

Source: PACE, 2008A.

**Santa Clara River -- Significance Criterion 3: Impacts to Geomorphic Function (Less than Significant).** The RMDP improvements and facilities associated with Alternative 6 would have limited and localized hydromodification impacts to the Santa Clara River. Under moderate storm runoff events, localized increases in flow quantity and velocity would be present at drainage outlet facilities along the banks of the Santa Clara River. In selected locations along the northern and southern banks of the Santa Clara River, the existing floodplain would be protected by buried soil cement and be inaccessible to infrequent flood flows (50- and 100-year events). Similar to Alternative 2, Santa Clara River flows of lower than the 50-year event would utilize the existing floodplain under the Alternative 6 condition. Bridge piers and abutments would have localized effects on channel alignment. Under Alternative 6, the Commerce Center Drive Bridge is not proposed and the associated bridge pier and abutment features are not required. In addition the south bank abutment for the Potrero Bridge has been removed and the north bank abutment has been pulled back from the River to reduce channel impacts. Therefore, Alternative 6 would have a lesser direct effect on Santa Clara River geomorphic function than Alternative 2.

**Table 4.2-33** provides general hydraulic characteristics of the River channel for the two-, five-, 10-, 20-, 50-, and 100-year events, comparing the existing conditions to those resulting from Alternative 6. Included in these characteristics are: maximum river flow depth measured in feet, average flow velocity measured in fps, friction slope (a measure of flow erodibility), flow area measured in sf, channel top width measured in feet, and total shear (a measure of friction caused by the weight of water on the River bottom, and an indicator of scour/erosion potential) measured in pounds per square foot. As shown, with Alternative 6 most of these characteristics increase in magnitude with an increase in storm intensity (return interval). Relative to existing conditions, Alternative 6 results in an increase in the maximum flow depth of less than one foot during the 50- and 100-year storm events. Alternative 6 would result in minor increases in average velocity during the 20-year return interval; there would be essentially no change or a decrease in velocities for the two-, five-, 10-, 50-, and 100-year events. Average friction slopes remain relatively unchanged as a result of Alternative 6, with minor increases during the 50- and 100-year return intervals. Alternative 6 would result in minor increases in the top width during the two- and five-year events, with a decrease in average top width observed during the 10-, 20-, 50-, and 100-year events, due primarily to channel constrictions at bridge crossings. Lastly, Alternative 6 would have a nominal effect on the total shear during the two-, five-, and 10-year events with minor increases observed during the less frequent 20-, 50-, and 100-year events.

The estimated change in hydraulic characteristics under the Alternative 6 RMDP would be relatively minor. For the high frequency floods (two-, five-, and 10-year), the proposed floodplain modifications would not increase erosion potential, hinder flows or substantially reduce the floodplain area. Instead, these flows would spread across the River channel, unaffected by the bank protection because the River would have sufficient width to allow these flows to meander and spread out as under pre-Project conditions. Compared with Alternative 2, during the 100-year event, the RMDP components proposed by Alternative 6 would result in minor reductions in the maximum flow depth, flow area, top width, and total shear, with a slight increase in average velocity. During more infrequent 20- to 100-year discharges, river flows would be not be substantially impacted by proposed improvements since the area of the floodplain would not be reduced during these infrequent flood events. Accordingly, the potential effects to geomorphic function in the Santa Clara River are not considered to be significant.

**Table 4.2-33**
**Summary of Average Channel Hydraulic Parameters**
**Existing vs. Alternative 6 -- Santa Clara River**

| Condition | Return Interval (years) | Max. Flow Depth (ft) | Average Velocity (fps) | Friction Slope -- | Flow Area (sq. ft.) | Top Width (ft) | Total Shear (psf) |
|---|---|---|---|---|---|---|---|
| Existing | 2 | 3.34 | 4.46 | 0.0053 | 774.2 | 404.2 | 0.72 |
| Existing | 5 | 5.11 | 5.82 | 0.0053 | 1585.2 | 520.3 | 1.16 |
| Existing | 10 | 6.50 | 6.65 | 0.0052 | 2423.6 | 614.0 | 1.48 |
| Existing | 20 | 7.99 | 6.89 | 0.0052 | 3658.7 | 887.0 | 1.60 |
| Existing | 50 | 9.84 | 7.48 | 0.0051 | 5581.5 | 1131.1 | 1.85 |
| Existing | 100 | 11.27 | 8.00 | 0.0051 | 7283.6 | 1236.1 | 2.13 |
| Alternative 6 | 2 | 3.37 | 4.45 | 0.0053 | 778.1 | 406.2 | 0.73 |
| Alternative 6 | 5 | 5.12 | 5.82 | 0.0053 | 1585.9 | 524.9 | 1.15 |
| Alternative 6 | 10 | 6.49 | 6.63 | 0.0052 | 2428.9 | 618.6 | 1.46 |
| Alternative 6 | 20 | 8.01 | 7.07 | 0.0052 | 3570.3 | 793.0 | 1.69 |
| Alternative 6 | 50 | 10.22 | 7.37 | 0.0052 | 5666.5 | 992.7 | 2.06 |
| Alternative 6 | 100 | 11.80 | 7.92 | 0.0051 | 7327.5 | 1078.7 | 2.38 |
| Alternative 2 | 100 | 11.87 | 7.8 | 0.0051 | 7489.4 | 1093.4 | 2.43 |

Source: PACE, 2008A.

Given the low frequency and duration of the lower frequency events, the potential impacts to geomorphic function in the Santa Clara River relative to Significance Criterion 3 are considered less than significant.

The HARC analysis indicates that the Alternative 6 would result in only minor changes to the hydrologic function of the Santa Clara River with small decreases in the source water and floodplain connection metrics. In total, Alternative 6 would result in a net loss of 5.22 hydrology AW-score units but would increase the total HARC AW-score units by 104.08. The overall increase in HARC AW-score units is primarily attributed to the benefits provided by Alternative 6 to riparian habitat as discussed in **Section 4.6**, Jurisdictional Waters and Streams. In general, the HARC analysis supports the conclusion that the relatively minor impacts to the hydrologic processes of the Santa Clara River do not have an overall negative effect on the geomorphic function, *e.g.*, ability to support riparian habitat. Therefore, impacts associated with Alternative 6 would be less than significant relative to Significance Criterion 3 since they would not result in a substantial reduction in geomorphic function.

**Santa Clara River -- Significance Criterion 4: Construction and Scour Impacts to Riparian Vegetation (Less than Significant).** Most of the areas along the River corridor within the Project site consist of agricultural fields, and to a lesser extent, disturbed and upland habitat areas with limited riparian habitat. (PACE, 2008A.) Alternative 6 includes the construction of 26,076 lf of soil cement, which is necessary to protect the Specific Plan's residential and commercial development and the bridges

at Commerce Center Drive and Long Canyon Road. The analysis of the impacts of installing bank protection, bridge piers and abutments, and erosion protection to vegetation along the Santa Clara River are primarily related to Alternative 6's hydrologic and hydraulic impacts on the Santa Clara River, as detailed below.

**Impacts on Velocity.** An increase in flow velocities in the River could result in significant impacts to riparian vegetation if the increase causes: (1) widespread and chronic scouring of the channel bed that removes a significant amount of aquatic wetland and riparian habitats from the River channel; and/or (2) substantial modification of the relative amounts of these different habitats in the River, essentially altering the quality of the riverine environment.

Impacts associated with erosion and sediment deposition and, therefore, streambed modification within the River are evaluated as a function of in-stream velocities, which are indicators for potential riverbed scouring. As discussed in **Subsection 4.2.5.1**, Impact Assessment Methods, a representative velocity of four fps was determined to be the appropriate indicator for potential erosion. **Table 4.2-32**, presented above, includes the change of Alternative 6, from existing conditions, in the total area of floodplain, delineated by vegetation type, where velocities exceed four fps for each return interval.

The total floodplain area subject to potentially erosive velocities would be decreased as a result of Alternative 6 for all return intervals. In addition, no impacts to velocity would be realized upstream or downstream of the Project reach. (PACE, 2008A.) The impacts relating to habitat removal and disturbance as a result of changes to River velocity are presented in **Section 4.5**, Biological Resources.

Based on these results, the bank stabilization, bridges, and turf-reinforced mats would not cause significant scouring, and, therefore, would not alter the amount and pattern of riparian habitats along the River within the Project area. The current pattern of scouring due to high velocities would remain intact and the Project would not substantially alter the frequency and magnitude of scouring of riparian vegetation. Based on this information, no significant impacts relative to Significance Criterion 4 would occur due to changes in velocity.

**Impacts on Water Depth.** An increase in water depth in the River could result in significant impacts to riparian habitat if the additional water depth causes greater "shear forces" (*i.e.*, friction caused by the weight of water) on the river bottom, and thereby increasing scouring of the channel bed and removal of vegetation. This effect could reduce the extent of aquatic, wetland, and riparian habitats in the River.

**Table 4.2-33** provides the general hydrologic characteristics of the River channel for the two-, five-, 10-, 20-, 50-, and 100-year events, both with and without Alternative 6 project components. The results of the hydraulic analysis indicate that water depths and, correspondingly, total shear in the River would not increase significantly due to Alternative 6 improvements. The additional riparian vegetation area subject to inundation would be increased slightly during the two- and five-year flood events (0.8 and 1.3 acres, respectively), but would be reduced by approximately 4.6, 77.5, 121.7, 142.3, and 211.6 acres as a result of Alternative 6 during the 10-, 20-, 50-, 100-year, and capital flood events, respectively. (PACE, 2008A.) **Figures 4.2-15** and **4.2-16** show the area of inundation and velocity distribution for the 10- and 100-year flow events for both existing conditions and Alternative 6. As shown in these figures, the decrease in inundated area (by percentage and acreage) would primarily affect areas of currently disturbed,

agricultural land. Accordingly, impacts to riparian habitat would be limited such that water flow depths, velocities, and total shear for all return events would not be significantly different in riparian habitat between existing and proposed conditions at the Project site. Since there will not be a significant change in flow depths or total shear in existing riparian habitat, the impacts to the amount and pattern of aquatic, wetland, and riparian habitats in the River are expected to be less-than-significant relative to Significance Criterion 4.

**Impacts of Modification.** The reinforced concrete and riprap bridge abutments, in addition to the soil cement proposed by Alternative 6, would encroach into the existing 100-year floodplain in some areas. Encroachment impacts can be analyzed on the basis of depth and velocity, as described below. Additionally, some banks located out of the floodplain need stabilization because of lateral migration of the riverbed, as well as the need for protection against the capital flood discharge. Long-term impacts would have the potential to occur because soil cement used to stabilize the River's banks places a permanent feature in the existing floodplain.

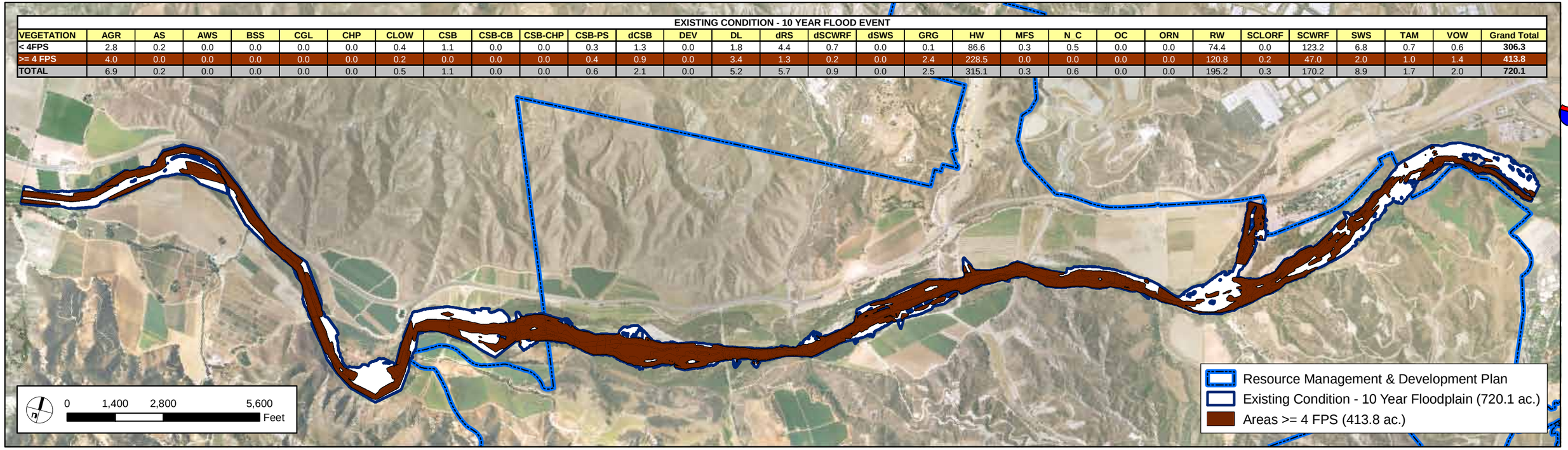
In other areas, the soil cement would be placed outside the existing River channel, creating additional River channel and riparian habitats. For example, soil cement proposed on the north side of the River near the confluence with Castaic River would be constructed on agricultural land, north of the existing channel. The land located between the existing river bank and the newly created stabilized bank would be excavated to widen the existing channel, which would increase the area available within the channel and increase the capacity of the River to convey the passage of flood flows. Overall, Alternative 6 proposes fewer feet of bank stabilization within the Santa Clara River and would therefore result in fewer impacted/removed acres compared with Alternative 2. Specifically, Alternative 6 would result in 20.0 acres of modified channel, where Alternative 2 would result in 36.9 acres of modified channel within the Santa Clara River floodplain.

The potential impacts from Alternative 6 RMDP improvements to Santa Clara River riparian vegetation are anticipated to be small and localized along the River floodplain. In addition, the frequency and duration of river flow conditions is considered to be episodic. The River, the floodplain, and riparian resources have been subjected to episodic disturbances under natural conditions and only minor changes in overall planform geomorphology occur as described above. As such, impacts of the RMDP to riparian vegetation along the Santa Clara River relative to Significance Criterion 4 are considered less than significant.

**Tributaries -- Significance Criterion 1: Short-Term Impacts from Construction of Bridges, Bank Stabilization, Grade Stabilizer Structures, and Buried Storm Drain (Significant but Mitigable).** Installation of bank stabilization features, grade stabilizer structures, buried storm drains, and bridge piers and abutments would directly affect elements of tributary geomorphology which would be a significant impact. Within the tributaries, Alternative 6 would authorize 27 fewer linear feet of buried bank stabilization, 16,511 fewer linear feet of drainage converted to buried storm drain, 2 fewer grade stabilizer structures, 9 more bridges, but 7 fewer culverts when compared with the proposed RMDP. Therefore, Alternative 6 would have a potentially lesser direct effect on the geomorphology of the tributaries than Alternative 2, although these impacts would still be significant prior to mitigation.

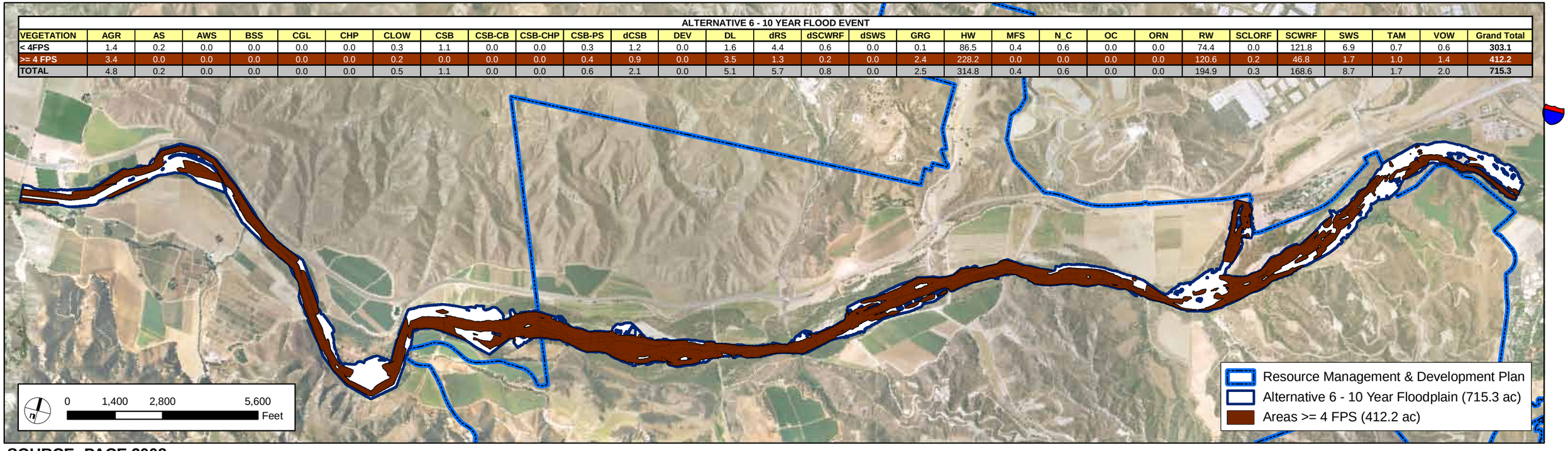
**EXISTING CONDITION - 10 YEAR FLOOD EVENT**

| VEGETATION | AGR | AS | AWS | BSS | CGL | CHP | CLOW | CSB | CSB-CB | CSB-CHP | CSB-PS | dCSB | DEV | DL | dRS | dSCWRF | dSWS | GRG | HW | MFS | N_C | OC | ORN | RW | SCLORF | SCWRF | SWS | TAM | VOW | Grand Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| < 4FPS | 2.8 | 0.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.4 | 1.1 | 0.0 | 0.0 | 0.3 | 1.3 | 0.0 | 1.8 | 4.4 | 0.7 | 0.0 | 0.1 | 86.6 | 0.3 | 0.5 | 0.0 | 0.0 | 74.4 | 0.0 | 123.2 | 6.8 | 0.7 | 0.6 | **306.3** |
| >= 4 FPS | 4.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.2 | 0.0 | 0.0 | 0.0 | 0.4 | 0.9 | 0.0 | 3.4 | 1.3 | 0.2 | 0.0 | 2.4 | 228.5 | 0.0 | 0.0 | 0.0 | 0.0 | 120.8 | 0.2 | 47.0 | 2.0 | 1.0 | 1.4 | **413.8** |
| TOTAL | 6.9 | 0.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.5 | 1.1 | 0.0 | 0.0 | 0.6 | 2.1 | 0.0 | 5.2 | 5.7 | 0.9 | 0.0 | 2.5 | 315.1 | 0.3 | 0.6 | 0.0 | 0.0 | 195.2 | 0.3 | 170.2 | 8.9 | 1.7 | 2.0 | **720.1** |




**ALTERNATIVE 6 - 10 YEAR FLOOD EVENT**

| VEGETATION | AGR | AS | AWS | BSS | CGL | CHP | CLOW | CSB | CSB-CB | CSB-CHP | CSB-PS | dCSB | DEV | DL | dRS | dSCWRF | dSWS | GRG | HW | MFS | N_C | OC | ORN | RW | SCLORF | SCWRF | SWS | TAM | VOW | Grand Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| < 4FPS | 1.4 | 0.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.3 | 1.1 | 0.0 | 0.0 | 0.3 | 1.2 | 0.0 | 1.6 | 4.4 | 0.6 | 0.0 | 0.1 | 86.5 | 0.4 | 0.6 | 0.0 | 0.0 | 74.4 | 0.0 | 121.8 | 6.9 | 0.7 | 0.6 | **303.1** |
| >= 4 FPS | 3.4 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.2 | 0.0 | 0.0 | 0.0 | 0.4 | 0.9 | 0.0 | 3.5 | 1.3 | 0.2 | 0.0 | 2.4 | 228.2 | 0.0 | 0.0 | 0.0 | 0.0 | 120.6 | 0.2 | 46.8 | 1.7 | 1.0 | 1.4 | **412.2** |
| TOTAL | 4.8 | 0.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.5 | 1.1 | 0.0 | 0.0 | 0.6 | 2.1 | 0.0 | 5.1 | 5.7 | 0.8 | 0.0 | 2.5 | 314.8 | 0.4 | 0.6 | 0.0 | 0.0 | 194.9 | 0.3 | 168.6 | 8.7 | 1.7 | 2.0 | **715.3** |




**SOURCE: PACE 2008**

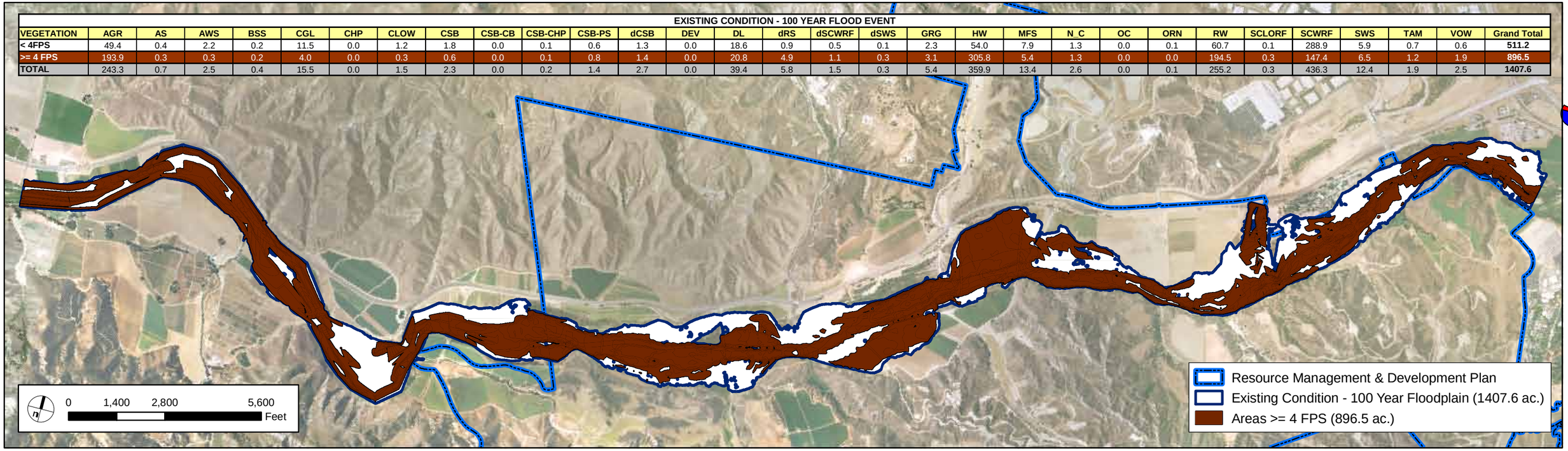
FIGURE 4.2-15

EXISTING CONDITION AND ALTERNATIVE 6
10-YEAR FLOOD INUNDATION AND VELOCITY DISTRIBUTION - SANTA CLARA RIVER

P:\8238E\GIS\mxds\EIR_2008\Section4_2\8238E_FIGURE-4-2-15_RiparianScourVelocityAnalysisAlt6_10Yr_082108.mxd

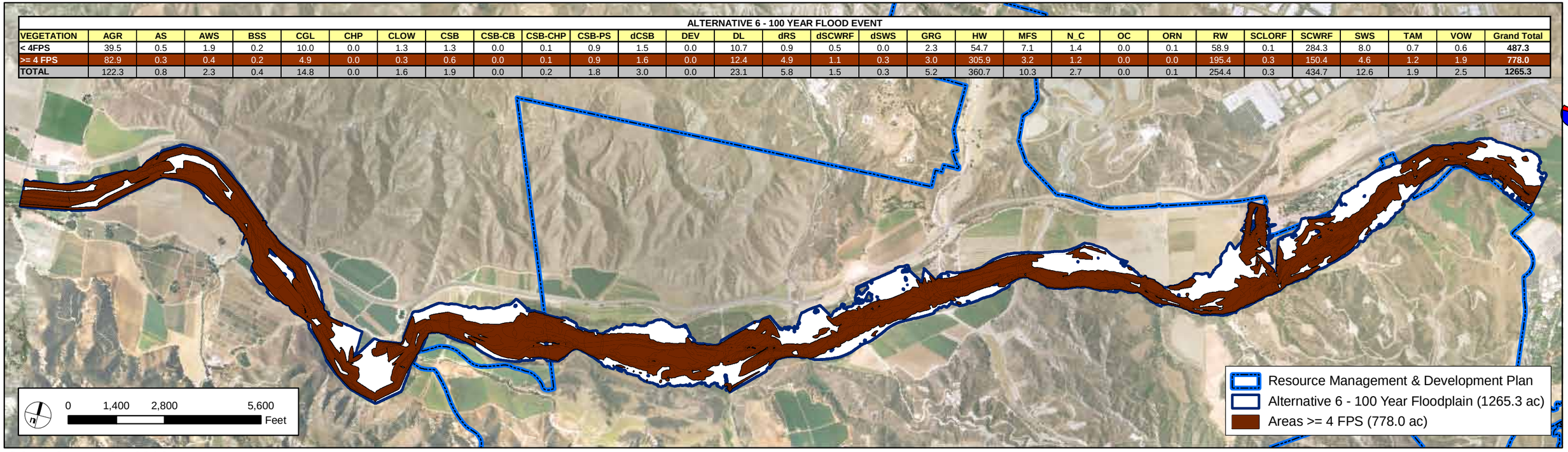
**EXISTING CONDITION - 100 YEAR FLOOD EVENT**

| VEGETATION | AGR | AS | AWS | BSS | CGL | CHP | CLOW | CSB | CSB-CB | CSB-CHP | CSB-PS | dCSB | DEV | DL | dRS | dSCWRF | dSWS | GRG | HW | MFS | N_C | OC | ORN | RW | SCLORF | SCWRF | SWS | TAM | VOW | Grand Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| < 4FPS | 49.4 | 0.4 | 2.2 | 0.2 | 11.5 | 0.0 | 1.2 | 1.8 | 0.0 | 0.1 | 0.6 | 1.3 | 0.0 | 18.6 | 0.9 | 0.5 | 0.1 | 2.3 | 54.0 | 7.9 | 1.3 | 0.0 | 0.1 | 60.7 | 0.1 | 288.9 | 5.9 | 0.7 | 0.6 | **511.2** |
| >= 4 FPS | 193.9 | 0.3 | 0.3 | 0.2 | 4.0 | 0.0 | 0.3 | 0.6 | 0.0 | 0.1 | 0.8 | 1.4 | 0.0 | 20.8 | 4.9 | 1.1 | 0.3 | 3.1 | 305.8 | 5.4 | 1.3 | 0.0 | 0.0 | 194.5 | 0.3 | 147.4 | 6.5 | 1.2 | 1.9 | **896.5** |
| TOTAL | 243.3 | 0.7 | 2.5 | 0.4 | 15.5 | 0.0 | 1.5 | 2.3 | 0.0 | 0.2 | 1.4 | 2.7 | 0.0 | 39.4 | 5.8 | 1.5 | 0.3 | 5.4 | 359.9 | 13.4 | 2.6 | 0.0 | 0.1 | 255.2 | 0.3 | 436.3 | 12.4 | 1.9 | 2.5 | **1407.6** |




**ALTERNATIVE 6 - 100 YEAR FLOOD EVENT**

| VEGETATION | AGR | AS | AWS | BSS | CGL | CHP | CLOW | CSB | CSB-CB | CSB-CHP | CSB-PS | dCSB | DEV | DL | dRS | dSCWRF | dSWS | GRG | HW | MFS | N_C | OC | ORN | RW | SCLORF | SCWRF | SWS | TAM | VOW | Grand Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| < 4FPS | 39.5 | 0.5 | 1.9 | 0.2 | 10.0 | 0.0 | 1.3 | 1.3 | 0.0 | 0.1 | 0.9 | 1.5 | 0.0 | 10.7 | 0.9 | 0.5 | 0.0 | 2.3 | 54.7 | 7.1 | 1.4 | 0.0 | 0.1 | 58.9 | 0.1 | 284.3 | 8.0 | 0.7 | 0.6 | **487.3** |
| >= 4 FPS | 82.9 | 0.3 | 0.4 | 0.2 | 4.9 | 0.0 | 0.3 | 0.6 | 0.0 | 0.1 | 0.9 | 1.6 | 0.0 | 12.4 | 4.9 | 1.1 | 0.3 | 3.0 | 305.9 | 3.2 | 1.2 | 0.0 | 0.0 | 195.4 | 0.3 | 150.4 | 4.6 | 1.2 | 1.9 | **778.0** |
| TOTAL | 122.3 | 0.8 | 2.3 | 0.4 | 14.8 | 0.0 | 1.6 | 1.9 | 0.0 | 0.2 | 1.8 | 3.0 | 0.0 | 23.1 | 5.8 | 1.5 | 0.3 | 5.2 | 360.7 | 10.3 | 2.7 | 0.0 | 0.1 | 254.4 | 0.3 | 434.7 | 12.6 | 1.9 | 2.5 | **1265.3** |




**SOURCE: PACE 2008**

FIGURE 4.2-16

EXISTING CONDITION AND ALTERNATIVE 6
100-YEAR FLOOD INUNDATION AND VELOCITY DISTRIBUTION - SANTA CLARA RIVER

P:\8238E\GIS\mxds\EIR_2008\Section4_2\8238E_FIGURE-4-2-16_RiparianScourVelocityAnalysisAlt6_100Yr_082108.mxd

As with Alternative 2, absent mitigation, there would be significant short-term sedimentation impacts during construction with respect to Significance Criterion 1. However, Mitigation Measures SP-4.2-2 (acquire state and federal permits), SP-4.2-3 (CDFG streambed agreements), SP-4.2-5 (DPW plan and map approvals), and SP-4.2-7 (DPW SUSMP and SWPPP requirements) would ensure that regulatory requirements are implemented and short-term impacts related to construction of RMDP components are less than significant through proper application of sediment controls and other BMPs required by existing local, state, and federal regulations.

**Tributaries -- Significance Criterion 2: Erosion and Downstream Deposition (Significant but Mitigable).** Implementation of Alternative 6 RMDP improvements and facilities, which are subject to the Corps and CDFG permitting requirements (particularly site clearing and grading operations), would have the potential to increase sediment flows downstream during storm events. Long-term impacts associated with erosion and sediment deposition are evaluated as a function of geomorphic stability. The basis of design for the five major tributary drainages is such that the channels would be designed to be in geomorphic equilibrium in terms of stability and delivery of sediment and flows under future conditions. As described in greater detail for Alternative 2, the channel designs will meet the following criteria: geomorphic stability; flood conveyance; ecological function; hydromodification control; low level maintenance. The preliminary channel designs under Alternative 6 for each tributary are described in the following paragraphs.

***Chiquito Canyon.*** The proposed design in Chiquito Canyon under Alternative 6 would significantly decrease the width of the floodplain in Chiquito Canyon, which would increase the velocity of flows, resulting in a significant effect prior to mitigation. In order to minimize impacts, the Project will be designed to mitigate Project effects to the geomorphic stability (*i.e.*, erosion and deposition) within Chiquito Canyon. Specifically, where the channel is not degraded and less extensive development will take place in the watershed, grade control structures will be used to maintain the existing slope. The reengineered channel will be designed to meet the specified basis of design criteria using the following approach:

1. Develop existing condition floodplain and creek hydraulic characteristics using a hydraulic model such as HEC-RAS.
2. Minimize impacts to existing condition floodplain. As a result of reducing the development impacts to the floodplain, the amount of environmental and hydraulic impacts (*e.g.*, resulting in substantial erosion or sediment deposition) from the proposed development will be minimized.
3. Creek bank flood protection (soil cement, rip rap or other suitable method) will be located to provide for bank erosion protection and to provide flood protection from the DPW Capital design flood event. In most cases, the bank protection will be buried with soil at a 3:1 slope over the hard bank protection. The soil backfill slope will vary from flatter to steeper and may be totally eliminated in some areas where necessary such as at structures, storm drain outlets or other pinch points.
4. Chiquito Canyon will not include a re-grading of the creek invert although the Ep of the proposed condition will be validated during the design phase. For Chiquito Canyon, the invert stabilization method will be as follows:

a. Creek bed grade control structures at 200 to 400 foot spacing along the creek corridor will be included.

b. These grade control structures will designed to be located at points along the creek where proposed project grading impacts will already be disturbing the creek bed and banks.

c. The grade control structures will be constructed with soil cement, rip rap or other grade stabilization methods acceptable to DPW.

d. The grade control structures will be at grade or below the existing grade and invert of the creek bed.

e. The grade control structures will be designed to function as a drop structure in the event the creek bed slope flattens overtime.

5. Chiquito Canyon top and toe elevation will be established based upon DPW standards.

The overall design approach will allow the tributary to naturally fluctuate between the stabilized existing condition and estimated equilibrium slope while providing suitable erosion and flood protection for public safety. Based upon the proposed design and use of DPW standards for bank protection top and toe, Chiquito Canyon would meet the minimal required design objectives provided by DPW. As such, the geomorphic basis of design will inherently minimize erosion and deposition.

The channel confluence with the Santa Clara River would largely be controlled by the aggradation or degradation in the Santa Clara River, as well as episodic River hydraulic events in the form of backwater effects. While the banks would be hardened in the proposed Project condition, the influence of the Santa Clara River on long-term bed stability at the creek channel outlet is expected to exceed that of the Project channel modifications. The upstream channel inlet (near the beginning of the defined channel) is generally in a natural state and no currently planned improvements are to be made in the upstream portion of the channel; as a result, no effects on channel stability in this area are expected.

Prior to mitigation, erosion and sedimentation impacts within Chiquito Canyon would be significant. The Newhall Ranch Specific Plan EIR identified feasible measures to lessen the effects of the Specific Plan on floodplains within the Project area. Specifically, Mitigation Measures SP-4.2-1 through SP-4.2-7 (flood control improvement approval from DPW, state and federal permits, CDFG stream bed agreements, FEMA CLOMR, DPW plan and map approvals, DPW-approved permanent erosion controls, DPW SUSMP and SWPPP requirements) are incorporated as part of the Project design to mitigate these impacts. In addition, Mitigation Measures GRR-1 through GRR-6 (DPW required runoff controls, minimization of bridge and structures, structural durability, hydromodification controls and channel design, sediment and debris control facilities, sediment redistribution) would further mitigate these impacts by controlling runoff and sediment delivered through the project reach, minimizing localized impacts from bridge crossings, using erosion resistant materials to ensure the long-term stability of RMDP structures, and ensuring that the Project design provides an equilibrium slope for each affected tributary in the post-development condition. Finally, in order to ensure that the channel functions as intended, Mitigation Measure GRR-7 describes the Geomorphology Monitoring and Management Plan

that will be implemented to evaluate compliance with the basis of the design criteria, the triggers for implementing remedial actions (if necessary), the approach for implementing remedial actions, and a description of potential remedial measures. Incorporation and implementation of proper design, regulatory compliance, facility maintenance, and specified mitigation measures will reduce the impact of erosion and/or downstream deposition to a less-than-significant level in relation to Significance Criterion 2.

***San Martinez Grande*.** The proposed design in San Martinez Grande Canyon under Alternative 6 would significantly decrease the width of the floodplain in the tributary, which would increase the velocity of flows, resulting in a significant effect prior to mitigation. In order to minimize impacts, the Project will be designed to mitigate Project effects to the geomorphic stability (*i.e.*, erosion and deposition) within San Martinez Grande Canyon. Specifically, where the channel is not degraded and less extensive development will take place in the watershed, grade control structures will be used to maintain the existing slope. The reengineered channel will be designed to meet the specified basis of design criteria using the following approach:

1. Develop existing condition floodplain and creek hydraulic characteristics using a hydraulic model such as HEC-RAS.
2. Minimize impacts to existing condition floodplain. As a result of reducing the development impacts to the floodplain, the amount of environmental and hydraulic impacts (*e.g.*, resulting in substantial erosion or sediment deposition) from the proposed development will be minimized.
3. Creek bank flood protection (soil cement, rip rap or other suitable method) will be located to provide for bank erosion protection and to provide flood protection from the DPW Capital design flood event. In most cases, the bank protection will be buried with soil at a 3:1 slope over the hard bank protection. The soil backfill slope will vary from flatter to steeper and may be totally eliminated in some areas where necessary such as at structures, storm drain outlets or other pinch points.
4. San Martinez Grande Canyon will not include a re-grading of the creek invert although the Ep of the proposed condition will be validated during the design phase. For San Martinez Grande Canyon, the invert stabilization method will be as follows:
    a. Creek bed grade control structures at 200 to 400 foot spacing along the creek corridor will be included.
    b. These grade control structures will designed to be located at points along the creek where proposed project grading impacts will already be disturbing the creek bed and banks.
    c. The grade control structures will be constructed with soil cement, rip rap or other grade stabilization methods acceptable to DPW.
    d. The grade control structures will be at grade or below the existing grade and invert of the creek bed.

e. The grade control structures will be designed to function as a drop structure in the event the creek bed slope flattens overtime.

5. San Martinez Grande Canyon top and toe elevation will be established based upon DPW standards.

The overall design approach will allow the tributary to naturally fluctuate between the stabilized existing condition and estimated equilibrium slope while providing suitable erosion and flood protection for public safety. Based upon the proposed design and use of DPW standards for bank protection top and toe, San Martinez Grande Canyon would meet the minimal required design objectives provided by DPW. As such, the geomorphic basis of design will inherently minimize erosion and deposition.

The channel confluence with the Santa Clara River would largely be controlled by the aggradation or degradation in the Santa Clara River, as well as episodic River hydraulic events in the form of backwater effects. While the banks would be hardened in the proposed Project condition, the influence of the Santa Clara River on long-term bed stability at the creek channel outlet is expected to exceed that of the Project channel modifications. The upstream channel inlet (near the beginning of the defined channel) is generally in a natural state and no currently planned improvements are to be made in the upstream portion of the channel; as a result, no effects on channel stability in this area are expected.

Prior to mitigation, erosion and sedimentation impacts within San Martinez Grande Canyon would be significant. The Newhall Ranch Specific Plan EIR identified feasible measures to lessen the effects of the Specific Plan on floodplains within the Project area. Specifically, Mitigation Measures SP-4.2-1 through SP-4.2-7 (flood control improvement approval from DPW, state and federal permits, CDFG stream bed agreements, FEMA CLOMR, DPW plan and map approvals, DPW-approved permanent erosion controls, DPW SUSMP and SWPPP requirements) are incorporated as part of the Project design to mitigate these impacts. In addition, Mitigation Measures GRR-1 through GRR-6 (DPW required runoff controls, minimization of bridge and structures, structural durability, hydromodification controls and channel design, sediment and debris control facilities, sediment redistribution) would further mitigate these impacts by controlling runoff and sediment delivered through the project reach, minimizing localized impacts from bridge crossings, using erosion resistant materials to ensure the long-term stability of RMDP structures, and ensuring that the Project design provides an equilibrium slope for each affected tributary in the post-development condition. Finally, in order to ensure that the channel functions as intended, Mitigation Measure GRR-7 describes the Geomorphology Monitoring and Management Plan that will be implemented to evaluate compliance with the basis of the design criteria, the triggers for implementing remedial actions (if necessary), the approach for implementing remedial actions, and a description of potential remedial measures. Incorporation and implementation of proper design, regulatory compliance, facility maintenance, and specified mitigation measures will reduce the impact of erosion and/or downstream deposition to a less-than-significant level in relation to Significance Criterion 2.

***Long Canyon.*** The proposed design in Long Canyon under Alternative 6 would significantly decrease the width of the floodplain in Long Canyon, which would increase the velocity of flows, resulting in a significant effect prior to mitigation. The proposed Project design would combine soil cement bank stabilization along with a soft-bottom channel. The basis of design for Long Canyon is such that any

increase in flow velocities and shear stress would not exceed the performance specifications of the bank stabilization. However, the soft bottom of the channel is vulnerable to down-cutting and scour. To decrease the channel velocities, the Project design includes grade stabilizer structures. These structures are designed to function by reducing the energy slope along the degradational zone to the point that the stream is no longer capable of scouring the bed. Proper placement of grade stabilizer structures would allow the channel to reach equilibrium, defined as the condition where the amount of sediment deposited is equivalent to the sediment transported from the channel.

The final design approach in accordance with the geomorphic basis of design is to preserve the existing channel as a back channel habitat area while creating an additional new channel sized to accommodate the changes in sediment and water delivery due to the build-out of the Newhall Ranch Specific Plan. The recommended approach for designing the reaches where valley grading is proposed involves breaking the valley into alternating long reaches that are at equilibrium grade and short reaches that are much steeper. This approach involves creating reaches of between 100 and 300 feet length where elevation drops of 10 to 30 feet occur (10 percent gradient). Concentrating the drop in these reaches using sequences of step-pools that convey the capital flood has the advantage of creating a more naturally functioning channel between the drops, and reducing the number and aerial extent of rock structures. The Long Canyon channel design incorporates the calculated post-development equilibrium slope to ensure a dynamically stable condition allowing for more or less equal amounts of erosion and deposition.

Prior to mitigation, erosion and sedimentation impacts within Long Canyon would be significant. The Newhall Ranch Specific Plan EIR identified feasible measures to lessen the effects of the Specific Plan on floodplains within the Project area. Specifically, Mitigation Measures SP-4.2-1 through SP-4.2-7 (flood control improvement approval from DPW, state and federal permits, CDFG stream bed agreements, FEMA CLOMR, DPW plan and map approvals, DPW-approved permanent erosion controls, DPW SUSMP and SWPPP requirements) are incorporated as part of the Project design to mitigate these impacts. In addition, Mitigation Measures GRR-1 through GRR-6 (DPW required runoff controls, minimization of bridge and structures, structural durability, hydromodification controls and channel design, sediment and debris control facilities, sediment redistribution) would further mitigate these impacts by controlling runoff and sediment delivered through the project reach, minimizing localized impacts from bridge crossings, using erosion resistant materials to ensure the long-term stability of RMDP structures, and ensuring that the Project design provides an equilibrium slope for each affected tributary in the post-development condition. Finally, in order to ensure that the channel functions as intended, Mitigation Measure GRR-7 describes the Geomorphology Monitoring and Management Plan that will be implemented to evaluate compliance with the basis of the design criteria, the triggers for implementing remedial actions (if necessary), the approach for implementing remedial actions, and a description of potential remedial measures. Incorporation and implementation of proper design, regulatory compliance, facility maintenance, and specified mitigation measures will reduce the impact of erosion and/or downstream deposition to a less-than-significant level in relation to Significance Criterion 2.

***Potrero Canyon.*** The proposed design under Alternative 6 would significantly decrease the width of the floodplain in Potrero Canyon, which would increase the velocity of flows, resulting in a significant effect prior to mitigation. The design for the proposed Project would combine soil cement bank stabilization

along with a soft-bottom channel. The bank stabilization consisting of soil cement would be emplaced according to the requirements established by the DPW. The basis of design for Potrero Canyon is such that any increase in flow velocities and shear stress would not exceed the performance specifications of the bank stabilization. However, the soft bottom of the channel is vulnerable to down-cutting and scour. To decrease the channel velocities, the design includes grade stabilizer structures. These structures are designed to function by reducing the energy slope along the degradational zone to the point that the stream is no longer capable of scouring the bed. Proper placement of grade stabilizer structures would allow the channel to reach its equilibrium, defined as the condition where the amount of sediment deposited is equivalent to the sediment eroded. The Potrero channel design incorporates the calculated post-development equilibrium slope to ensure a dynamically stable condition allowing for more or less equal amounts of erosion and deposition to sustain revegetated riparian and adjacent upland habitat areas.

The geomorphic basis of design is such that Potrero Canyon would be designed to convey sediment under future conditions with a "dynamically stable channel" (neither long-term erosion nor deposition) and to support the proposed native re-vegetation program.

Prior to mitigation, erosion and sedimentation impacts within Potrero Canyon would be significant. The Newhall Ranch Specific Plan EIR identified feasible measures to lessen the effects of the Specific Plan on floodplains within the Project area. Specifically, Mitigation Measures SP-4.2-1 through SP-4.2-7 (flood control improvement approval from DPW, state and federal permits, CDFG stream bed agreements, FEMA CLOMR, DPW plan and map approvals, DPW-approved permanent erosion controls, DPW SUSMP and SWPPP requirements) are incorporated as part of the Project design to mitigate these impacts. In addition, Mitigation Measures GRR-1 through GRR-6 (DPW required runoff controls, minimization of bridge and structures, structural durability, hydromodification controls and channel design, sediment and debris control facilities, sediment redistribution would further mitigate these impacts by controlling runoff and sediment delivered through the project reach, minimizing localized impacts from bridge crossings, using erosion resistant materials to ensure the long-term stability of RMDP structures, and ensuring that the Project design provides an equilibrium slope for each affected tributary in the post-development condition. Finally, in order to ensure that the channel functions as intended, Mitigation Measure GRR-7 describes the Geomorphology Monitoring and Management Plan that will be implemented to evaluate compliance with the basis of the design criteria, the triggers for implementing remedial actions (if necessary), the approach for implementing remedial actions, and a description of potential remedial measures. Incorporation and implementation of proper design, regulatory compliance, facility maintenance, and specified mitigation measures will reduce the impact of erosion and/or downstream deposition to a less-than-significant level in relation to Significance Criterion 2.

***Lion Canyon.*** The proposed design under Alternative 6 includes the placement of three new road crossings in Lion Canyon. These crossings may constrict the floodplain, resulting in an increase in the velocity of flows which would be a significant effect prior to mitigation. The basis of design for this drainage is such that Lion Canyon would be designed to be in geomorphic equilibrium in terms of stability and delivery of sediment and water under future conditions. The channel floodplain will be designed to maximize geomorphic stability and ecological function, provide adequate flood conveyance, and avoid hydromodification to the extent possible. In addition, the design would minimize the need for maintenance activities.

Phillip Williams and Associates (PWA, 2007g) evaluated the channel design erosion potential. Post-development condition sediment supplies to the Lion Canyon drainage are predicted to range from 27 percent to 37 percent of the existing condition. The results of the analysis indicate that with the proposed RMDP components, the erosion potential within Lion Canyon would be in equilibrium and that the proposed channel would not aggrade or generate excess sediment from erosion or create a larger than natural downstream impact from sedimentation associated with hydromodification. Mitigation measure SP-4.2-3 (state and federal permits) would require that hydraulic modeling be performed for the final design to assess the effects within Lion Canyon, and that the design would be modified as necessary to reduce any erosion or deposition impacts. The Lion channel design incorporates the calculated post-development equilibrium slope to ensure a dynamically stable condition allowing for more or less equal amounts of erosion and deposition.

Prior to mitigation, erosion and sedimentation impacts within Lion Canyon would be significant. The Newhall Ranch Specific Plan EIR identified feasible measures to lessen the effects of the Specific Plan on floodplains within the Project area. Specifically, Mitigation Measures SP-4.2-1 through SP-4.2-7 (flood control improvement approval from DPW, state and federal permits, CDFG stream bed agreements, FEMA CLOMR, DPW plan and map approvals, DPW-approved permanent erosion controls, DPW SUSMP and SWPPP requirements) are incorporated as part of the Project design to mitigate these impacts. In addition, Mitigation Measures GRR-1 through GRR-6 (DPW required runoff controls, minimization of bridge and structures, structural durability, hydromodification controls and channel design, sediment and debris control facilities, sediment redistribution) would further mitigate these impacts by controlling runoff and sediment delivered through the project reach, minimizing localized impacts from bridge crossings, using erosion resistant materials to ensure the long-term stability of RMDP structures, and ensuring that the Project design provides an equilibrium slope for each affected tributary in the post-development condition. Finally, in order to ensure that the channel functions as intended, Mitigation Measure GRR-7 describes the Geomorphology Monitoring and Management Plan that will be implemented to evaluate compliance with the basis of the design criteria, the triggers for implementing remedial actions (if necessary), the approach for implementing remedial actions, and a description of potential remedial measures. Incorporation and implementation of proper design, regulatory compliance, facility maintenance, and specified mitigation measures will reduce the impact of erosion and/or downstream deposition to a less-than-significant level in relation to Significance Criterion 2.

**Minor Drainages.** Implementation of the proposed RMDP would involve the placement of one new culverted road crossing in Ayers Canyon, a minor drainage on the south side of the River; in addition, the existing six-lane bridge allowing SR-126 to cross the Castaic Creek drainage would be expanded to eight lanes.

The other drainages to be converted entirely or partially to underground storm drains include drainages in Homestead Canyon, Off-Haul Canyon, Mid-Martinez Canyon, Humble Canyon, Lion Canyon, Exxon Canyon, Unnamed Canyon B, Unnamed Canyon C, Dead-End Canyon, Middle Canyon, Magic Mountain Canyon, Unnamed Canyon 1 and Unnamed Canyon 2.

The conversion of open drainages to buried underground conduits would eliminate the erosion of existing drainage channels and the associated sediment loading from other uplands sources. The impact of underground storm drains would significantly decrease erosion and siltation. Accordingly, construction of the proposed 32,583 feet of buried storm drain could result in significant erosion or deposition impacts within the minor drainages.

Prior to mitigation, erosion and sedimentation impacts within the minor tributary drainages would be significant. The Newhall Ranch Specific Plan EIR identified feasible measures to lessen the effects of the Specific Plan on floodplains within the Project area. Specifically, Mitigation Measures SP-4.2-1 through SP-4.2-7 (flood control improvement approval from DPW, state and federal permits, CDFG stream bed agreements, FEMA CLOMR, DPW plan and map approvals, DPW-approved permanent erosion controls, DPW SUSMP and SWPPP requirements) are incorporated as part of the Project design to reduce these impacts. In addition, Mitigation Measures GRR-1 through GRR-6 (DPW required runoff controls, minimization of bridge and structures, structural durability, hydromodification controls and channel design, sediment and debris control facilities, sediment redistribution) would reduce this potential impact to less than significant within the minor tributaries by controlling runoff and sediment delivered through the project reach, minimizing localized impacts from bridge crossings, using erosion resistant materials to ensure the long-term stability of RMDP structures, and ensuring that the Project design provides an equilibrium slope for each affected tributary in the post-development condition.

Erosion and deposition impacts within the tributaries would be significant absent mitigation, but, with the implementation of the Project-specific mitigation measures, would be less-than-significant relative to Significance Criterion 2.

**Tributaries -- Significance Criterion 3: Impacts to Geomorphic Function (Less than Significant).** The tributary drainages incorporate hydromodification controls that lessen potential stormwater-related impacts (intensity and duration) to the River and tributary geomorphic function. The following includes an analysis of the potential impacts to the geomorphic function of the affected tributaries within the Project area.

Alternative 6 proposes that 17 drainages on Newhall Ranch be graded to accommodate pads for residential and commercial buildings, and that these flows be conveyed by buried storm drains varying in diameter from 30 to 144 inches. In total, approximately 43,334 feet of existing drainage channel would be converted to buried storm drains. The RMDP also proposes four partially-lined open channels on tributaries to the mainstem of the Santa Clara River within the RMDP boundaries. In some cases, streams would be relocated from their current locations and soft-bottom channels would be recreated in different locations generally parallel to the current alignments. The total area affected by the conversion to buried storm drain, reengineering, and/or bank stabilization for each drainage within the RMDP area is included in **Table 4.2-34**.

Reengineered channel area, installation of bank stabilization, conversion of the existing channels to buried storm drain, and road crossings would result in a total of 83.2 acres of existing channel impacted by the RMDP components, with 55.0 acres altered through reengineering and installation of bank stabilization.

**Table 4.2-34**
**Total Impacted Channel Area By Treatment Type**
**Alternative 6 - Tributaries**

| Tributary | Storm Drain Area (acres) | Stabilized and Reengineered Channel Area (acres) | Road Crossings -- Bridges & Culverts (acres) |
|---|---|---|---|
| Ayers Canyon | 0.0 | 0.0 | 0.2 |
| Agriculture Ditch | 1.4 | 0.2 | 0.0 |
| Chiquito Canyon | 1.0 | 16.1 | 1.0 |
| Dead-End Canyon | 0.5 | 0.0 | 0.0 |
| Exxon Canyon | 0.3 | 0.0 | 0.0 |
| Homestead Canyon | 0.6 | 0.0 | 0.0 |
| Humble Canyon | 0.1 | 0.0 | 0.0 |
| Lion Canyon | 3.4 | 3.0 | 0.4 |
| Long Canyon | 0.7 | 2.2 | 0.3 |
| Magic Mountain Canyon | 6.4 | 0.0 | 0.0 |
| Middle Canyon | 1.5 | 0.0 | 0.0 |
| Mid-Martinez Canyon | 2.1 | 0.0 | 0.0 |
| Off-Haul Canyon | 5.4 | 0.0 | 0.0 |
| Potrero Canyon | 0.8 | 26.4 | 0.6 |
| Salt Creek Canyon | 0.0 | 6.9 | 0.0 |
| San Martinez Grande Canyon | 0.0 | 0.1 | 0.1 |
| Unnamed Canyon 1 | 0.3 | 0.0 | 0.0 |
| Unnamed Canyon 2 | 0.5 | 0.0 | 0.0 |
| Unnamed Canyon A | 0.0 | 0.0 | 0.0 |
| Unnamed Canyon B | 0.5 | 0.0 | 0.0 |
| Unnamed Canyon C | 0.2 | 0.0 | 0.0 |
| Unnamed Canyon D | 0.0 | 0.0 | 0.0 |
| **TOTAL ALT. 6** | **25.6** | **55.0** | **2.6** |
| **TOTAL ALT. 2** | **38.0** | **62.7** | **2.1** |

Source: RMDP, 2008

The effects of these changes on the geomorphic function of the tributaries within the Project area can be determined with an evaluation of the hydrologic function metrics of the HARC (see **Section 4.6**, Jurisdictional Waters and Streams). **Table 4.2-35** compares the total hydrology AW-score units and the total HARC AW-score units calculated for the tributaries.

**Table 4.2-35**
**Summary of HARC AW- Total Score and Hydrology**
**Existing vs. Alternative 6 - Tributaries**

| Condition | HARC AW-Total Score | HARC AW-Hydrology |
|---|---|---|
| **Chiquito Canyon** | | |
| Existing | 12.59 | 15.95 |
| Alternative 6 | 15.92 | 15.40 |
| CHANGE | 3.33 | 0.55 |
| **San Martinez Grande Canyon** | | |
| Existing | 2.84 | 3.22 |
| Alternative 6 | 17.19 | 16.54 |
| CHANGE | 14.35 | 13.32 |
| **Long Canyon** | | |
| Existing | 3.22 | 3.55 |
| Alternative 6 | 4.83 | 5.25 |
| CHANGE | 1.61 | 1.70 |
| **Potrero Canyon** | | |
| Existing | 34.50 | 39.08 |
| Alternative 6 | 121.39 | 119.42 |
| CHANGE | 86.89 | 80.34 |
| **Lion Canyon** | | |
| Existing | 5.41 | 5.96 |
| Alternative 6 | 2.63 | 2.44 |
| CHANGE | -2.78 | -3.52 |
| **Minor Drainages*** | | |
| Existing | 21.27 | 21.70 |
| Alternative 6 | 11.16 | 11.24 |
| CHANGE | -10.11 | -10.46 |
| **Salt Creek Canyon** | | |
| Existing | 71.85 | 67.83 |
| Alternative 6 | 91.75 | 97.04 |
| **CHANGE** | 19.90 | 29.21 |
| **TOTAL CHANGE ALT. 6** | **+112.87** | **+110.38** |
| **TOTAL CHANGE ALT. 2** | **-7.17** | **-17.28** |

* "Minor Drainages" are located in the following canyons: Bridge Construction -- Castaic Creek; Buried Storm Drains - Homestead (2), Off-Haul (2), Mid Martinez (1), Humble (1), Exxon (2), Unnamed Canyon B (1), Unnamed Canyon C (1), Dead End (2), Unnamed Canyon D (1), Middle (1) and Magic Mountain (1).

In total, Alternative 6 would result in a net gain of 110.38 hydrology AW-score units and an overall net gain of 112.87 total HARC AW-score units within the tributaries. The overall increase in HARC AW-score units within the tributaries suggests that Alternative 6 components do not have an overall impact on the geomorphic function of the tributaries. Specifically, net gains in the total HARC AW-score units

would be produced in Chiquito, San Martinez Grande, Long, Potrero, and Salt Canyons, indicating that the gain in riparian/wetland function of these tributaries would compensate for any such losses in the other tributaries. Therefore, impacts would be less than significant relative to Significance Criterion 3 since they would not result in a substantial reduction in geomorphic function.

**Tributaries -- Significance Criterion 4: Construction and Scour Impacts to Riparian Vegetation (Significant but Mitigable).** Impacts to riparian vegetation within the tributaries located within the RMDP boundary are primarily associated with the physical alterations to the stream channels. As described in **Section 2.0**, Project Description, in some cases where a channel is currently incised and eroding its riparian corridor, it is more feasible to provide the desired degree of ecological function by relocating the channel and creating a stable channel with new vegetative plantings; where the channel is in good condition and has a healthy riparian corridor it is more desirable to preserve the creek in-situ and retrofit with small step-pool structures to protect against future headcuts. Under Alternative 6, approximately 43,334 lf of channel would be converted to buried storm drain. In addition, 75,402 lf of bank stabilization, 187 grade stabilizer structures, 9 bridges, and 8 culverts would be constructed as part of Alternative 6. Accordingly, nearly all tributary riparian reaches within the RMDP area would sustain impacts to riparian vegetation resources from grading or installation of RMDP components within the reach. The seven reaches in the Salt Creek drainage are exceptions in this regard; the entire portion of the Salt Creek watershed within the applicant's ownership would be dedicated as permanent open space and no fill of the drainage is proposed, except for habitat restoration or enhancement activities.

Reengineered channel area, installation of bank stabilization, and conversion of the existing channels to buried storm drain would result in a total of 83.2 acres of existing channel impacted by the RMDP components, with 55.0 acres altered through reengineering and installation of bank stabilization. These changes could have a significant effect on riparian vegetation of the tributary drainages. The effects of these changes on the geomorphic function of the tributaries within the Project area can be determined with an evaluation of the hydrologic function metrics of the HARC (see **Section 4.6**, Jurisdictional Waters and Streams).

**Table 4.2-35**, presented above, compares the total hydrology AW-score units and the total HARC AW-score units calculated for the tributaries. The HARC analysis indicates that, overall, Alternative 6 would result in substantial changes to the hydrologic function of the tributaries with net losses observed for the hydrology process metrics. In total, Alternative 6 would result in a net gain of 110.38 hydrology AW-score units and a net gain of 112.87 total HARC AW-score units within the tributaries. As such, implementation of the Alternative 6 RMDP components would involve a cumulative net gain of riparian area. In reaches where buried bank stabilization is proposed, the temporary impact zone would be revegetated with native riparian plants. In regards to scour of riparian vegetation, Alternative 6 could result in a substantial increase in the frequency and magnitude of scouring of riparian vegetation which, absent mitigation, would be a significant impact.

To mitigate these impacts Mitigation Measures SW-2 and SW-3 presented in **Section 4.6**, Jurisdictional Waters and Streams would provide riparian enhancement through removal of exotic species, restoration of sediment equilibrium, and recontouring of existing, incised banks to increase the extent of Corps and CDFG jurisdictional areas as well as providing avoidance and restoration measures in the Potrero and Salt

Creek watershed. In reaches where RMDP components would be constructed, the temporary impact zone would be revegetated with native riparian plants. Specifically, Mitigation Measure SW-5 (**Section 4.6**, Jurisdictional Waters and Streams) would be implemented to ensure that all areas where temporary construction impacts affect Corps or CDFG jurisdictional areas are revegetated (generally, these are areas where impacts would occur due to the construction of Project facilities). In addition, riparian habitat restoration activities that would be implemented in conjunction with the RMDP would include revegetation of native plant communities on candidate sites contiguous to existing riparian habitats. Site restoration would also include the maintenance of revegetation sites, including the control of non-native plants and irrigation system maintenance. As described in Mitigation Measures BIO-1, BIO-6, and BIO-7, monitoring of the restoration sites would be conducted to evaluate the success of revegetation efforts. Contingency plans and appropriate remedial measures to be implemented should habitat restoration objectives not be achieved would also be included in tentative map-level habitat restoration plans. **Section 4.5**, Biological Resources, provides more detail on the restoration methods proposed to be used. Incorporation and implementation of the specified mitigation measures will reduce the impacts relative to riparian scour to a less-than-significant level in relation to Significance Criterion 4. Accordingly, the impacts of the RMDP to the riparian habitat of the tributaries are considered significant prior to mitigation, but mitigable to a less-than-significant level relative to Significance Criterion 4 through implementation of Mitigation Measures SW-2, SW-3, SW-5, BIO-1, BIO-6, and BIO-7.

**SCP Direct Impacts**

**Significance Criterion 1: Short-Term Impacts from Construction (No Impact).** The SCP is a conservation and permitting plan for an upland plant species (spineflower), and would not authorize any construction activities within the Santa Clara River or tributary corridors. Therefore, no direct impacts would result from implementation of the SCP relative to Significance Criterion 1.

**Significance Criterion 2: Erosion and Downstream Deposition (No Impact).** The same analysis for Significance Criterion 1, above, applies to this criterion.

**Significance Criterion 3: Impacts to Geomorphic Function (No Impact).** The same analysis for Significance Criterion 1, above, applies to this criterion.

**Significance Criterion 4: Construction and Scour Impacts to Riparian Vegetation (No Impact).** The same analysis for Significance Criterion 1, above, applies to this criterion.

### 4.2.5.7.2. Indirect Impacts

**RMDP Indirect Impacts**

**Significance Criterion 1: Short-Term Indirect Impacts from Construction of Newhall Ranch Specific Plan Development (Significant but Mitigable).** Under Alternative 6, indirect impacts associated with construction of the Specific Plan development would be virtually the same as those for Alternative 2 (proposed Project). The indirect impacts from construction associated with the Specific Plan are included as part of the discussion for indirect RMDP impacts for Alternative 2.

Absent mitigation, there would be significant short-term sedimentation impacts during construction with respect to Significance Criterion 1. However, Mitigation Measures SP-4.2-2 (acquire state and federal permits), SP-4.2-3 (CDFG streambed agreements), SP-4.2-5 (DPW plan and map approvals), and SP-4.2-7 (DPW SUSMP and SWPPP requirements) would ensure that regulatory requirements are implemented and short-term impacts related to construction of RMDP components are less than significant through proper application of sediment controls and other BMPs required by existing local, state, and federal regulations.

**Significance Criterion 2: Indirect Impacts from Erosion and Downstream Deposition (Significant but Mitigable).** Under Alternative 6, indirect impacts associated with erosion and downstream deposition would be similar to those for Alternative 2 (proposed Project). The developed area of the Specific Plan would be covered with non-erosive surfaces, including pavement and permanent vegetation, which would reduce the sedimentation of site runoff. Alternative 6 proposes to develop 556 acres less developed area in the Newhall Ranch Specific Plan area than that proposed by Alternative 2 (proposed Project). Accordingly, less surface runoff would occur under Alternative 6. Permanent erosion control measures that reduce sediment in runoff include check dams to reduce flow velocities in tributary water courses, drainage swales, slope drains, subsurface drains, storm drain inlet/outlet protection, and sediment traps.

The drainage areas in which the Specific Plan site lies would not be completely developed; therefore, storm flows from the upper reaches would contain sediment and vegetative debris. The amount of sediment and debris contained in the storm flows would be dependent upon the size of the area being drained and whether or not the area had been subject to burning. If this debris enters and clogs on-site drainages, upstream flooding could occur, which would be a significant impact. Because Alternative 6 would result in less surface runoff compared to Alternative 2, this impact would be less than that associated with Alternative 2, but still significant.

In order to prevent sediment and debris from the upper reaches of the drainage areas from entering storm drainage improvements, permanent erosion control measures will be implemented, including the installation of desilting and debris basins, drainage swales, slope drains, storm drain inlet/outlet protection, and sediment traps. (Compliance Measure SP-4.2-6, DPW-approved permanent erosion controls.) The specific improvements for each drainage area would be designed as part of the final Drainage Plan prepared to DPW standards during the subdivision process. (Compliance Measure SP-4.2-5, DPW plan and map approvals.) In addition, Compliance Measure SP-4.2-7, DPW SUSMP and SWPPP requirements would further reduce erosion impacts by requiring that stormwater discharges from open channels or drainage systems discharging to the Santa Clara River in excess of four fps (erosive flows) be controlled to prevent accelerated erosion and protect River habitat. Discharge flows would be regulated using water control features and energy dissipation structures where required to reduce discharge velocities to non-erosive rates. Specifically, implementation of GRR-1 and GRR-4, (DPW required runoff controls and hydromodification controls and channel design respectively) will further control the rate of stormwater runoff to minimize downstream erosion through construction of BMPs, and channels will be designed to incorporate the calculated post-development equilibrium slope to ensure a dynamically stable condition allowing for more or less equal amounts of erosion and deposition.

With installation of these temporary and permanent erosion/sedimentation control measures, the Specific Plan would not result in significant sedimentation or debris-related impacts either on or downstream of the Specific Plan site. Instead, the Specific Plan would have a beneficial post-construction impact on downstream sedimentation because, as the site builds out, some steep slopes would be graded to flatter slopes, and many of the areas of the site that have been subject to the vegetation-denuding effects of grazing and burning would become covered with vegetation and other non-erodible surfaces.

Similar to Alternative 2, the changes to the site under Alternative 6 would reduce site sedimentation to below existing levels and would reduce debris volume generation throughout the tributary watershed, although to a lesser degree than under Alternative 2. This would, in turn, have beneficial downstream deposition impacts because burned and bulked flows from the site would be substantially reduced, resulting in lower flood flow rates. With the implementation of the Project-incorporated Mitigation Measures SP-4.2-5, SP-4.2-6, and SP-4.2-7 (DPW plan and map approvals, DPW-approved erosion controls, and DPW SUSMP and SWPPP requirements respectively) erosion and deposition impacts resulting from build-out of the Newhall Ranch Specific Plan development are considered less than significant prior to mitigation. The implementation of Project-Specific mitigation measures GRR-1 and GRR-4 (DPW required runoff controls and hydromodification controls and channel design respectively) would further reduce these impacts. Accordingly, erosion and downstream deposition impacts would be maintained to less than significant relative to Significance Criterion 2.

**Significance Criterion 3: Indirect Impacts to Geomorphic Function (Significant but Mitigable).** Potential indirect hydromodification impacts to the Santa Clara River and tributaries include stream corridor disturbances from Specific Plan build-out and associated increased runoff intensity from the urbanized tributary drainages, which would be a significant impact prior to mitigation. Alternative 6 proposes to develop 556 acres less developed area in the Newhall Ranch Specific Plan area than that proposed by Alternative 2 (proposed Project). Accordingly, less surface runoff would occur under Alternative 6. The indirect impacts to geomorphic function associated with the Specific Plan are included as part of the discussion for indirect RMDP impacts for Alternative 2. Since Alternative 6 would result in less surface runoff than Alternative 2, the impacts to the geomorphic function of the Santa Clara River and tributaries would also be less under this alternative, but would still be significant. Each of the tributary drainages is designed with hydromodification control components in accordance with DPW design standards to ensure that soft-bottom waterways maintain an equilibrium between sediment supply to the waterway and sediment transport through the waterway.

Implementation of Mitigation Measures SP-4.2-5 (DPW plan and map approvals) would ensure that no significant erosion or sedimentation impacts would occur as a result of the Project. The additional implementation of Mitigation Measures GRR-1 through GRR-6 (DPW required runoff controls, minimization of bridge and structures, structural durability, hydromodification controls and channel design, sediment and debris control facilities, sediment redistribution) would ensure that no substantial reductions in geomorphic function would occur in the RMDP area tributaries. Accordingly, the impacts are considered less than significant relative to Significance Criterion 3.

**Significance Criterion 4: Indirect Construction and Scour Impacts to Riparian Vegetation (Less than Significant).** Implementation of the Alternative 6 RMDP component would indirectly facilitate the

build-out of the Specific Plan sites. The confluence of the tributaries to the Santa Clara River are all maintained within the SMA/SEA 23 boundaries and are preserved in a largely natural state. As indicated above, no significant increases in velocity, erosion, or sedimentation would occur in the Santa Clara River because of the proposed build-out.

The implementation of the Specific Plan would result in the loss of riparian vegetation along the RMDP area drainages. Losses of riparian vegetation during construction are addressed in **Section 4.5**, Biological Resources. The impacts to riparian vegetation can be evaluated with the use of the HARC analysis. As discussed in the preceding sections, the number of AW-score units ultimately describes the value of a particular reach, and the number of AW-score units impacted versus preserved will show the impacts of the proposed Project and alternatives on wetland and riparian resources (*i.e.*, post-Project HARC scores serve as a surrogate indicator of potential increases in the frequency and magnitude of scour of riparian vegetation [refer to **Subsection 4.2.5.1.4**, Scour Impacts to Riparian Vegetation]). Conceptually, the alternative with the fewest lost AW-score units would be the least damaging alternative. However, an alternative with a greater loss of HARC AW-score units may be mitigated by producing AW-score units in another location within the Project area through wetland/riparian restoration or creation (see **Section 4.6**, Jurisdictional Waters and Streams, for further discussion on the HARC assessment methods). **Table 4.2-35**, presented above, compares the total hydrology AW-score units and the total HARC AW-score units calculated for the tributaries.

The HARC analysis indicates that, overall, Alternative 6 would result in substantial changes to the hydrologic function of the tributaries with net losses observed for the hydrology process metrics. In total, Alternative 6 would result in a net gain of 110.38 hydrology AW-score units and a net gain of and 112.87 total HARC AW-score units within the tributaries. The overall increase in HARC AW-score units within the tributaries suggests that Alternative 6 components do not have an overall impact on the geomorphic function of the tributaries. Specifically, net gains in the total HARC AW-score units would be produced in Chiquito, San Martinez Grande, Potrero, Long, and Salt Creek Canyon, indicating that the gain in riparian/wetland function of these tributaries would compensate for any such losses in the other tributaries. Therefore, impacts would be less than significant relative to Significance Criterion 4.

**Significance Criterion 5: Impacts to Riparian Resources Supported by the Middle Canyon Spring (Significant but Mitigable).** Although Alternative 6 would result in less development in Middle Canyon compared to Alternative 2, the potential impacts of Alternative 6 on the groundwater hydrology associated with the Middle Canyon Spring are similar to those discussed in the impact analysis for Alternative 2. Accordingly, Alternative 6 has the potential to result in a significant impact to riparian resources supported by the Middle Canyon Spring. However, implementation of Mitigation Measures BIO-74 and BIO-77 would reduce these impacts to less than significant relative to Significance Criterion 5. Mitigation Measure BIO-74 requires the installation of fencing and signage around the spring prior to construction, during construction, and following construction to restrict access and protect the spring area. Mitigation Measure BIO-77 includes the development of the Middle Canyon Spring HMP in consultation with CDFG and implementation of HMP following approval by CDFG.

**SCP Indirect Impacts**

**Significance Criterion 1: Short-Term Impacts from Construction Newhall Ranch Specific Plan, VCC, and Entrada Developments (Significant but Mitigable).** Implementation of the Alternative 6 SCP component would indirectly facilitate the build-out of the Specific Plan and Entrada sites. The VCC site would not be developed under this alternative. With the exception of the VCC site, construction impacts associated with the build-out facilitated by Alternative 6 would be virtually the same as those associated with the build-out facilitated by Alternative 2. Short-term construction impacts to geomorphology associated with construction of the Specific Plan development are included among the indirect impacts of the RMDP Project component, and are discussed in the preceding subsections on Alternative 2. The indirect impacts associated with the build-out of the Entrada developments are included among the indirect impacts of the SCP Project component, and are discussed in the preceding subsections on Alternative 2.

No previously adopted mitigation measures exist for the VCC or Entrada planning areas. Therefore, the geomorphology-related mitigation measures required by this EIS/EIR in those planning areas include the measures previously adopted by the County for the Specific Plan site in addition to new measures proposed by the Corps and CDFG. Accordingly, with the implementation of Compliance Measures SP-4.2-5, SP 4.2-6, and SP 4.2-7 (DPW plan and map approvals, DPW-approved permanent erosion controls, and DPW SUSMP and SWPPP requirements), short-term impacts from the build-out of the Newhall Ranch Specific Plan site are considered significant but mitigable to less than significant relative to Significance Criterion 1 through proper design and BMP implementation.

**Significance Criterion 2: Indirect Impacts from Erosion and Downstream Deposition (Significant but Mitigable).** Implementation of the Alternative 6 SCP component would indirectly facilitate the build-out of the Specific Plan and Entrada sites. The VCC site would not be developed under this alternative. Indirect impacts of erosion and downstream deposition associated with build-out of the Specific Plan development are included among the indirect impacts of the RMDP Project component, and are discussed in the preceding subsections on Alternative 2. The indirect impacts associated with the build-out of the Entrada development are included among the indirect impacts of the SCP Project component, and are discussed in the preceding subsections on Alternative 2.

Alternative 6 proposes to develop 78.6 acres less developed area in the Entrada planning area than that proposed by Alternative 2 (proposed Project). The 177.6 acre commercial / industrial development in the VCC project would not be constructed under this alternative. Accordingly, less surface runoff would occur under Alternative 6. Because Alternative 6 would result in less surface runoff compared to Alternative 2, this impact would be less than that associated with Alternative 2, but would still be significant.

With the implementation of Compliance Measures SP-4.2-5, SP 4.2-6, and SP 4.2-7 (DPW plan and map approvals, DPW-approved permanent erosion controls, and DPW SUSMP and SWPPP requirements respectively) the erosion and downstream deposition impacts of the Newhall Ranch Specific Plan, VCC, and Entrada developments would be reduced to a less-than-significant level absent additional mitigation relative to Significance Criterion 2.

**Significance Criterion 3: Indirect Impacts to Geomorphic Function (Significant but Mitigable).** Implementation of the Alternative 6 SCP component would indirectly facilitate the build-out of the Specific Plan and Entrada sites. The VCC site would not be developed under this alternative. Indirect hydromodification impacts associated with build-out of the Specific Plan development are included among the indirect impacts of the RMDP Project component, and are discussed in the preceding subsections on Alternative 2. The indirect impacts associated with the build-out of the Entrada development are included among the indirect impacts of the SCP Project component, and are discussed in the preceding subsections on Alternative 2. Alternative 6 proposes to develop 78.6 acres less developed area in the Entrada planning area than that proposed by Alternative 2 (proposed Project). The 177.6 acre commercial / industrial development the VCC project would not be constructed under this alternative. Accordingly, less surface runoff would occur under Alternative 6. Because Alternative 6 would result in less surface runoff compared to Alternative 2, this impact would be less than that associated with Alternative 2, but still significant.

Mitigation Measures GRR-1, GRR-2, and GRR-4 (DPW required runoff controls, minimization of bridge and structures, and hydromodification controls and channel design) would be implemented to reduce impacts to the geomorphic function of the tributaries resulting from the build-out of the proposed developments. These Mitigation Measures will ensure that erosion and deposition impacts are mitigated to less than significant. Accordingly, impacts resulting from the build-out of the Specific Plan, VCC, and Entrada planning areas are considered to be significant but mitigable to a less-than-significant level relative to Significance Criterion 3.

**Significance Criterion 4: Indirect Construction and Scour Impacts to Riparian Vegetation (Less than Significant).** Implementation of the Alternative 6 SCP component would indirectly facilitate the build-out of the Specific Plan and Entrada sites. The VCC site would not be developed under this alternative. Indirect impacts to riparian vegetation associated with build-out of the Specific Plan development are included among the indirect impacts of the RMDP Project component, and are discussed in the preceding subsections on Alternative 2. The indirect impacts associated with the build-out of the VCC and Entrada developments are included among the indirect impacts of the SCP Project component, and are discussed in the preceding subsections on Alternative 2. Alternative 6 proposes to develop 78.6 acres less developed area in the Entrada planning area than that proposed by Alternative 2 (proposed Project). The 177.6 acre commercial / industrial development in the VCC project would not be constructed under this alternative. Accordingly, less disturbance to riparian vegetation would occur under Alternative 6. Because Alternative 6 would result in less disturbance to riparian vegetation compared to Alternative 2, this impact would be less than that associated with Alternative 2, and therefore, less than significant relative to Significance Criterion 4.

#### 4.2.5.7.3 Secondary Impacts

**RMDP and SCP Secondary Impacts**

**Significance Criterion 6: Impacts to the "Dry Gap" (Less than Significant).** The potential impacts associated with the Newhall Ranch WRP for Alternative 6 would be similar to those described in the impact analysis for Alternative 2. As discussed in that analysis, the potential impacts of the Newhall Ranch WRP to the Dry Gap are considered less-than-significant relative to Significance Criterion 6 since

they will not substantially lengthen the duration of seasonal flow in the Dry Gap. This significance finding is based on the fact discharge from the WRP will occur in the winter and will be small relative to the overall flow in the Santa Clara River and the existing data which show that increases in base flow due to discharges from the Valencia WRP and the Saugus WRP since the 1960s have not led to a substantial change in the duration of seasonal flow in the Dry Gap.

**Significance Criterion 7: Impacts to Ventura County Beaches (Less than Significant).** The effects of Alternative 6 components on beach replenishment are a function of the sediment load delivered through the Project reach. As discussed in **Subsection 4.2.3.1.3**, Beach Replenishment, above, the Santa Clara River contributes approximately 60 percent of beach sand within Ventura County. However, the reduction of area subject to erosion due to project components and the build-out of the Specific Plan and Entrada plan areas under Alternative 6 could result in a relative reduction of floodwater sediment, which could negatively impact beaches, as incrementally less sediment would be available for their replenishment.

The RMDP component of Alternative 6 that would have the most effect on sediment supply in the tributaries is the conversion of tributary drainage to buried storm drain; the majority of the impacts to beach replenishment are related to the indirect effects of the Specific Plan build-out as discussed under the indirect impact discussion below. For this analysis, it is assumed that the area converted to buried storm drain results in a net loss of sediment supplied by the affected area. As detailed in **Subsection 4.2.3.1.3**, Beach Replenishment, roughly 1,170 tons per square mile per year of suspended sediment originates from the area upstream of the Los Angeles County/Ventura county line. Approximately 25.6 acres (0.04 square miles) within the tributaries that could potentially contribute to sediment supply would be converted to buried storm drain; this could result in a net reduction of 47 tons of sediment per year.

In order to estimate the direct impacts to sediment supply associated with the RMDP components within the Santa Clara River floodplain, it is assumed that the floodplain areas subject to velocities greater than four fps contribute to the sediment supply within the Project reach during the capital flood event. Accordingly, Alternative 6 would result in a maximum reduction of 171 acres (0.27 square miles) of floodplain area subject to velocities greater than four fps during the capital flood event (see **Table 4.2-32**). Therefore, Alternative 6 would result in a maximum net reduction of about 171 acres (0.27 square miles) of channel area that could potentially contribute to sediment supply. Given this estimate, the reduction of 171 acres (0.27 square miles) would result in a maximum direct reduction of approximately 315 tons of sediment per year. In total, Alternative 6 could result in the reduction of 362 tons of sediment per year delivered through the Project reach.

The build-out of the Specific Plan would have greater effects to the sediment supplied to the River system. The build-out of the Specific Plan under Alternative 6 would convert approximately 4,456 acres (7.0 square miles) to non-erodible surfaces, including pavement and permanent vegetation that would reduce the sedimentation of site runoff. Accordingly, this would result in the reduction of roughly 8,146 tons of sediment per year.

The drainage areas in which the Entrada site lies would not be completely developed; therefore, storm flows from the upper reaches would contain sediment and vegetative debris. The VCC planning area would not be developed under this alternative. The Entrada planning area consists of approximately 316.1

acres. Development of the Entrada site would result in approximately 144.2 acres (0.23 square miles) of non-erosive surfaces, including pavement and permanent vegetation that would reduce the sedimentation of site runoff which would result in a direct reduction of roughly 264 tons of sediment per year.

As detailed in **Subsection 4.2.3.1.3**, Beach Replenishment, the Santa Clara River exports an estimated 4.08 million tons per year from its mouth into the Santa Barbara Channel. In total, the RMDP and SCP would result in the net reduction of 8,410 tons of sediment per year, or approximately 0.2 percent reaching the Santa Barbara Channel, which would be a less-than-significant impact. In order to minimize this reduction in sediment delivery to Ventura County beaches, Mitigation Measure GRR-6 specifies that sediment from upland sources, such as debris basins and other sediment retention activities, would be redistributed in permitted upland and/or riparian locations along the Santa Clara River to reintroduce sediment for beach replenishment purposes. This sediment management activity would lessen the adverse effect of debris and sediment reduction on downstream beach erosion.

Based on this analysis, the reduction of sediment delivered to Ventura County beaches due to the RMDP components and build-out of the Specific Plan, VCC and Entrada planning areas would be less than significant relative to Significance Criterion 7 since the decrease in average annual sediment transported to the beaches would be less than 1 percent.

#### 4.2.5.8 Impacts of Alternative 7 (Avoidance of 100-Year Floodplain, Elimination of Two Planned Bridges, and Avoidance of Spineflower)

Under Alternative 7, infrastructure would be constructed in and adjacent to the Santa Clara River and tributary drainages within the Project area.

**Santa Clara River. Figure 3.0-38** depicts the locations of the Alternative 7 proposed RMDP Santa Clara River features relative to river jurisdictional areas. Bank protection would still be required to protect Specific Plan development from flooding and erosion, and would be constructed in upland areas as shown on **Figure 3.0-38**. This alternative would involve the creation of pads for residential and commercial buildings, and would require 17,425 lf of buried bank stabilization on the north bank, and 8,089 lf of buried bank stabilization on the south bank of the Santa Clara River. One bridge (Long Canyon Road Bridge) would be constructed across the Santa Clara River at the mouth of Long Canyon. In addition, the WRP outfall to the Santa Clara River would be constructed.

**Table 4.2-36a** summarizes the characteristics of the major RMDP infrastructure along the Santa Clara River, including north side (17,425 lf) and south side (8,089 lf), for a total of 25,514 lf of buried bank stabilization to be constructed along the Santa Clara River. This table shows 22 storm drain outlets along the north bank and three such outlets on the south bank of the Santa Clara River (25 storm drain outlets). In addition, the table documents the length, width, and vertical clearance of the Long Canyon Road Bridge, as well as the number of piers supporting that bridge. A summary of the RMDP infrastructure authorized under the RMDP component of Alternative 7 is presented in **Table 4.2-36a**. The proposed RMDP components within the Santa Clara River are described and illustrated in **Section 3.0**, Description of Alternatives, Alternative 7 -- RMDP Santa Clara River Features.

**Table 4.2-36a**
**Alternative 7 Santa Clara River Major RMDP Infrastructures**

| Santa Clara River Location | Bank Stabilization (lf) | Outlets (No.) | Bridges | | | |
|---|---|---|---|---|---|---|
| | | | Length (lf) | Length (lf) | Length (lf) | Length (lf) |
| **Bridges** | | | | | | |
| Commerce Center Drive Bridge | - | - | - | - | - | - |
| Long Canyon Road Bridge | - | - | 2,600 | 100 | 25 | 31-40 |
| Potrero Canyon Road Bridge | - | - | - | - | - | - |
| **Banks** | | | - | - | - | - |
| North River Bank | 17,425 | 22 | - | - | - | - |
| South River Bank | 8,089 | 3 | - | - | - | - |
| **Total** | **25,514** | **25** | - | - | - | - |

Source: RMDP, 2008.

Alternative 7 would involve the designation of 492.7 acres of Newhall Ranch as spineflower preserve, in addition to the 64.3 acres of previously designated conservation easements. An additional 66.0 acres in the Entrada planning area and 37.6 acres in the VCC planning area would be dedicated as well, bringing the total spineflower preserves under Alternative 7 to 660.6 acres.

**Tributary Drainages. Figure 3.0-39** (**Section 3.0**, Description of Alternatives) illustrates the modified, converted, and preserved tributary drainages within the Project area under Alternative 7. This alternative would involve the creation of pads for residential and commercial buildings, and would require 19,330 lf of ephemeral drainages within the Project area to be graded and converted to buried storm drains.

Under Alternative 7, there are five major tributary drainages that would be partially regraded or modified but remain in a soft-bottom channel condition: Chiquito Canyon, San Martinez Grande Canyon, Potrero Canyon, Long Canyon, and Lion Canyon. Significant portions of several small, tributary drainages would be graded and replaced with storm drains or other appropriate conveyance facilities, including: Dead-End Canyon, Exxon Canyon, Mid-Martinez Canyon, Off-Haul Canyon, Homestead Canyon, the Chiquito Canyon agricultural ditch, Unnamed Canyon B, Unnamed Canyon C, Unnamed Canyon 1, and Unnamed Canyon 2.

**Chiquito Canyon.** The west bank of Chiquito Canyon would remain unstabilized, with the exception of the area within approximately 1,000 feet of the mouth as shown on **Figure 3.0-40** (**Section 3.0**, Description of Alternatives). On the east bank, Alternative 7 would include stabilization in upland areas along the entire length of the drainage except for a 1,000-foot section at the northern Project area boundary. Three bridges would cross the Chiquito Canyon drainage under this alternative, and would be located approximately 2,000, 3,000, and 5,000 feet upstream of the Santa Clara River confluence. In addition, the existing two-lane bridge allowing SR-126 to cross the drainage would be widened to four lanes (**Figure 3.0-40**, **Section 3.0**, Description of Alternatives). Approximately 1,454 lf of buried bank

stabilization would be installed along the west bank and 5,999 lf of buried bank stabilization would be installed on the east bank of Chiquito Canyon. In addition, approximately 192 lf of drainage would be converted to buried storm drain. **Table 4.2-36b** describes the Alternative 7 tributary drainage RMDP infrastructure characteristics, including the Chiquito Canyon modified drainage. The proposed RMDP components are described and illustrated in **Section 3.0**, Description of Alternatives, Proposed Chiquito Tributary Treatments -- Alternative 7.

**San Martinez Grande Canyon.** In San Martinez Grande Canyon, buried bank stabilization would be installed in upland areas along the lower one-third of the west bank and approximately two-thirds of the east bank as shown on **Figure 3.0-41** (**Section 3.0**, Description of Alternatives). Approximately 1,233 lf of buried bank stabilization along the west bank and 3,149 lf of buried bank stabilization along the east bank would be installed under this alternative. One new bridge would cross the drainage approximately two-thirds of the way up from the mouth of the canyon to the northern boundary of the Project area, and another would be installed just upstream of SR-126 (**Figure 3.0-41**, **Section 3.0**, Description of Alternatives). In addition, this alternative would include widening of SR-126 north of the confluence of San Martinez Grande Canyon with the Santa Clara River pursuant to the Caltrans SR-126 widening project. **Table 4.2-36b** describes the Alternative 7 tributary drainage RMDP infrastructure characteristics, including the San Martinez Grande Canyon modified drainage. The proposed RMDP components are described and illustrated in **Section 3.0**, Description of Alternatives, Proposed San Martinez Grande Tributary Treatments -- Alternative 7.

**Long Canyon.** In Long Canyon, buried bank stabilization would be installed in upland areas along the full length of both banks between the mouth and the eastern Project area boundary as shown on **Figure 3.0-42** (**Section 3.0**, Description of Alternatives). Approximately 8,800 lf of buried bank stabilization along the west bank and 10,871 lf of buried bank stabilization along the east bank would be installed under this alternative. In addition, approximately 961 lf of drainage would be converted to buried storm drain. Two bridges would cross the drainage, located approximately 2,000 feet upstream of the Santa Clara River confluence and approximately 1,000 feet downstream (Magic Mountain Parkway) of the eastern boundary of the Project area. **Table 4.2-36b** describes the Alternative 7 tributary drainage RMDP infrastructure characteristics, including the Long Canyon modified drainage. The proposed RMDP components are described and illustrated in **Section 3.0**, Description of Alternatives, Proposed Long Canyon Tributary Treatments -- Alternative 7.

**Table 4.2-36b**
**Alternative 7 Tributary Drainage RMDP Infrastructure**

| Drainage Location | Drainage Modified (lf) | Drainage Converted to Buried Storm Drain (lf) | Bank Stabilization[1] (lf) | | Preserved Drainage (lf) | Road Crossings | |
|---|---|---|---|---|---|---|---|
| | | | West Bank | East Bank | | Bridges | Culverts |
| **Modified Drainages** | | | | | | | |
| Chiquito Canyon | 468 | 192 | 1,454 | 5,999 | 11,399 | 3 | 0 |
| Lion Canyon | 1,059 | 0 | 1,931 | 1,906 | 10,871 | 4 | 0 |
| Long Canyon | 1,286 | 961 | 8,800 | 10,871 | 8,331 | 2 | 0 |
| Potrero Canyon | 907 | 1,121 | 26,274 | 22,363 | 37,664 | 7 | 0 |
| San Martinez Grande Canyon | 269 | 0 | 1,233 | 3,149 | 4,901 | 2 | 0 |
| Subtotal | 3,989 | 2,274 | 39,692 | 44,287 | 73,167 | 18 | 0 |
| **Unimproved/Converted Drainages** | | | | | | | |
| Agricultural Ditch | 1,499 | 297 | 0 | 0 | 0 | 0 | 0 |
| Ayers Canyon | 106 | 0 | 0 | 0 | 2,359 | 1 | 0 |
| Dead-End Canyon | 0 | 928 | 0 | 0 | 1,003 | 0 | 0 |
| Exxon Canyon | 0 | 1,276 | 0 | 0 | 2,265 | 0 | 0 |
| Homestead Canyon | 0 | 609 | 0 | 0 | 0 | 0 | 0 |
| Humble Canyon | 0 | 325 | 0 | 0 | 5,212 | 0 | 0 |
| Middle Canyon | 4 | 0 | 0 | 0 | 7,582 | 0 | 0 |
| Mid-Martinez Canyon | 22 | 4,541 | 0 | 0 | 250 | 0 | 0 |
| Off-Haul Canyon | 0 | 2,611 | 0 | 0 | 6,167 | 0 | 0 |
| Salt Canyon | 7,290 | 0 | 0 | 1,992 | 101,470 | 0 | 0 |
| Magic Mountain Canyon | 0 | 0 | 0 | 0 | 6,111 | 0 | 0 |
| Unnamed Canyon 1 | 0 | 4,647 | 0 | 0 | 0 | 0 | 0 |
| Unnamed Canyon 2 | 0 | 416 | 0 | 0 | 0 | 0 | 0 |
| Unnamed Canyon A | 0 | 0 | 0 | 0 | 1,293 | 0 | 0 |
| Unnamed Canyon B | 0 | 1,004 | 0 | 0 | 568 | 0 | 0 |
| Unnamed Canyon C | 0 | 402 | 0 | 0 | 869 | 0 | 0 |
| Unnamed Canyon D | 0 | 0 | 0 | 0 | 1,492 | 0 | 0 |
| Subtotal | 8,921 | 17,056 | 0 | 1,992 | 136,641 | 0 | 0 |
| **Totals** | **12,910** | **19,330** | **39,692** | **46,279** | **209,809** | **19** | **0** |

Notes:
[1] The lf of bank stabilization does not necessarily reflect impacts to jurisdictional areas; it only provides the linear feet of bank protection to be installed along various tributary drainages.

Source: RMDP, 2008.

**Potrero Canyon.** Under Alternative 7, the Potrero Canyon drainage would be stabilized with buried soil cement installed in upland areas along the full length of the north/east banks between the mouth and the eastern boundary of the Project area as shown on **Figure 3.0-43** (**Section 3.0**, Description of Alternatives). The south/west bank would be similarly stabilized, but the mesic meadow area at the mouth of Potrero Canyon would not have bank protection installed on the west side. Approximately 26,274 lf of buried bank stabilization along the west bank and 22,363 lf of buried bank stabilization along the east bank would be installed under this alternative. In addition, approximately 1,121 lf of drainage would be converted to buried storm drain. Seven new bridge crossing locations would be constructed across the drainage as shown on **Figure 3.0-43** (**Section 3.0**, Description of Alternatives). **Table 4.2-36b** describes the Alternative 7 tributary drainage RMDP infrastructure characteristics, including the Potrero Canyon modified drainage. The proposed RMDP components are described and illustrated in **Section 3.0**, Description of Alternatives, Proposed Potrero Tributary Treatments -- Alternative 7.

**Lion Canyon.** Approximately 1,931 lf of buried bank stabilization along the west bank and 1,906 lf of buried bank stabilization along the east bank would be installed under this alternative. Four bridges would be constructed across the three forks of the Lion Canyon drainage, one across the east fork, two across the middle fork, and one across the west fork as shown on **Figure 3.0-44** (**Section 3.0**, Description of Alternatives). **Table 4.2-36b** describes the Alternative 7 tributary drainage RMDP infrastructure characteristics, including the Lion Canyon modified drainage. The proposed RMDP components are described and illustrated in **Section 3.0**, Description of Alternatives, Proposed Lion Canyon Tributary Treatments -- Alternative 7.

**Minor Tributaries and Drainages.** Implementation of the proposed RMDP would involve the placement of one new culverted road crossing in Ayers Canyon, a minor drainage on the south side of the River; in addition, the existing six-lane bridge allowing SR-126 to cross the Castaic Creek drainage would be expanded to eight lanes. Upland areas along one segment of the Salt Creek drainage would be stabilized with 1,992 lf of buried soil cement, and the Salt Creek watershed would be dedicated as permanent open space in conjunction with the High Country SMA/SEA 20. Minor RMDP-related treatments to tributary drainages such as Salt Creek Canyon are shown on **Figure 3.0-39** (**Section 3.0**, Description of Alternatives) for Alternative 7. Approximately 19,330 lf of existing channel would be converted to buried storm drain under this alternative. **Table 4.2-36b** describes the Alternative 7 tributary drainage RMDP infrastructure characteristics, including the converted and preserved minor tributary drainages.

Implementation of Alternative 7 would result in the reduction of approximately 1,247 acres of developable area in the Newhall Ranch Specific Plan area compared to the build-out potential of the proposed RMDP. This alternative also would result in a decrease of 72.7 acres of developable area for the Entrada planning area. The 177.6 acre commercial / industrial development in the VCC project would not be constructed under this alternative. The reduction of buildable space would occur due to preservation of streams and riparian areas, designation of spineflower preserves, close proximity to unstabilized drainages, and reduction of access to isolated parcels.

#### 4.2.5.8.1 Direct Impacts

**RMDP Direct Impacts**

**Santa Clara River -- Significance Criterion 1: Short-Term Impacts from Construction of Bridges, Bank Stabilization, and Turf Reinforcement Mats (Significant but Mitigable).** Installation of bank stabilization features and bridge piers and abutments would directly impact elements of Santa Clara River geomorphology. Bridge piers and abutments would have localized effects on channel alignment. This would be a significant impact prior to mitigation. Under Alternative 7, the Potrero Canyon Road and Commerce Center Drive Bridges are not proposed and the associated bridge pier and abutment features are not required. In addition, the bank stabilization for the western one half of the Landmark project site has been pulled back from the existing conditions 100-year floodplain and CDFG jurisdictional limit to avoid permanent impacts. In general, the bank stabilization locations were designed to avoid Corps and CDFG jurisdictional areas and the Project reach. Since fewer bridge pier and abutment features and fewer linear feet of bank stabilization would be constructed, Alternative 7 would have less of a direct effect on the Santa Clara River geomorphology than Alternative 2, although still significant. Specifically, Alternative 7 would result in approximately 60 percent less floodplain area temporarily disturbed during the construction of RMDP components within the Santa Clara River and terraced areas along the edge of the riverbed. Direct construction impacts associated with build-out of the Specific Plan development are included among the direct impacts of the RMDP Project component, and are discussed in the preceding subsections on Alternative 2.

Implementation of Mitigation Measure SP-4.2-2 (acquire state and federal permits), SP-4.2-3 (CDFG streambed agreements), SP-4.2-5 (DPW plan and map approvals), and SP-4.2-7 (DPW SUSMP and SWPPP requirements) would reduce the short-term impacts to the Santa Clara River geomorphology. Specifically, construction of the RMDP components would be subject to CWA section 402(p), which regulates construction, municipal, and industrial stormwater discharges under the NPDES program. The Project proposes to implement a regional stormwater mitigation plan (**Appendix 4.4**, Geosyntec, 2008) to comply with NPDES permit requirements. Pursuant to NPDES regulations for permitting of stormwater discharges, SWRCB has issued a statewide general Permit and Waste Discharge Requirements for stormwater discharges from construction sites. Under this Construction General Permit, discharges of stormwater from construction sites with a disturbed area of one or more acres are required to either obtain individual NPDES permits for stormwater discharges or be covered by the Construction General Permit. Coverage under the Construction General Permit is accomplished by completing and filing a Notice of Intent with SWRCB and implementing a SWPPP. This plan requires the implementation of BMPs to reduce or eliminate pollutants in stormwater discharges. Therefore, short-term sedimentation impacts with respect to Significance Criterion 1 during construction would be reduced to a less than significant through the implementation of existing regulatory requirements and obtaining required permits from the State and County.

Absent mitigation, there would be significant short-term sedimentation impacts during construction with respect to Significance Criterion 1. However, Mitigation Measures SP-4.2-2 (acquire state and federal permits), SP-4.2-3 (CDFG streambed agreements), SP-4.2-5 (DPW plan and map approvals), and SP-4.2-7 (DPW SUSMP and SWPPP requirements) would ensure that regulatory requirements are implemented and short-term impacts related to construction of RMDP components are less than significant through

proper application of sediment controls and other BMPs required by existing local, state, and federal regulations.

**Santa Clara River -- Significance Criterion 2: Erosion and Downstream Deposition (Significant but Mitigable).** Implementation of the RMDP improvements and facilities, particularly site clearing and grading operations, would have the potential to increase sediment flows downstream during storm events which may result in substantial erosion and deposition and could result in significant impacts downstream.

As discussed in **Subsection 4.2.5.1**, Impact Assessment Methods, a representative velocity of 4.0 fps was determined to be the appropriate indicator for potential erosion. Direct impacts associated with erosion could result if the RMDP improvements resulted in an increase of the two- to 100-year and capital flood floodplain area subject to velocities greater than four fps. **Table 4.2-37** includes the change in the total area of floodplain, delineated by vegetation type, where velocities exceed four fps for each return interval of Alternative 7 from existing conditions.

The total floodplain area subject to potentially erosive velocities would be decreased as a result of Alternative 7 during the 2-, 5-, 10-, 50-, and 100-year return interval flows and the capital flood event. An increase would be observed during the 20-year flood event; however, the additional 0.4 acres subject to velocities greater than four fps is not considered to be significant relative to the substantial decrease in area subject to erosive velocities during the other return interval flood events as a result of the RMDP components. In some areas, velocities greater than four fps correspond with outlet structures, access ramps, or bridge abutments, which could result in a significant erosion impact. Refer to **Appendix 4.1**, Newhall Ranch Resource Management & Development Plan: River & Tributaries Drainage Analysis, Santa Clara River (PACE, 2008A) identifies locations of potential erosion within Santa Clara River riparian areas.

Where necessary to minimize erosion and structural damage to such structures, erosion resistant materials would be used according to the standards, criteria, and specifications developed by the DPW to ensure long-term stability (Mitigation Measure GRR-3). The specific improvements for each drainage area would be designed as part of the final drainage plans prepared to DPW standards during the subdivision process. (Mitigation Measures SP-4.2-5 and SP-4.2-6.). No impacts to velocity would be realized upstream or downstream of the Project.

Downstream deposition characteristics and potential erosion of the soils covering the buried soil cement would be approximately the same under both Alternatives 2 and 7 since the location of the buried bank stabilization is approximately the same for both alternatives. Accordingly, erosion and downstream deposition impacts resulting from Alternative 7 are expected to be significant but mitigable. Specifically, to minimize erosion and structural damage to such structures, erosion resistant materials such as concrete, soil cement or secured rip-rap would be used according to the standards, criteria, and specifications developed by the DPW to ensure long-term stability (Mitigation Measure GRR-3). The specific improvements for each drainage area would also be designed as part of the final drainage plans

**Table 4.2-37**
**Change in Floodplain Area (By Vegetation Type) Where Velocity > 4 fps**
**Alternative 7 -- Santa Clara River**

| Vegetation Type | Change in Flood Plain Area (Acres) | | | | | | |
|---|---|---|---|---|---|---|---|
| | 2 Year | 5 Year | 10 Year | 20 Year | 50 Year | 100 Year | CAP |
| Agriculture | -0.2 | -0.2 | -0.7 | 0.3 | -8.0 | -5.8 | -16.7 |
| Alluvial Scrub | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Arroweed Scrub | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Big Sagebrush Scrub | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| California Annual Grassland | 0.0 | 0.0 | 0.0 | 0.0 | 0.4 | 0.0 | 0.0 |
| Undifferentiated Chaparral | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| California Sagebrush | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| California Sagebrush-California Buckwheat | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| California Sagebrush-Undifferentiated Chaparral | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| California Sagebrush-Purple Sage | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Cottonwood Willow Riparian Forest | -0.2 | -0.1 | 0.1 | 0.1 | 0.3 | 0.2 | -0.1 |
| Burned California Sagebrush | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Disturbed Cottonwood Willow Riparian Forest | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Developed | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Disturbed Land | -0.1 | 0.0 | 0.0 | 0.0 | 0.0 | -1.0 | -1.7 |
| Disturbed Riparian Scrub | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Disturbed Southern Willow Scrub | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Giant Reed | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 0.0 | 0.0 |
| Herbaleous Wetlands | -0.1 | -0.2 | -0.1 | 0.1 | -0.2 | 0.6 | 0.2 |
| Live Oak Woodland | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Mulefat Scrub | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 0.1 | 1.0 |
| Open Channel | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Southern Coast Live Oak Riparian Forest | 0.0 | 0.0 | 0.0 | 0.0 | -0.1 | 0.0 | 0.0 |
| Ornamental | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| River Wash | -0.1 | -0.4 | 0.3 | 0.4 | 0.4 | 0.8 | -0.2 |
| Southern Willow Scrub | 0.0 | 0.0 | 0.0 | 0.1 | 0.0 | 0.2 | 0.1 |
| Tamarisk Scrub | 0.0 | 0.0 | 0.0 | 0.0 | -0.1 | 0.0 | 0.0 |
| Valley Oak Woodland | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **TOTAL CHANGE** | **-0.7** | **-0.9** | **-0.8** | **0.4** | **-7.1** | **-4.9** | **-17.4** |

Source: PACE, 2008A.

prepared to DPW standards during the subdivision process. (Mitigation Measures SP-4.2-5, DPW plan and map approvals and SP-4.2-6, DPW-approved permanent erosion controls.). Incorporation and implementation of proper design, regulatory compliance, facility maintenance, and specified mitigation measures will reduce the impact of erosion and/or downstream deposition to a less-than-significant level in relation to Significance Criterion 2.

**Santa Clara River -- Significance Criterion 3: Impacts to Geomorphic Function (Less than Significant).** The RMDP improvements and facilities associated with Alternative 7 would have limited and localized hydromodification impacts to the Santa Clara River. Under moderate storm runoff events, localized increases in flow quantity and velocity would be present at drainage outlet facilities along the banks of the Santa Clara River. In selected locations along the northern and southern banks of the Santa Clara River, the existing floodplain would be protected by buried soil cement and be inaccessible to infrequent flood flows (50- and 100-year events). Similar to Alternative 2, Santa Clara River flows of lower than the 50-year event would utilize the existing floodplain under the Alternative 7 condition. Bridge piers and abutments would have localized effects on channel alignment. Under Alternative 7, Potrero Canyon Road Bridge and the previously approved Commerce Center Bridge are not proposed and the associated bridge pier and abutment features are not required. Therefore, Alternative 7 would have a lesser direct effect on Santa Clara River geomorphic function than Alternative 2.

**Table 4.2-38** provides general hydraulic characteristics of the River channel for the two-, five-, 10-, 20-, 50- and 100-year events, comparing the existing conditions to those resulting from Alternative 7. Included in these characteristics are: maximum river flow depth measured in feet, average flow velocity measured in fps, friction slope (a measure of flow erodibility), flow area measured in sf, channel top width measured in feet, and total shear (a measure of friction caused by the weight of water on the River bottom, and an indicator of scour/erosion potential) measured in pounds per square foot. As shown, with Alternative 7 most of these characteristics increase in magnitude with an increase in storm intensity (return interval). Relative to existing conditions, Alternative 7 results in an increase in the maximum flow depth of less than one foot during the 50- and 100-year storm events. Alternative 7 would result in minor increases in average velocity during the 50- and 100 year return intervals, with essentially no change in velocities for the two-, five-, 10-, and 20-year events. Average friction slopes remain relatively unchanged as a result of Alternative 7 with minor increases during the two- and 50-year return intervals. Alternative 7, would result in minor increases in the top width during the two-, five and 50-year events, with a decrease in average top width observed during the 10-, 20-, and 100-year events. Lastly, Alternative 7 would have a nominal effect on the total shear during the two-, five-, 10-, and 20-year events with minor increases observed during the less frequent 50- and 100-year events.

**Table 4.2-38**
**Summary of Average Channel Hydraulic Parameters**
**Existing vs. Alternative 7 -- Santa Clara River**

| Condition | Return Interval (years) | Max. Flow Depth (ft) | Average Velocity (fps) | Friction Slope | Flow Area (sq. ft.) | Top Width (ft) | Total Shear (psf) |
|---|---|---|---|---|---|---|---|
| Existing | 2 | 3.34 | 4.46 | 0.0053 | 774.2 | 404.2 | 0.72 |
| Existing | 5 | 5.11 | 5.82 | 0.0053 | 1585.2 | 520.3 | 1.16 |
| Existing | 10 | 6.50 | 6.65 | 0.0052 | 2423.6 | 614.0 | 1.48 |
| Existing | 20 | 7.99 | 6.89 | 0.0052 | 3658.7 | 887.0 | 1.60 |
| Existing | 50 | 9.84 | 7.48 | 0.0051 | 5581.5 | 1131.1 | 1.85 |
| Existing | 100 | 11.27 | 8.00 | 0.0051 | 7283.6 | 1236.1 | 2.13 |
| Alternative 7 | 2 | 3.34 | 4.44 | 0.0054 | 776.8 | 405.2 | 0.73 |
| Alternative 7 | 5 | 5.11 | 5.81 | 0.0053 | 1590.5 | 520.7 | 1.16 |
| Alternative 7 | 10 | 6.50 | 6.64 | 0.0052 | 2425.6 | 612.9 | 1.48 |
| Alternative 7 | 20 | 8.01 | 6.94 | 0.0052 | 3624.3 | 875.1 | 1.63 |
| Alternative 7 | 50 | 9.93 | 7.53 | 0.0052 | 5519.5 | 1133.7 | 1.94 |
| Alternative 7 | 100 | 11.37 | 8.13 | 0.0051 | 7096.4 | 1233.9 | 2.24 |
| Alternative 2 | 100 | 11.87 | 7.8 | 0.0051 | 7489.4 | 1093.4 | 2.43 |

Source: PACE, 2008A.

The estimated change in hydraulic characteristics under the Alternative 7 RMDP would be relatively minor. For the high frequency floods (two-, five-, and 10-year), the proposed floodplain modifications would not increase erosion potential, hinder flows or substantially reduce the floodplain area. Instead, these flows would spread across the River channel, unaffected by the bank protection because the River would have sufficient width to allow these flows to meander and spread out as under pre-Project conditions. Compared with Alternative 2, during the 100-year event, the RMDP components proposed by Alternative 7 would result in reductions in the maximum flow depth, flow area, and total shear, with increases in average velocity and top width. During more infrequent 20- to 100-year discharges, river flows would be impacted by proposed improvements as wide as the buried soil cement. This would limit the area of the floodplain during these infrequent flood events, causing inundation over a smaller area because the bank protection would be developed under the Specific Plan for various land uses, including residential, commercial, industrial, and parks. Accordingly, the potential effects to geomorphic function in the Santa Clara River are not considered to be significant.

Given the low frequency and duration of such conditions, the potential impacts to geomorphic function in the Santa Clara River relative to Significance Criterion 3 are considered less than significant.

The HARC analysis indicates that the Alternative 7 would result in only minor changes to the hydrologic function of the Santa Clara River with small decreases in the source water and floodplain connection metrics. In total, Alternative 7 would result in a net gain/loss of 212.02 hydrology AW-score units and

would increase the total HARC AW-score units by 254.08. The overall increase in HARC AW-score units is primarily attributed to the benefits provided by Alternative 7 to riparian habitat as discussed in **Section 4.6**, Jurisdictional Waters and Streams. In general, the HARC analysis supports the conclusion that the relatively minor impacts to the hydrologic processes of the Santa Clara River do not have an overall negative effect on the geomorphic function, *e.g.*, ability to support riparian habitat. Therefore, impacts associated with Alternative 7 would be less than significant relative to Significance Criterion 3 since they would not result in a substantial reduction in geomorphic function.

**Santa Clara River -- Significance Criterion 4: Construction and Scour Impacts to Riparian Vegetation (Less than Significant).** Most of the areas along the River corridor within the Project site consist of agricultural fields, and to a lesser extent, disturbed and upland habitat areas with limited riparian habitat. (PACE, 2008A.) Alternative 7 includes the construction of 25,514 lf of soil cement, which is necessary to protect the Specific Plan's residential and commercial development and the bridge at Long Canyon Road. The analysis of the impacts of installing bank protection, bridge piers and abutments, and erosion protection to vegetation along the Santa Clara River are primarily related to Alternative 7's hydrologic and hydraulic impacts on the Santa Clara River, as detailed below.

**Impacts on Velocity.** An increase in flow velocities in the River could result in significant impacts to riparian vegetation if the increase causes: (1) widespread and chronic scouring of the channel bed that removes a significant amount of aquatic wetland and riparian habitats from the River channel; and/or (2) substantial modification of the relative amounts of these different habitats in the River, essentially altering the quality of the riverine environment.

Impacts associated with erosion and sediment deposition and, therefore, streambed modification within the River are evaluated as a function of in-stream velocities, which are indicators for potential riverbed scouring. As discussed in **Subsection 4.2.5.1**, Impact Assessment Methods, a representative velocity of four fps was determined to be the appropriate indicator for potential erosion. **Table 4.2-37**, presented above, includes the change of Alternative 7, from existing conditions, in the total area of floodplain, delineated by vegetation type, where velocities exceed four fps for each return interval.

The total floodplain area subject to potentially erosive velocities would be decreased as a result of Alternative 7 for the five-, 10-, 50-year, and capital flood events. An additional 0.3, 1.7, and 44 acres would be impacted by erosive flows during the two-, 20-, and 100-year events. No impacts to velocity would be realized upstream or downstream of the Project reach. (PACE, 2008A.) The additional 0.3 and 1.7 acres impacted during the two- and 20-year events is not considered to be significant when compared with the relative reduction in impacted riparian area during the five-, 10-, 50-year, and capital flood events. The additional 44-acres impacted during the 100-year event, however, could be significant. The largest decrease in vegetation due to erosive velocities by percent and acres is agriculture. The impact to geomorphology due to the erosion of this type of vegetation is not considered to be significant. The impacts relating to habitat removal and disturbance as a result of changes to River velocity are presented in **Section 4.5**, Biological Resources.

Based on these results, the bank stabilization, bridges, and turf-reinforced mats would not cause significant scouring, and, therefore, would not alter the amount and pattern of riparian habitats along the

River within the Project area. The current pattern of scouring due to high velocities would remain intact and the Project would not substantially alter the frequency and magnitude of scouring of riparian vegetation. Based on this information, no significant impacts relative to Significance Criterion 4 would occur due to changes in velocity.

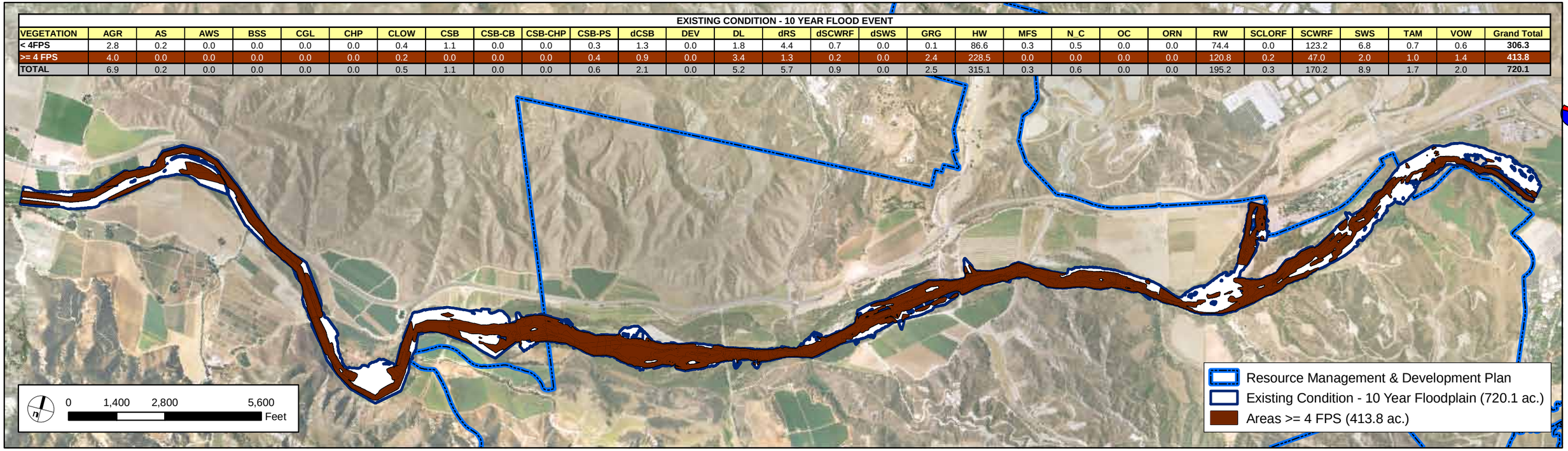
**Impacts on Water Depth.** An increase in water depth in the River could result in significant impacts to riparian habitat if the additional water depth causes greater "shear forces" (*i.e.*, friction caused by the weight of water) on the river bottom, and thereby increasing scouring of the channel bed and removal of vegetation. This effect could reduce the extent of aquatic, wetland, and riparian habitats in the River.

**Table 4.2-38** provides the general hydrologic characteristics of the River channel for the two-, five-, 10-, 20-, 50-, and 100-year events, both with and without Alternative 7 project components. The results of the hydraulic analysis indicate that water depths and, correspondingly, total shear in the River would not increase significantly due to Alternative 7 improvements. The additional riparian vegetation area subject to inundation would be increased slightly during the two-, five-, 50-, 100-year, and capital flood events (0.7, 5.9, 5.0, 4.8, and 3.7 acres, respectively), but would be reduced by approximately 1.5 and 5.0 acres as a result of Alternative 7 during the 10- and 20-year events, respectively. (PACE, 2008A.) **Figures 4.2-17** and **4.2-18** show the area of inundation and velocity distribution for the 10- and 100-year flow events for both existing conditions and Alternative 7. As shown in these figures, the decrease in inundated area (by percentage and acreage) would primarily affect areas of currently disturbed, agricultural land. Accordingly, impacts to riparian habitat would be limited such that water flow depths, velocities, and total shear for all return events would not be significantly different in riparian habitat between existing and proposed conditions at the Project site. Since there will not be a significant change in flow depths or total shear in existing riparian habitat, the impacts to the amount and pattern of aquatic, wetland, and riparian habitats in the River are expected to be less-than-significant relative to Significance Criterion 4.

**Impacts of Modification.** The reinforced concrete and riprap bridge abutments, in addition to the soil cement proposed by Alternative 7, were designed to avoid Corps and CDFG jurisdictional areas. Since the bank stabilization locations were designed to avoid these jurisdictional areas, they would be constructed outside of the existing 100-year floodplain boundaries. Encroachment impacts would therefore be minimized. The banks located out of the floodplain need stabilization because of lateral migration of the riverbed, as well as the need for protection against the capital flood discharge. Long-term impacts would have the potential to occur because soil cement used to stabilize the river's banks places a permanent feature in the existing floodplain.

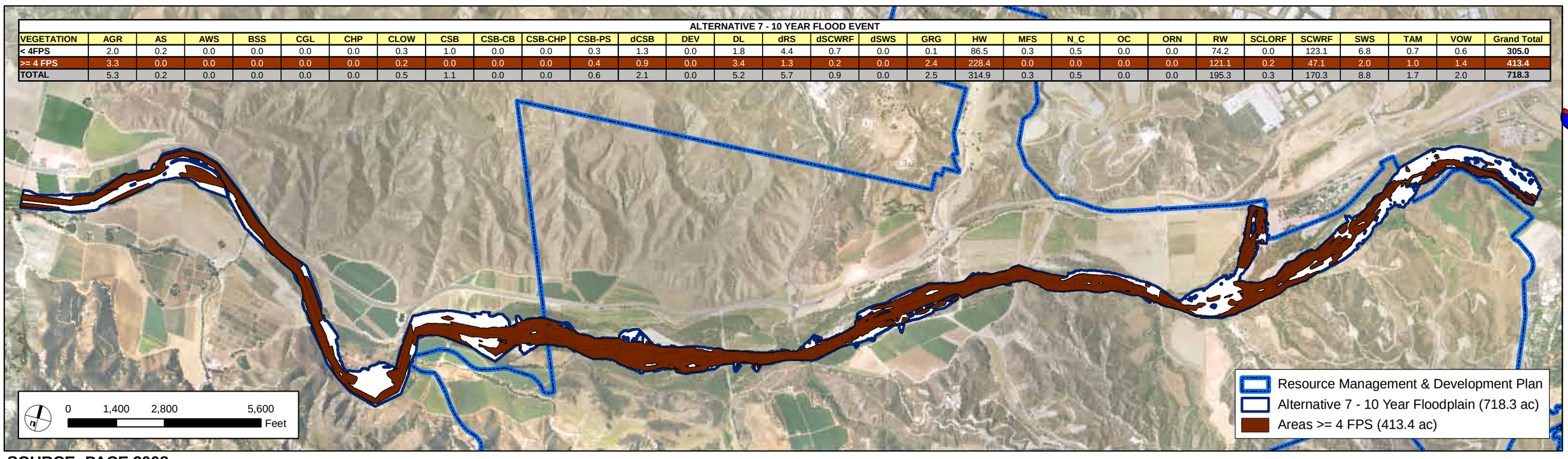
**EXISTING CONDITION - 10 YEAR FLOOD EVENT**

| VEGETATION | AGR | AS | AWS | BSS | CGL | CHP | CLOW | CSB | CSB-CB | CSB-CHP | CSB-PS | dCSB | DEV | DL | dRS | dSCWRF | dSWS | GRG | HW | MFS | N_C | OC | ORN | RW | SCLORF | SCWRF | SWS | TAM | VOW | Grand Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| < 4FPS | 2.8 | 0.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.4 | 1.1 | 0.0 | 0.0 | 0.3 | 1.3 | 0.0 | 1.8 | 4.4 | 0.7 | 0.0 | 0.1 | 86.6 | 0.3 | 0.5 | 0.0 | 0.0 | 74.4 | 0.0 | 123.2 | 6.8 | 0.7 | 0.6 | **306.3** |
| >= 4 FPS | 4.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.2 | 0.0 | 0.0 | 0.0 | 0.4 | 0.9 | 0.0 | 3.4 | 1.3 | 0.2 | 0.0 | 2.4 | 228.5 | 0.0 | 0.0 | 0.0 | 0.0 | 120.8 | 0.2 | 47.0 | 2.0 | 1.0 | 1.4 | **413.8** |
| TOTAL | 6.9 | 0.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.5 | 1.1 | 0.0 | 0.0 | 0.6 | 2.1 | 0.0 | 5.2 | 5.7 | 0.9 | 0.0 | 2.5 | 315.1 | 0.3 | 0.6 | 0.0 | 0.0 | 195.2 | 0.3 | 170.2 | 8.9 | 1.7 | 2.0 | **720.1** |




**ALTERNATIVE 7 - 10 YEAR FLOOD EVENT**

| VEGETATION | AGR | AS | AWS | BSS | CGL | CHP | CLOW | CSB | CSB-CB | CSB-CHP | CSB-PS | dCSB | DEV | DL | dRS | dSCWRF | dSWS | GRG | HW | MFS | N_C | OC | ORN | RW | SCLORF | SCWRF | SWS | TAM | VOW | Grand Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| < 4FPS | 2.0 | 0.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.3 | 1.0 | 0.0 | 0.0 | 0.3 | 1.3 | 0.0 | 1.8 | 4.4 | 0.7 | 0.0 | 0.1 | 86.5 | 0.3 | 0.5 | 0.0 | 0.0 | 74.2 | 0.0 | 123.1 | 6.8 | 0.7 | 0.6 | **305.0** |
| >= 4 FPS | 3.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.2 | 0.0 | 0.0 | 0.0 | 0.4 | 0.9 | 0.0 | 3.4 | 1.3 | 0.2 | 0.0 | 2.4 | 228.4 | 0.0 | 0.0 | 0.0 | 0.0 | 121.1 | 0.2 | 47.1 | 2.0 | 1.0 | 1.4 | **413.4** |
| TOTAL | 5.3 | 0.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.5 | 1.1 | 0.0 | 0.0 | 0.6 | 2.1 | 0.0 | 5.2 | 5.7 | 0.9 | 0.0 | 2.5 | 314.9 | 0.3 | 0.5 | 0.0 | 0.0 | 195.3 | 0.3 | 170.3 | 8.8 | 1.7 | 2.0 | **718.3** |




**SOURCE: PACE 2008**

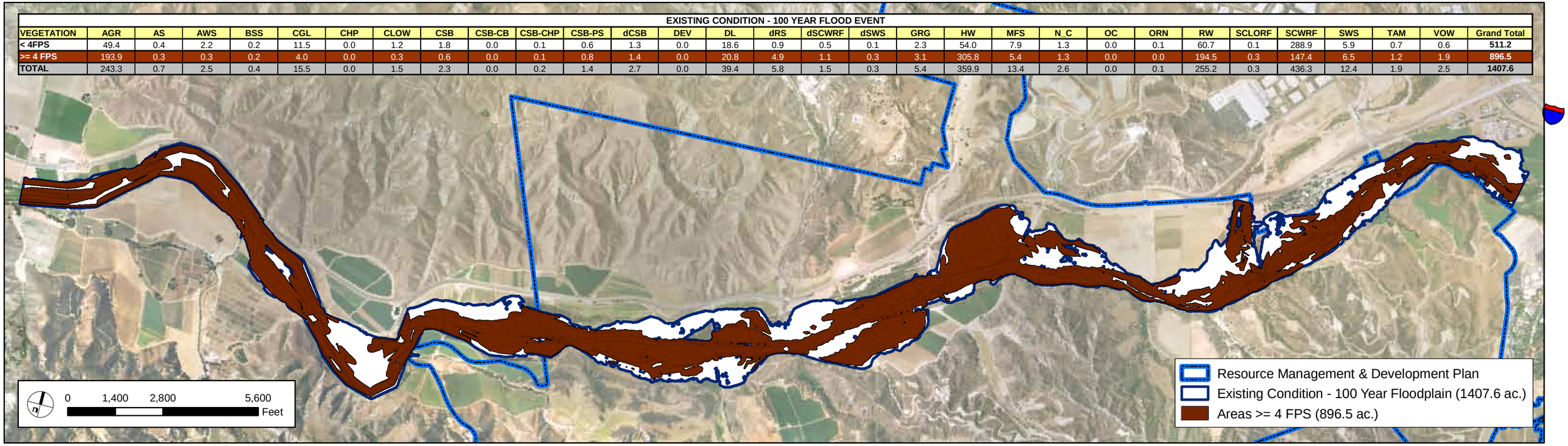
FIGURE 4.2-17

EXISTING CONDITION AND ALTERNATIVE 7
10-YEAR FLOOD INUNDATION AND VELOCITY DISTRIBUTION - SANTA CLARA RIVER

P:\8238E\GIS\mxds\EIR_2008\Section4_2\8238E_FIGURE-4-2-17_RiparianScourVelocityAnalysisAlt7_10Yr_082108.mxd

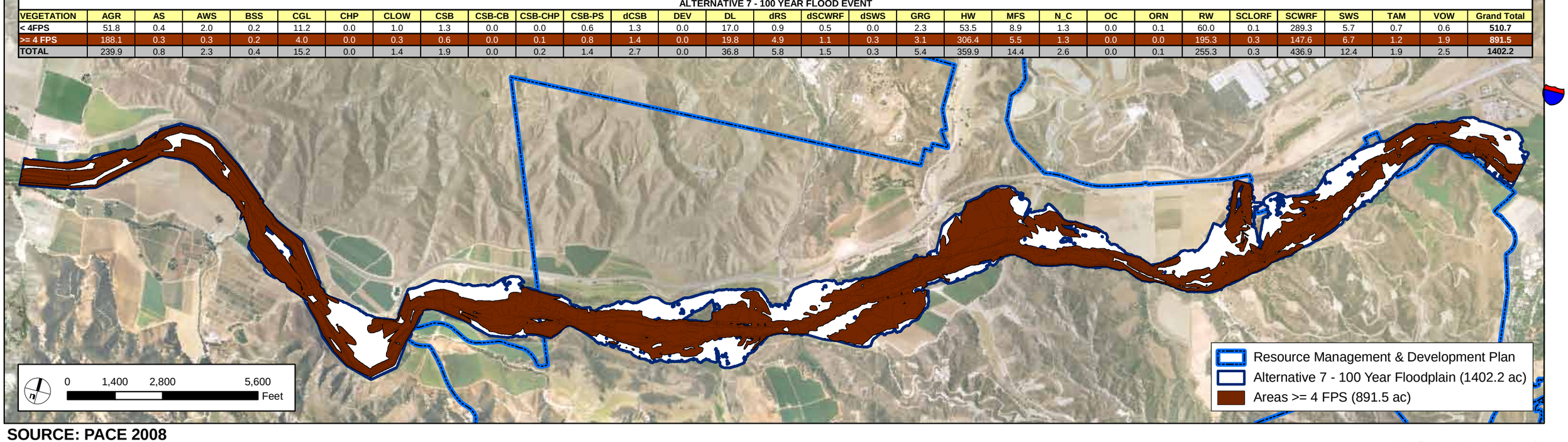
**EXISTING CONDITION - 100 YEAR FLOOD EVENT**

| VEGETATION | AGR | AS | AWS | BSS | CGL | CHP | CLOW | CSB | CSB-CB | CSB-CHP | CSB-PS | dCSB | DEV | DL | dRS | dSCWRF | dSWS | GRG | HW | MFS | N_C | OC | ORN | RW | SCLORF | SCWRF | SWS | TAM | VOW | Grand Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| < 4FPS | 49.4 | 0.4 | 2.2 | 0.2 | 11.5 | 0.0 | 1.2 | 1.8 | 0.0 | 0.1 | 0.6 | 1.3 | 0.0 | 18.6 | 0.9 | 0.5 | 0.1 | 2.3 | 54.0 | 7.9 | 1.3 | 0.0 | 0.1 | 60.7 | 0.1 | 288.9 | 5.9 | 0.7 | 0.6 | **511.2** |
| >= 4 FPS | 193.9 | 0.3 | 0.3 | 0.2 | 4.0 | 0.0 | 0.3 | 0.6 | 0.0 | 0.1 | 0.8 | 1.4 | 0.0 | 20.8 | 4.9 | 1.1 | 0.3 | 3.1 | 305.8 | 5.4 | 1.3 | 0.0 | 0.0 | 194.5 | 0.3 | 147.4 | 6.5 | 1.2 | 1.9 | **896.5** |
| TOTAL | 243.3 | 0.7 | 2.5 | 0.4 | 15.5 | 0.0 | 1.5 | 2.3 | 0.0 | 0.2 | 1.4 | 2.7 | 0.0 | 39.4 | 5.8 | 1.5 | 0.3 | 5.4 | 359.9 | 13.4 | 2.6 | 0.0 | 0.1 | 255.2 | 0.3 | 436.3 | 12.4 | 1.9 | 2.5 | **1407.6** |




**ALTERNATIVE 7 - 100 YEAR FLOOD EVENT**

| VEGETATION | AGR | AS | AWS | BSS | CGL | CHP | CLOW | CSB | CSB-CB | CSB-CHP | CSB-PS | dCSB | DEV | DL | dRS | dSCWRF | dSWS | GRG | HW | MFS | N_C | OC | ORN | RW | SCLORF | SCWRF | SWS | TAM | VOW | Grand Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| < 4FPS | 51.8 | 0.4 | 2.0 | 0.2 | 11.2 | 0.0 | 1.0 | 1.3 | 0.0 | 0.0 | 0.6 | 1.3 | 0.0 | 17.0 | 0.9 | 0.5 | 0.0 | 2.3 | 53.5 | 8.9 | 1.3 | 0.0 | 0.1 | 60.0 | 0.1 | 289.3 | 5.7 | 0.7 | 0.6 | **510.7** |
| >= 4 FPS | 188.1 | 0.3 | 0.3 | 0.2 | 4.0 | 0.0 | 0.3 | 0.6 | 0.0 | 0.1 | 0.8 | 1.4 | 0.0 | 19.8 | 4.9 | 1.1 | 0.3 | 3.1 | 306.4 | 5.5 | 1.3 | 0.0 | 0.0 | 195.3 | 0.3 | 147.6 | 6.7 | 1.2 | 1.9 | **891.5** |
| TOTAL | 239.9 | 0.8 | 2.3 | 0.4 | 15.2 | 0.0 | 1.4 | 1.9 | 0.0 | 0.2 | 1.4 | 2.7 | 0.0 | 36.8 | 5.8 | 1.5 | 0.3 | 5.4 | 359.9 | 14.4 | 2.6 | 0.0 | 0.1 | 255.3 | 0.3 | 436.9 | 12.4 | 1.9 | 2.5 | **1402.2** |




**SOURCE: PACE 2008**

FIGURE 4.2-18

EXISTING CONDITION AND ALTERNATIVE 7
100-YEAR FLOOD INUNDATION AND VELOCITY DISTRIBUTION - SANTA CLARA RIVER

P:\8238E\GIS\mxds\EIR_2008\Section4_2\8238E_FIGURE-4-2-18_RiparianScourVelocityAnalysisAlt7_100Yr_082108.mxd

In other areas, the soil cement would be placed outside the existing River channel, creating additional River channel and riparian habitats. For example, soil cement proposed on the north side of the River near the confluence with Castaic River would be constructed on agricultural land, north of the existing channel. The land located between the existing river bank and the newly created stabilized bank would be excavated to widen the existing channel, which would increase the area available within the channel and increase the capacity of the River to convey the passage of flood flows. Overall, Alternative 7 proposes fewer feet of bank stabilization within the Santa Clara River and would therefore result in fewer impacted/removed acres compared with Alternative 2. Specifically, Alternative 7 would result in 6.4 acres of modified channel, where Alternative 2 would result in 36.9 acres of modified channel within the Santa Clara River floodplain.

The potential impacts from Alternative 7 RMDP improvements to Santa Clara River riparian vegetation are anticipated to be small and localized along the River floodplain. In addition, the frequency and duration of river flow conditions is considered to be episodic. The River, the floodplain, and riparian resources have been subjected to episodic disturbances under natural conditions and only minor changes in overall planform geomorphology occur as described above. As such, impacts of the RMDP to riparian vegetation along the Santa Clara River relative to Significance Criterion 4 are considered less than significant.

**Tributaries -- Significance Criterion 1: Short-Term Impacts from Construction of Bridges, Bank Stabilization, Grade Stabilizer Structures, and Buried Storm Drain (Significant but Mitigable).** Installation of bank stabilization features, grade stabilizer structures, buried storm drains, and bridge piers and abutments would directly impact elements of tributary geomorphology which would be a significant impact. Alternative 7 would authorize 10,542 more linear feet of buried bank stabilization, 40,515 fewer linear feet of drainage converted to buried storm drain, 18 more bridges, but 15 fewer culverted road crossings, and no grade stabilizer when compared with the proposed RMDP. Therefore, considering that structures will be set further back from the drainage channels, resulting in less construction impact to the drainages, Alternative 7 would have less of a direct effect on the geomorphology of the tributaries than Alternative 2.

Absent mitigation, there would be significant short-term sedimentation impacts during construction with respect to Significance Criterion 1. However, Mitigation Measures SP-4.2-2 (acquire state and federal permits), SP-4.2-3 (CDFG streambed agreements), SP-4.2-5 (DPW plan and map approvals), and SP-4.2-7 (DPW SUSMP and SWPPP requirements) would ensure that regulatory requirements are implemented and short-term impacts related to construction of RMDP components are less than significant through proper application of sediment controls and other BMPs required by existing local, state, and federal regulations.

**Tributaries -- Significance Criterion 2: Erosion and Downstream Deposition (Significant but Mitigable).** Implementation of Alternative 7 RMDP improvements and facilities, which are subject to the Corps and CDFG permitting requirements (particularly site clearing and grading operations), would have the potential to increase sediment flows downstream during storm events. Long-term impacts associated with erosion and sediment deposition are evaluated as a function of geomorphic stability. The basis of design for the five major tributary drainages is such that the channels would be designed to be in

geomorphic equilibrium in terms of stability and delivery of sediment and flows under future conditions. As described in greater detail for Alternative 2, the channel designs will meet the following criteria: geomorphic stability; flood conveyance; ecological function; hydromodification control; low level maintenance. The preliminary channel designs under Alternative 7 for each tributary are described in the following paragraphs.

**Chiquito Canyon.** The proposed design in Chiquito Canyon under Alternative 7 would significantly decrease the width of the floodplain in Chiquito Canyon, which would increase the velocity of flows, resulting in a significant effect prior to mitigation. In order to minimize impacts, the Project will be designed to mitigate Project effects to the geomorphic stability (*i.e.*, erosion and deposition) within Chiquito Canyon. Specifically, where the channel is not degraded and less extensive development will take place in the watershed, grade control structures will be used to maintain the existing slope. The reengineered channel will be designed to meet the specified basis of design criteria using the following approach:

1. Develop existing condition floodplain and creek hydraulic characteristics using a hydraulic model such as HEC-RAS.
2. Minimize impacts to existing condition floodplain. As a result of reducing the development impacts to the floodplain, the amount of environmental and hydraulic impacts (*e.g.*, resulting in substantial erosion or sediment deposition) from the proposed development will be minimized.
3. Creek bank flood protection (soil cement, rip rap or other suitable method) will be located to provide for bank erosion protection and to provide flood protection from the DPW Capital design flood event. In most cases, the bank protection will be buried with soil at a 3:1 slope over the hard bank protection. The soil backfill slope will vary from flatter to steeper and may be totally eliminated in some areas where necessary such as at structures, storm drain outlets or other pinch points.
4. Chiquito Canyon will not include a re-grading of the creek invert although the Ep of the proposed condition will be validated during the design phase. For Chiquito Canyon, the invert stabilization method will be as follows:
    a. Creek bed grade control structures at 200 to 400 foot spacing along the creek corridor will be included.
    b. These grade control structures will designed to be located at points along the creek where proposed project grading impacts will already be disturbing the creek bed and banks.
    c. The grade control structures will be constructed with soil cement, rip rap or other grade stabilization methods acceptable to DPW.
    d. The grade control structures will be at grade or below the existing grade and invert of the creek bed.
    e. The grade control structures will be designed to function as a drop structure in the event the creek bed slope flattens overtime.

5. Chiquito Canyon top and toe elevation will be established based upon DPW standards.

The overall design approach will allow the tributary to naturally fluctuate between the stabilized existing condition and estimated equilibrium slope while providing suitable erosion and flood protection for public safety. Based upon the proposed design and use of DPW standards for bank protection top and toe, Chiquito Canyon would meet the minimal required design objectives provided by DPW. As such, the geomorphic basis of design will inherently minimize erosion and deposition.

The channel confluence with the Santa Clara River would largely be controlled by the aggradation or degradation in the Santa Clara River, as well as episodic River hydraulic events in the form of backwater effects. While the banks would be hardened in the proposed Project condition, the influence of the Santa Clara River on long-term bed stability at the creek channel outlet is expected to exceed that of the Project channel modifications. The upstream channel inlet (near the beginning of the defined channel) is generally in a natural state and no currently planned improvements are to be made in the upstream portion of the channel; as a result, no effects on channel stability in this area are expected.

Prior to mitigation, erosion and sedimentation impacts within Chiquito Canyon would be significant. The Newhall Ranch Specific Plan EIR identified feasible measures to lessen the effects of the Specific Plan on floodplains within the Project area. Specifically, Mitigation Measures SP-4.2-1 through SP-4.2-7 (flood control improvement approval from DPW, state and federal permits, CDFG stream bed agreements, FEMA CLOMR, DPW plan and map approvals, DPW-approved permanent erosion controls, DPW SUSMP and SWPPP requirements) are incorporated as part of the Project design to mitigate these impacts. In addition, Mitigation Measures GRR-1 through GRR-6 (DPW required runoff controls, minimization of bridge and structures, structural durability, hydromodification controls and channel design, sediment and debris control facilities, sediment redistribution) would further mitigate these impacts by controlling runoff and sediment delivered through the project reach, minimizing localized impacts from bridge crossings, using erosion resistant materials to ensure the long-term stability of RMDP structures, and ensuring that the Project design provides an equilibrium slope for each affected tributary in the post-development condition. Finally, in order to ensure that the channel functions as intended, Mitigation Measure GRR-7 describes the Geomorphology Monitoring and Management Plan that will be implemented to evaluate compliance with the basis of the design criteria, the triggers for implementing remedial actions (if necessary), the approach for implementing remedial actions, and a description of potential remedial measures. Incorporation and implementation of proper design, regulatory compliance, facility maintenance, and specified mitigation measures will reduce the impact of erosion and/or downstream deposition to a less-than-significant level in relation to Significance Criterion 2.

**San Martinez Grande.** The proposed design in San Martinez Grande Canyon under Alternative 7 would significantly decrease the width of the floodplain in the tributary, which would increase the velocity of flows, resulting in a significant effect prior to mitigation. In order to minimize impacts, the Project will be designed to mitigate Project effects to the geomorphic stability (*i.e.*, erosion and deposition) within San Martinez Grande Canyon. Specifically, where the channel is not degraded and less extensive development will take place in the watershed, grade control structures will be used to maintain the existing slope. The reengineered channel will be designed to meet the specified basis of design criteria using the following approach:

1. Develop existing condition floodplain and creek hydraulic characteristics using a hydraulic model such as HEC-RAS.

2. Minimize impacts to existing condition floodplain. As a result of reducing the development impacts to the floodplain, the amount of environmental and hydraulic impacts (*e.g.*, resulting in an substantial erosion or sediment deposition) from the proposed development will be minimized.

3. Creek bank flood protection (soil cement, rip rap or other suitable method) will be located to provide for bank erosion protection and to provide flood protection from the DPW Capital design flood event. In most cases, the bank protection will be buried with soil at a 3:1 slope over the hard bank protection. The soil backfill slope will vary from flatter to steeper and may be totally eliminated in some areas where necessary such as at structures, storm drain outlets or other pinch points.

4. San Martinez Grande Canyon will not include a re-grading of the creek invert although the Ep of the proposed condition will be validated during the design phase. For San Martinez Grande Canyon, the invert stabilization method will be as follows:

    a. Creek bed grade control structures at 200 to 400 foot spacing along the creek corridor will be included.

    b. These grade control structures will designed to be located at points along the creek where proposed project grading impacts will already be disturbing the creek bed and banks.

    c. The grade control structures will be constructed with soil cement, rip rap or other grade stabilization methods acceptable to DPW.

    d. The grade control structures will be at grade or below the existing grade and invert of the creek bed.

    e. The grade control structures will be designed to function as a drop structure in the event the creek bed slope flattens overtime.

5. San Martinez Grande Canyon top and toe elevation will be established based upon DPW standards.

The overall design approach will allow the tributary to naturally fluctuate between the stabilized existing condition and estimated equilibrium slope while providing suitable erosion and flood protection for public safety. Based upon the proposed design and use of DPW standards for bank protection top and toe, San Martinez Grande Canyon would meet the minimal required design objectives provided by DPW. As such, the geomorphic basis of design will inherently minimize erosion and deposition.

The channel confluence with the Santa Clara River would largely be controlled by the aggradation or degradation in the Santa Clara River, as well as episodic River hydraulic events in the form of backwater effects. While the banks would be hardened in the proposed Project condition, the influence of the Santa Clara River on long-term bed stability at the creek channel outlet is expected to exceed that of the Project channel modifications. The upstream channel inlet (near the beginning of the defined channel) is

generally in a natural state and no currently planned improvements are to be made in the upstream portion of the channel; as a result, no effects on channel stability in this area are expected.

Prior to mitigation, erosion and sedimentation impacts within San Martinez Grande Canyon would be significant. The Newhall Ranch Specific Plan EIR identified feasible measures to lessen the effects of the Specific Plan on floodplains within the Project area. Specifically, Mitigation Measures SP-4.2-1 through SP-4.2-7 (flood control improvement approval from DPW, state and federal permits, CDFG stream bed agreements, FEMA CLOMR, DPW plan and map approvals, DPW-approved permanent erosion controls, DPW SUSMP and SWPPP requirements) are incorporated as part of the Project design to mitigate these impacts. In addition, Mitigation Measures GRR-1 through GRR-6 (DPW required runoff controls, minimization of bridge and structures, structural durability, hydromodification controls and channel design, sediment and debris control facilities, sediment redistribution) would further mitigate these impacts by controlling runoff and sediment delivered through the project reach, minimizing localized impacts from bridge crossings, using erosion resistant materials to ensure the long-term stability of RMDP structures, and ensuring that the Project design provides an equilibrium slope for each affected tributary in the post-development condition. Finally, in order to ensure that the channel functions as intended, Mitigation Measure GRR-7 describes the Geomorphology Monitoring and Management Plan that will be implemented to evaluate compliance with the basis of the design criteria, the triggers for implementing remedial actions (if necessary), the approach for implementing remedial actions, and a description of potential remedial measures. Incorporation and implementation of proper design, regulatory compliance, facility maintenance, and specified mitigation measures will reduce the impact of erosion and/or downstream deposition to a less-than-significant level in relation to Significance Criterion 2.

***Long Canyon.*** The proposed design in Long Canyon under Alternative 7 would significantly decrease the width of the floodplain in Long Canyon, which would increase the velocity of flows, resulting in a significant effect prior to mitigation. The proposed Project design would combine soil cement bank stabilization along with a soft-bottom channel. The basis of design for Long Canyon is such that any increase in flow velocities and shear stress would not exceed the performance specifications of the bank stabilization. However, the soft bottom of the channel is vulnerable to down-cutting and scour. To decrease the channel velocities, the Project design includes grade stabilizer structures. Proper placement of grade stabilizer structures would allow the channel to reach equilibrium, defined as the condition where the amount of sediment deposited is equivalent to the sediment transported from the channel.

The final design approach in accordance with the geomorphic basis of design is to preserve the existing channel as a back channel habitat area while creating an additional new channel sized to accommodate the changes in sediment and water delivery due to the build-out of the Newhall Ranch Specific Plan. The recommended approach for designing the reaches where valley grading is proposed involves breaking the valley into alternating long reaches that are at equilibrium grade and short reaches that are much steeper. This approach involves creating reaches of between 100 and 300 feet length where elevation drops of 10 to 30 feet occur (10 percent gradient). Concentrating the drop in these reaches using sequences of step-pools that convey the capital flood has the advantage of creating a more naturally functioning channel between the drops, and reducing the number and aerial extent of rock structures. The Long Canyon

channel design incorporates the calculated post-development equilibrium slope to ensure a dynamically stable condition allowing for more or less equal amounts of erosion and deposition.

Prior to mitigation, erosion and sedimentation impacts within Long Canyon would be significant. The Newhall Ranch Specific Plan EIR identified feasible measures to lessen the effects of the Specific Plan on floodplains within the Project area. Specifically, Mitigation Measures SP-4.2-1 through SP-4.2-7 (flood control improvement approval from DPW, state and federal permits, CDFG stream bed agreements, FEMA CLOMR, DPW plan and map approvals, DPW-approved permanent erosion controls, DPW SUSMP and SWPPP requirements) are incorporated as part of the Project design to mitigate these impacts. In addition, Mitigation Measures GRR-1 through GRR-6 (DPW required runoff controls, minimization of bridge and structures, structural durability, hydromodification controls and channel design, sediment and debris control facilities, sediment redistribution) would further mitigate these impacts by controlling runoff and sediment delivered through the project reach, minimizing localized impacts from bridge crossings, using erosion resistant materials to ensure the long-term stability of RMDP structures, and ensuring that the Project design provides an equilibrium slope for each affected tributary in the post-development condition. Finally, in order to ensure that the channel functions as intended, Mitigation Measure GRR-7 describes the Geomorphology Monitoring and Management Plan that will be implemented to evaluate compliance with the basis of the design criteria, the triggers for implementing remedial actions (if necessary), the approach for implementing remedial actions, and a description of potential remedial measures. Incorporation and implementation of proper design, regulatory compliance, facility maintenance, and specified mitigation measures will reduce the impact of erosion and/or downstream deposition to a less-than-significant level in relation to Significance Criterion 2.

***Potrero Canyon.*** The proposed design under Alternative 7 would significantly decrease the width of the floodplain in Potrero Canyon, which would increase the velocity of flows, resulting in a significant effect prior to mitigation. The design for the proposed Project would combine soil cement bank stabilization along with a soft-bottom channel. The bank stabilization consisting of soil cement would be emplaced according to the requirements established by the DPW. The basis of design for Potrero Canyon is such that any increase in flow velocities and shear stress would not exceed the performance specifications of the bank stabilization. However, the soft bottom of the channel is vulnerable to down-cutting and scour. To decrease the channel velocities, the design includes grade stabilizer structures. These structures are Proper placement of grade stabilizer structures would allow the channel to reach its equilibrium, defined as the condition where the amount of sediment deposited is equivalent to the sediment eroded. The Potrero channel design incorporates the calculated post-development equilibrium slope to ensure a dynamically stable condition allowing for more or less equal amounts of erosion and deposition to sustain revegetated riparian and adjacent upland habitat areas.

The geomorphic basis of design is such that Potrero Canyon would be designed to convey sediment under future conditions with a "dynamically stable channel" (neither long-term erosion nor deposition) and to support the proposed native re-vegetation program.

Prior to mitigation, erosion and sedimentation impacts within Potrero Canyon would be significant. The Newhall Ranch Specific Plan EIR identified feasible measures to lessen the effects of the Specific Plan on

floodplains within the Project area. Specifically, Mitigation Measures SP-4.2-1 through SP-4.2-7 (flood control improvement approval from DPW, state and federal permits, CDFG stream bed agreements, FEMA CLOMR, DPW plan and map approvals, DPW-approved permanent erosion controls, DPW SUSMP and SWPPP requirements) are incorporated as part of the Project design to mitigate these impacts. In addition, Mitigation Measures GRR-1 through GRR-6 (DPW required runoff controls, minimization of bridge and structures, structural durability, hydromodification controls and channel design, sediment and debris control facilities, sediment redistribution) would further mitigate these impacts by controlling runoff and sediment delivered through the project reach, minimizing localized impacts from bridge crossings, using erosion resistant materials to ensure the long-term stability of RMDP structures, and ensuring that the Project design provides an equilibrium slope for each affected tributary in the post-development condition. Finally, in order to ensure that the channel functions as intended, Mitigation Measure GRR-7 describes the Geomorphology Monitoring and Management Plan that will be implemented to evaluate compliance with the basis of the design criteria, the triggers for implementing remedial actions (if necessary), the approach for implementing remedial actions, and a description of potential remedial measures. Incorporation and implementation of proper design, regulatory compliance, facility maintenance, and specified mitigation measures will reduce the impact of erosion and/or downstream deposition to a less-than-significant level in relation to Significance Criterion 2.

***Lion Canyon.*** The proposed design under Alternative 7 includes the placement of three new road crossings in Lion Canyon. These crossings may constrict the floodplain, resulting in an increase in the velocity of flows which would be a significant effect prior to mitigation. The basis of design for this drainage is such that Lion Canyon would be designed to be in geomorphic equilibrium in terms of stability and delivery of sediment and water under future conditions. The channel floodplain will be designed to maximize geomorphic stability and ecological function, provide adequate flood conveyance, and avoid hydromodification to the extent possible. In addition, the design would minimize the need for maintenance activities.

Phillip Williams and Associates (PWA, 2007g) evaluated the channel design erosion potential. Post-development condition sediment supplies to the Lion Canyon drainage are predicted to range from 27 percent to 37 percent of the existing condition. The results of the analysis indicate that with the proposed RMDP components, the erosion potential within Lion Canyon would be in equilibrium and that the proposed channel would not aggrade or generate excess sediment from erosion or create a larger than natural downstream impact from sedimentation associated with hydromodification. Mitigation measure SP-4.2-3 (state and federal permits) would require that hydraulic modeling be performed for the final design to assess the effects within Lion Canyon, and that the design would be modified as necessary to reduce any erosion or deposition impacts. The Lion channel design incorporates the calculated post-development equilibrium slope to ensure a dynamically stable condition allowing for more or less equal amounts of erosion and deposition.

Prior to mitigation, erosion and sedimentation impacts within Lion Canyon would be significant. The Newhall Ranch Specific Plan EIR identified feasible measures to lessen the effects of the Specific Plan on floodplains within the Project area. Specifically, Mitigation Measures SP-4.2-1 through SP-4.2-7 (flood control improvement approval from DPW, state and federal permits, CDFG stream bed agreements,

FEMA CLOMR, DPW plan and map approvals, DPW-approved permanent erosion controls, DPW SUSMP and SWPPP requirements) are incorporated as part of the Project design to mitigate these impacts. In addition, Mitigation Measures GRR-1 through GRR-6 (DPW required runoff controls, minimization of bridge and structures, structural durability, hydromodification controls and channel design, sediment and debris control facilities, sediment redistribution) would further mitigate these impacts by controlling runoff and sediment delivered through the project reach, minimizing localized impacts from bridge crossings, using erosion resistant materials to ensure the long-term stability of RMDP structures, and ensuring that the Project design provides an equilibrium slope for each affected tributary in the post-development condition. Finally, in order to ensure that the channel functions as intended, Mitigation Measure GRR-7 describes the Geomorphology Monitoring and Management Plan that will be implemented to evaluate compliance with the basis of the design criteria, the triggers for implementing remedial actions (if necessary), the approach for implementing remedial actions, and a description of potential remedial measures. Incorporation and implementation of proper design, regulatory compliance, facility maintenance, and specified mitigation measures will reduce the impact of erosion and/or downstream deposition to a less-than-significant level in relation to Significance Criterion 2.

***Minor Drainages.*** Implementation of the proposed RMDP would involve the placement of one new bridge crossing in Ayers Canyon, a minor drainage on the south side of the River; in addition, the existing six-lane bridge allowing SR-126 to cross the Castaic Creek drainage would be expanded to eight lanes.

The other drainages to be converted entirely or partially to underground storm drains include drainages in Homestead Canyon, Off-Haul Canyon, Mid-Martinez Canyon, Humble Canyon, Exxon Canyon, Unnamed Canyon B, Unnamed Canyon C, Dead-End Canyon, Unnamed Canyon 1 and Unnamed Canyon 2.

The conversion of open drainages to buried underground conduits would eliminate the erosion of existing drainage channels and the associated sediment loading from other uplands sources. The impact of underground storm drains would significantly decrease erosion and siltation. Accordingly, construction of the proposed 19,330 feet of buried storm drain could result in significant erosion or deposition impacts within the minor drainages**.**

Prior to mitigation, erosion and sedimentation impacts within the minor tributary drainages would be significant. The Newhall Ranch Specific Plan EIR identified feasible measures to lessen the effects of the Specific Plan on floodplains within the Project area. Specifically, Mitigation Measures SP-4.2-1 through SP-4.2-7 (flood control improvement approval from DPW, state and federal permits, CDFG stream bed agreements, FEMA CLOMR, DPW plan and map approvals, DPW-approved permanent erosion controls, DPW SUSMP and SWPPP requirements) are incorporated as part of the Project design to reduce these impacts by controlling runoff and sediment delivered through the project reach, minimizing localized impacts from bridge crossings, using erosion resistant materials to ensure the long-term stability of RMDP structures, and ensuring that the Project design provides an equilibrium slope for each affected tributary in the post-development condition. In addition, Mitigation Measures GRR-1 through GRR-6 (DPW required runoff controls, minimization of bridge and structures, structural durability,

hydromodification controls and channel design, sediment and debris control facilities, sediment redistribution) would reduce this potential impact to less than significant within the minor tributaries.

Erosion and deposition impacts within the tributaries would be significant absent mitigation, but, with the implementation of the Project-specific mitigation measures, would be less-than-significant relative to Significance Criterion 2.

**Tributaries -- Significance Criterion 3: Impacts to Geomorphic Function (Less than Significant).** The tributary drainages incorporate hydromodification controls that lessen potential stormwater-related impacts (intensity and duration) to the River and tributary geomorphic function. The following includes an analysis of the potential impacts to the geomorphic function of the affected tributaries within the Project area.

Alternative 7 proposes that portions of 14 drainages within the RMDP area be graded to accommodate pads for residential and commercial buildings, and that these flows be conveyed by buried storm drains varying in diameter from 30 to 144 inches. In total, approximately 19,330 feet of existing drainage channel would be converted to buried storm drains. The RMDP also proposes five partially-lined open channels on tributaries to the mainstem of the Santa Clara River within the RMDP boundaries. In Alternative 7, streams are preserved in their current locations and are only impacted where road crossings or bridges occur. The total area affected by the conversion to buried storm drain, reengineering, and/or bank stabilization for each drainage within the RMDP area is included in **Table 4.2-39**.

Reengineered channel area, installation of bank stabilization, and conversion of the existing channels to buried storm drain would result in a total of 21.3 acres of existing channel impacted by the RMDP components, with 9.0 acres altered through reengineering and installation of bank stabilization.

**Table 4.2-39**
**Total Impacted Channel Area By Treatment Type**
**Alternative 7 - Tributaries**

| Tributary | Storm Drain Area (acres) | Stabilized and Reengineered Channel Area (acres) | Road Crossings -- Bridges & Culverts (Acres) |
|---|---|---|---|
| Ayers Canyon | 0.0 | 0.0 | 0.2 |
| Agricultural Ditch | 0.3 | 1.3 | 0.0 |
| Chiquito Canyon | 0.1 | 0.0 | 1.3 |
| Dead-End Canyon | 0.4 | 0.0 | 0.0 |
| Exxon Canyon | 0.3 | 0.0 | 0.0 |
| Homestead Canyon | 0.6 | 0.0 | 0.0 |
| Humble Canyon | 0.1 | 0.0 | 0.0 |
| Lion Canyon | 0.0 | 0.2 | 0.3 |
| Long Canyon | 0.7 | 0.5 | 0.1 |
| Magic Mountain Canyon | 0.0 | 0.0 | 0.0 |
| Middle Canyon | 0.0 | 0.0 | 0.0 |
| Mid-Martinez Canyon | 2.1 | 0.0 | 0.0 |
| Off-Haul Canyon | 2.2 | 0.0 | 0.0 |
| Potrero Canyon | 0.8 | 0.0 | 1.2 |
| Salt Creek Canyon | 0.0 | 6.9 | 0.0 |
| San Martinez Grande Canyon | 0.0 | 0.0 | 0.1 |
| Unnamed Canyon 1 | 0.3 | 0.0 | 0.0 |
| Unnamed Canyon 2 | 0.5 | 0.0 | 0.0 |
| Unnamed Canyon A | 0.0 | 0.0 | 0.0 |
| Unnamed Canyon B | 0.5 | 0.0 | 0.0 |
| Unnamed Canyon C | 0.2 | 0.0 | 0.0 |
| Unnamed Canyon D | 0.0 | 0.0 | 0.0 |
| **TOTAL ALT. 7** | **9.0** | **9.0** | **3.2** |
| **TOTAL ALT. 2** | **38.0** | **62.7** | **2.1** |

Source: RMDP, 2008

The effects of these changes on the geomorphic function of the tributaries within the Project area can be determined with an evaluation of the hydrologic function metrics of the HARC (see **Section 4.6**, Jurisdictional Waters and Streams). **Table 4.2-40** compares the total hydrology AW-score units and the total HARC AW-score units calculated for the tributaries.

**Table 4.2-40**
**Summary of HARC AW- Total Score and Hydrology**
**Existing vs. Alternative 7 - Tributaries**

| Condition | HARC AW-Total Score | HARC AW-Hydrology |
|---|---|---|
| **Chiquito Canyon** | | |
| Existing | 12.59 | 15.95 |
| Alternative 7 | 38.81 | 42.76 |
| CHANGE | 26.22 | 26.81 |
| **San Martinez Grande Canyon** | | |
| Existing | 2.84 | 3.22 |
| Alternative 7 | 17.75 | 18.09 |
| CHANGE | 14.91 | 14.87 |
| **Long Canyon** | | |
| Existing | 3.22 | 3.55 |
| Alternative 7 | 29.54 | 28.32 |
| CHANGE | 26.32 | 24.77 |
| **Potrero Canyon** | | |
| Existing | 34.50 | 39.08 |
| Alternative 7 | 133.23 | 136.95 |
| CHANGE | 98.73 | 97.87 |
| **Lion Canyon** | | |
| Existing | 5.41 | 5.96 |
| Alternative 7 | 10.43 | 10.74 |
| CHANGE | 5.02 | 4.78 |
| **Minor Drainages*** | | |
| Existing | 21.27 | 21.70 |
| Alternative 7 | 13.97 | 13.59 |
| CHANGE | -7.30 | -8.11 |
| **Salt Creek Canyon** | | |
| Existing | 71.85 | 67.83 |
| Alternative 7 | 97.04 | 91.75 |
| CHANGE | 25.19 | 23.92 |
| **Total Change ALT. 7** | **+189.09** | **+184.91** |
| **Total Change ALT. 2** | **-7.17** | **-17.28** |

* "Minor Drainages" are located in the following canyons: Bridge Construction -- Castaic Creek; Buried Storm Drains - Homestead (2), Off-Haul (2), Mid Martinez (1), Humble (1), Exxon (2), Unnamed Canyon B (1), Unnamed Canyon C (1), Dead End (2), Unnamed Canyon D (1), Middle (1) and Magic Mountain (1).

Source: URS, 2008

In total, Alternative 7 would result in a net gain of 184.91 hydrology AW-score units within the tributaries a significant overall net gain of 189.09 total HARC AW-score units within the tributaries. Specifically, net gains in the total HARC AW-score units would be produced in Chiquito, Martinez, Long, Potrero, Lion, and Salt Canyons, indicating that the gain in riparian/wetland function of these tributaries would compensate for any such losses in the other tributaries. Therefore, impacts would be less than significant relative to Significance Criterion 3 since they would not result in a substantial reduction in geomorphic function.

**Tributaries -- Significance Criterion 4: Construction and Scour Impacts to Riparian Vegetation (Significant but Mitigable).** Impacts to riparian vegetation within the tributaries located within the RMDP boundary are primarily associated with the physical alterations to the stream channels. As described in **Section 2.0**, Project Description, in some cases where a channel is currently incised and eroding its riparian corridor, it is more feasible to provide the desired degree of ecological function by relocating the channel and creating a stable channel with new vegetative plantings; where the channel is in good condition and has a healthy riparian corridor it is more desirable to preserve the creek in-situ and retrofit with small step-pool structures to protect against future headcuts. Under Alternative 7, approximately 19,330 lf of channel would be converted to buried storm drain. In addition, 85,971 lf of bank stabilization, and 19 bridges would be constructed as part of Alternative 7. Accordingly, nearly all tributary riparian reaches within the RMDP area would sustain impacts to riparian vegetation resources from grading or installation of RMDP components within the reach. The seven reaches in the Salt Creek drainage are exceptions in this regard; the entire portion of the Salt Creek watershed within the applicant's ownership would be dedicated as permanent open space and no fill of the drainage is proposed, except for habitat restoration or enhancement activities.

Reengineered channel area, installation of bank stabilization, and conversion of the existing channels to buried storm drain would result in a total of 21.3 acres of existing channel impacted by the RMDP components, with 9.0 acres altered through reengineering and installation of bank stabilization. These changes could have a significant effect on riparian vegetation of the tributary drainages. The effects of these changes on the geomorphic function of the tributaries within the Project area can be determined with an evaluation of the hydrologic function metrics of the HARC (see **Section 4.6**, Jurisdictional Waters and Streams).

**Table 4.2-40**, presented above, compares the total hydrology AW-score units and the total HARC AW-score units calculated for the tributaries. The HARC analysis indicates that, overall, Alternative 7 would result in substantial changes to the geomorphic function of the tributaries with net losses observed for the hydrology process metrics. In total, Alternative 7 would result in a net gain of 184.91 hydrology AW-score units and a net gain of 189.09 total HARC AW-score units within the tributaries. As such, implementation of the Alternative 7 RMDP components would involve a cumulative net gain of riparian area. In reaches where buried bank stabilization is proposed, the temporary impact zone would be revegetated with native riparian plants. In regards to scour of riparian vegetation, Alternative 7 could result in a substantial increase in the frequency and magnitude of scouring of riparian vegetation which, absent mitigation, would be a significant impact.

To mitigate these impacts Mitigation Measures SW-2 and SW-3 presented in **Section 4.6**, Jurisdictional Waters and Streams would provide riparian enhancement through removal of exotic species, restoration of sediment equilibrium, and recontouring of existing, incised banks to increase the extent of Corps and CDFG jurisdictional areas as well as providing avoidance and restoration measures in the Potrero and Salt Creek watershed. In reaches where RMDP components would be constructed, the temporary impact zone would be revegetated with native riparian plants. Specifically, Mitigation Measure SW-5 (**Section 4.6**, Jurisdictional Waters and Streams) would be implemented to ensure that all areas where temporary construction impacts affect Corps or CDFG jurisdictional areas are revegetated (generally, these are areas where impacts would occur due to the construction of Project facilities). In addition, riparian habitat restoration activities that would be implemented in conjunction with the RMDP would include revegetation of native plant communities on candidate sites contiguous to existing riparian habitats. Site restoration would also include the maintenance of revegetation sites, including the control of non-native plants and irrigation system maintenance. As described in Mitigation Measures BIO-1, BIO-6, and BIO-7, monitoring of the restoration sites would be conducted to evaluate the success of revegetation efforts. Contingency plans and appropriate remedial measures to be implemented should habitat restoration objectives not be achieved would also be included in tentative map-level habitat restoration plans. **Section 4.5**, Biological Resources, provides more detail on the restoration methods proposed to be used. Incorporation and implementation of the specified mitigation measures will reduce the impacts relative to riparian scour to a less-than-significant level in relation to Significance Criterion 4. Accordingly, the impacts of the RMDP to the riparian habitat of the tributaries are considered significant prior to mitigation, but mitigable to a less-than-significant level relative to Significance Criterion 4 through implementation of Mitigation Measures SW-2, SW-3, SW-5, BIO-1, BIO-6, and BIO-7.

**SCP Direct Impacts**

**Significance Criterion 1: Short-Term Impacts from Construction (No Impact).** The SCP is a conservation and permitting plan for an upland plant species (spineflower), and would not authorize any construction activities within the Santa Clara River or tributary corridors. Therefore, no direct impacts would result from implementation of the SCP relative to Significance Criterion 1.

**Significance Criterion 2: Erosion and Downstream Deposition (No Impact).** The same analysis for Significance Criterion 1, above, applies to this criterion.

**Significance Criterion 3: Impacts to Geomorphic Function (No Impact).** The same analysis for Significance Criterion 1, above, applies to this criterion.

**Significance Criterion 4: Construction and Scour Impacts to Riparian Vegetation (No Impact).** The same analysis for Significance Criterion 1, above, applies to this criterion.

#### 4.2.4.8.2 Indirect Impacts

**RMDP Indirect Impacts**

**Significance Criterion 1: Short-Term Indirect Impacts from Construction of Newhall Ranch Specific Plan Development (Significant but Mitigable).** Under Alternative 7, indirect impacts

associated with construction of the Specific Plan development would be virtually the same as those for Alternative 2 (proposed Project). The indirect impacts from construction associated with the Specific Plan are included as part of the discussion for indirect RMDP impacts for Alternative 2.

Absent mitigation, there would be significant short-term sedimentation impacts during construction with respect to Significance Criterion 1. However, Mitigation Measures SP-4.2-2 (acquire state and federal permits), SP-4.2-3 (CDFG streambed agreements), SP-4.2-5 (DPW plan and map approvals), and SP-4.2-7 (DPW SUSMP and SWPPP requirements) would ensure that regulatory requirements are implemented and short-term impacts related to construction of RMDP components are less than significant through proper application of sediment controls and other BMPs required by existing local, state, and federal regulations.

**Significance Criterion 2: Indirect Impacts from Erosion and Downstream Deposition (Significant but Mitigable).** Under Alternative 7, indirect impacts associated with erosion and downstream deposition would be similar to those for Alternative 2 (proposed Project). The developed area of the Specific Plan would be covered with non-erosive surfaces, including pavement and permanent vegetation, which would reduce the sedimentation of site runoff. Alternative 7 proposes to develop 1,246.8 acres less developed area in the Newhall Ranch Specific Plan area than that proposed by Alternative 2 (proposed Project). Accordingly, less surface runoff would occur under Alternative 7. Permanent erosion control measures that reduce sediment in runoff include check dams to reduce flow velocities in tributary water courses, drainage swales, slope drains, subsurface drains, storm drain inlet/outlet protection, and sediment traps.

The drainage areas in which the Specific Plan site lies would not be completely developed; therefore, storm flows from the upper reaches would contain sediment and vegetative debris. The amount of sediment and debris contained in the storm flows would be dependent upon the size of the area being drained and whether or not the area had been subject to burning. If this debris enters and clogs on-site drainages, upstream flooding could occur, which would be a significant impact. Because Alternative 7 would result in less surface runoff compared to Alternative 2, this impact would be less than that associated with Alternative 2, but still significant.

In order to prevent sediment and debris from the upper reaches of the drainage areas from entering storm drainage improvements, permanent erosion control measures will be implemented, including the installation of desilting and debris basins, drainage swales, slope drains, storm drain inlet/outlet protection, and sediment traps. (Mitigation Measure SP-4.2-6, DPW-approved permanent erosion controls.) The specific improvements for each drainage area would be designed as part of the final Drainage Plan prepared to DPW standards during the subdivision process. (Compliance Measure SP-4.2-5, DPW plan and map approvals.) In addition, Mitigation Measure SP-4.2-7, DPW SUSMP and SWPPP requirements would further reduce erosion impacts by requiring that stormwater discharges from open channels or drainage systems discharging to the Santa Clara River in excess of four fps (erosive flows) be controlled to prevent accelerated erosion and protect River habitat. Discharge flows would be regulated using water control features and energy dissipation structures where required to reduce discharge velocities to non-erosive rates. Specifically, implementation of GRR-1 and GRR-4, (DPW required runoff controls and hydromodification controls and channel design respectively) will further control the rate of stormwater runoff to minimize downstream erosion through construction of BMPs, and channels will be

designed to incorporate the calculated post-development equilibrium slope to ensure a dynamically stable condition allowing for more or less equal amounts of erosion and deposition.

With installation of these temporary and permanent erosion/sedimentation control measures, the Specific Plan would not result in significant sedimentation or debris-related impacts either on or downstream of the Specific Plan site. Instead, the Specific Plan would have a beneficial post-construction impact on downstream sedimentation because, as the site builds out, some steep slopes would be graded to flatter slopes, and many of the areas of the site that have been subject to the vegetation-denuding effects of grazing and burning would become covered with vegetation and other non-erodible surfaces.

Similar to Alternative 2, the changes to the site would reduce site sedimentation to below existing levels and would reduce debris volume generation throughout the tributary watershed, although to a lesser degree than under Alternative 2. This would, in turn, have beneficial downstream deposition impacts because burned and bulked flows from the site would be substantially reduced, resulting in lower flood flow rates. With the implementation of the Project-incorporated Mitigation Measures SP-4.2-5, SP-4.2-6, and SP-4.2-7 (DPW plan and map approvals, DPW-approved erosion controls, and DPW SUSMP and SWPPP requirements respectively) erosion and deposition impacts resulting from build-out of the Newhall Ranch Specific Plan development are considered less than significant prior to mitigation. The implementation of Project-Specific mitigation measures GRR-1 and GRR-4 (DPW required runoff controls and hydromodification controls and channel design respectively) would further reduce these impacts. Accordingly, erosion and downstream deposition impacts would be maintained to less than significant relative to Significance Criterion 2.

**Significance Criterion 3: Indirect Impacts to Geomorphic Function (Significant but Mitigable).** Potential indirect hydromodification impacts to the Santa Clara River include stream corridor disturbances from Specific Plan build-out and associated increased runoff intensity from the urbanized tributary drainages, which would be a significant impact prior to mitigation. Alternative 7 proposes to develop 1,246.8 acres less developed area in the Newhall Ranch Specific Plan area than that proposed by Alternative 2 (proposed Project). Accordingly, less surface runoff would occur under Alternative 7. The indirect impacts to geomorphic function associated with the Specific Plan are included as part of the discussion for indirect RMDP impacts for Alternative 2. Since Alternative 7 would result in less surface runoff than Alternative 2, the impacts to the geomorphic function of the Santa Clara River and tributaries would also be less under this alternative, but would still be significant. Each of the tributary drainages is designed with hydromodification control components in accordance with DPW design standards to ensure that soft-bottom waterways maintain an equilibrium between sediment supply to the waterway and sediment transport through the waterway.

Implementation of Mitigation Measures SP-4.2-5 (DPW plan and map approvals) would ensure that no significant erosion or sedimentation impacts would occur as a result of the Project. The additional implementation of Mitigation Measures GRR-1 through GRR-6 (DPW required runoff controls, minimization of bridge and structures, structural durability, hydromodification controls and channel design, sediment and debris control facilities, sediment redistribution) would ensure that no substantial reductions in geomorphic function would occur in the RMDP area tributaries. Accordingly, the impacts are considered less than significant relative to Significance Criterion 3

**Significance Criterion 4: Indirect Construction and Scour Impacts to Riparian Vegetation (Less than Significant).** Implementation of the Alternative 7 RMDP component would indirectly facilitate the build-out of the Specific Plan sites. The confluence of the tributaries to the Santa Clara River are all maintained within the SMA/SEA 23 boundaries and are preserved in a largely natural state. As indicated above, no significant increases in velocity, erosion, or sedimentation would occur in the Santa Clara River because of the proposed build-out.

The implementation of the Specific Plan would result in the loss of riparian vegetation along the RMDP area drainages. Losses of riparian vegetation during construction are addressed in **Section 4.5**, Biological Resources. The impacts to riparian vegetation can be evaluated with the use of the HARC analysis. As discussed in the preceding sections, the number of AW-score units ultimately describes the value of a particular reach, and the number of AW-score units impacted versus preserved will show the impacts of the proposed Project and alternatives on wetland and riparian resources (*i.e.*, post-Project HARC scores serve as a surrogate indicator of potential increases in the frequency and magnitude of scour of riparian vegetation [refer to **Subsection 4.2.5.1.4**, Scour Impacts to Riparian Vegetation]). Conceptually, the alternative with the fewest lost AW-score units would be the least damaging alternative. However, an alternative with a greater loss of HARC AW-score units may be mitigated by producing AW-score units in another location within the Project area through wetland/riparian restoration or creation (see **Section 4.6**, Jurisdictional Waters and Streams, for further discussion on the HARC assessment methods). **Table 4.2-40**, presented above, compares the total hydrology AW-score units and the total HARC AW-score units calculated for the tributaries.

The HARC analysis indicates that, overall, Alternative 7 would result in substantial changes to the hydrologic function of the tributaries with net losses observed for the hydrology process metrics. In total, Alternative 7 would result in a net gain of 184.91 hydrology AW-score units and a net gain of and 189.09 total HARC AW-score units within the tributaries. The overall increase in HARC AW-score units within the tributaries suggests that Alternative 7 components do not have an overall impact on the geomorphic function of the tributaries. Specifically, net gains in the total HARC AW-score units would be produced in Chiquito, San Martinez Grande, Potrero, Long, Lion, and Salt Creek Canyon, indicating that the gain in riparian/wetland function of these tributaries would compensate for any such losses in the other tributaries. Therefore, impacts would be less than significant relative to Significance Criterion 4.

**Significance Criterion 5: Impacts to Riparian Resources Supported by the Middle Canyon Spring (Significant but Mitigable).** Although Alternative 7 would result in less development in Middle Canyon compared to Alternative 2, the potential impacts of Alternative 7 on the groundwater hydrology associated with the Middle Canyon Spring are similar to those discussed in the impact analysis for Alternative 2. Accordingly, Alternative 7 has the potential to result in a significant impact to riparian resources supported by the Middle Canyon Spring. However, implementation of Mitigation Measures BIO-74 and BIO-77 would reduce these impacts to less than significant relative to Significance Criterion 5. Mitigation Measure BIO-74 requires the installation of fencing and signage around the spring prior to construction, during construction, and following construction to restrict access and protect the spring area. Mitigation Measure BIO-77 includes the development of the Middle Canyon Spring HMP in consultation with CDFG and implementation of HMP following approval by CDFG.

**SCP Indirect Impacts**

**Significance Criterion 1: Short-Term Impacts from Construction Newhall Ranch Specific Plan, VCC, and Entrada Developments (Significant but Mitigable).** Implementation of the Alternative 7 SCP component would indirectly facilitate the build-out of the Specific Plan and Entrada sites. The VCC site would not be developed under this alternative. With the exception of the VCC site, construction impacts associated with the build-out facilitated by Alternative 6 would be virtually the same as those associated with the build-out facilitated by Alternative 2. Short-term construction impacts to geomorphology associated with construction of the Specific Plan development are included among the indirect impacts of the RMDP Project component, and are discussed in the preceding subsections on Alternative 2. The indirect impacts associated with the build-out of the Entrada developments are included among the indirect impacts of the SCP Project component, and are discussed in the preceding subsections on Alternative 2.

No previously adopted mitigation measures exist for the VCC or Entrada planning areas. Therefore, the geomorphology-related mitigation measures required by this EIS/EIR in those planning areas include the measures previously adopted by the County for the Specific Plan site in addition to new measures proposed by the Corps and CDFG. Accordingly, with the implementation of Compliance Measures SP-4.2-5, SP 4.2-6, and SP 4.2-7 (DPW plan and map approvals, DPW-approved permanent erosion controls, and DPW SUSMP and SWPPP requirements), short-term impacts from the build-out of the Newhall Ranch Specific Plan site are considered significant but mitigable to less than significant relative to Significance Criterion 1 through proper design and BMP implementation.

**Significance Criterion 2: Indirect Impacts from Erosion and Downstream Deposition (Significant but Mitigable).** Implementation of the Alternative 7 SCP component would indirectly facilitate the build-out of the Specific Plan and Entrada sites. The VCC site would not be developed under this alternative. Indirect impacts of erosion and downstream deposition associated with build-out of the Specific Plan development are included among the indirect impacts of the RMDP Project component, and are discussed in the preceding subsections on Alternative 2. The indirect impacts associated with the build-out of the Entrada development are included among the indirect impacts of the SCP Project component, and are discussed in the preceding subsections on Alternative 2.

Alternative 7 proposes to develop 72.7 acres less developed area in the Entrada planning area than that proposed by Alternative 2 (proposed Project). The 177.6 acre commercial / industrial development in the VCC project would not be constructed under this alternative. Accordingly, less surface runoff would occur under Alternative 7. Because Alternative 7 would result in less surface runoff compared to Alternative 2, this impact would be less than that associated with Alternative 2, but would still be significant.

With the implementation of Compliance Measures SP-4.2-5, SP 4.2-6, and SP 4.2-7 (DPW plan and map approvals, DPW-approved permanent erosion controls, and DPW SUSMP and SWPPP requirements respectively) the erosion and downstream deposition impacts of the Newhall Ranch Specific Plan, VCC, and Entrada developments would be reduced to a less-than-significant level absent additional mitigation relative to Significance Criterion 2.

**Significance Criterion 3: Indirect Impacts to Geomorphic Function (Significant but Mitigable).** Implementation of the Alternative 7 SCP component would indirectly facilitate the build-out of the Specific Plan and Entrada sites. The VCC site would not be developed under this alternative. Indirect hydromodification impacts associated with build-out of the Specific Plan development are included among the indirect impacts of the RMDP Project component, and are discussed in the preceding subsections. The indirect impacts associated with the build-out of the Entrada development are included among the indirect impacts of the SCP Project component, and are discussed in the preceding subsections. Alternative 7 proposes to develop 176.2 acres less developed area in the Entrada planning area than that proposed by Alternative 2 (proposed Project). The 177.6 acre commercial / industrial development in the VCC project would not be constructed under this alternative. Accordingly, less surface runoff would occur under Alternative 7. Because Alternative 7 would result in less surface runoff compared to Alternative 2, this impact would be less than that associated with Alternative 2, but still significant.

Mitigation Measures GRR-1, GRR-2, and GRR-4 (DPW required runoff controls, minimization of bridge and structures, and hydromodification controls and channel design) would be implemented to reduce impacts to the geomorphic function of the tributaries resulting from the build-out of the proposed developments. These Mitigation Measures will ensure that erosion and deposition impacts are mitigated to less than significant. Accordingly, impacts resulting from the build-out of the Specific Plan, VCC, and Entrada planning areas are considered to be significant but mitigable to a less-than-significant level relative to Significance Criterion 3.

**Significance Criterion 4: Indirect Construction and Scour Impacts to Riparian Vegetation (Less than Significant).** Implementation of the Alternative 7 SCP component would indirectly facilitate the build-out of the Specific Plan and Entrada sites. The VCC site would not be developed under this alternative. Indirect impacts to riparian vegetation associated with build-out of the Specific Plan development are included among the indirect impacts of the RMDP Project component, and are discussed in the preceding subsections on Alternative 2. The indirect impacts associated with the build-out of the Entrada development are included among the indirect impacts of the SCP Project component, and are discussed in the preceding subsections on Alternative 2. Alternative 7 proposes to develop 72.7 acres less developed area in the Entrada planning area than that proposed by Alternative 2 (proposed Project). The 177.6 acre commercial / industrial development in the VCC project would not be constructed under this alternative. Accordingly, less disturbance to riparian vegetation would occur under Alternative 7. Because Alternative 7 would result in disturbance to riparian vegetation compared to Alternative 2, this impact would be less than that associated with Alternative 2, and therefore, less than significant relative to Significance Criterion 4.

#### 4.2.4.8.3 Secondary Impacts

**RMDP and SCP Secondary Impacts**

**Significance Criterion 6: Impacts to the "Dry Gap" (Less than Significant).** The potential impacts associated with the Newhall Ranch WRP for Alternative 7 would be similar to those described in the impact analysis for Alternative 2. As discussed in that analysis, the potential impacts of the Newhall Ranch WRP to the Dry Gap are considered less-than-significant relative to Significance Criterion 6 since they will not substantially lengthen the duration of seasonal flow in the Dry Gap. This significance

finding is based on the fact discharge from the WRP will occur in the winter and will be small relative to the overall flow in the Santa Clara River and the existing data which show that increases in base flow due to discharges from the Valencia WRP and the Saugus WRP since the 1960s have not led to a substantial change in the duration of seasonal flow in the Dry Gap.

**Significance Criterion 7: Impacts to Ventura County Beaches (Less than Significant).** The effects of Alternative 7 components on beach replenishment are a function of the sediment load delivered through the Project reach. As discussed in **Subsection 4.2.3.1.3**, Beach Replenishment, above, the Santa Clara River contributes approximately 60 percent of beach sand within Ventura County. However, the reduction of area subject to erosion due to project components and the build-out of the Specific Plan and Entrada plan areas under Alternative 7 could result in a relative reduction of floodwater sediment, which could negatively impact beaches, as incrementally less sediment would be available for their replenishment.

The RMDP components of the Alternative 7 Project that would have the most effect on sediment supply in the tributaries is the conversion of tributary drainage to buried storm drains; the majority of the impacts to beach replenishment are related to the indirect effects of the Newhall Ranch Specific Plan build-out as discussed under the indirect impact discussion above. For this analysis it is assumed that the area converted to buried storm drain results in a net loss of sediment supplied by the affected area. As detailed in **Subsection 4.2.3.1.3**, Beach Replenishment, roughly 1,170 tons per square mile per year of suspended sediment originates from the area upstream of the Los Angeles County/Ventura County line. Approximately 9.0 acres (0.014 square miles) within the tributaries that could potentially contribute to sediment supply would be converted to buried storm drain; this could result in a net reduction of 15 tons of sediment per year.

In order to estimate the direct impacts to sediment supply associated with the RMDP components within the Santa Clara River floodplain, it is assumed that the floodplain areas subject to velocities greater than four fps contribute to the sediment supply within the Project reach during the capital flood event. Accordingly, Alternative 7 would result in a maximum reduction of 17.4 acres (0.03 square miles) of floodplain area subject to velocities greater than four fps during the capital flood event (see **Table 4.2-37**). Therefore, Alternative 7 would result in a maximum net reduction of about 17.4 acres (0.03 square miles) of channel area that could potentially contribute to sediment supply. Given this estimate, the reduction of 17.4 acres (0.03 square miles) would result in a maximum direct reduction of approximately 30 tons of sediment per year. In total, Alternative 7 could result in the reduction of 45 tons of sediment per year delivered through the Project reach.

The build-out of the Specific Plan would have greater effects to the sediment supplied to the River system. The build-out of the Specific Plan under Alternative 7 would convert approximately 3,708.3 acres (5.8 square miles) to non-erodible surfaces, including pavement and permanent vegetation that would reduce the sedimentation of site runoff. Accordingly, this would result in the reduction of roughly 6,750 tons of sediment per year.

The drainage areas in which the Entrada site lies would not be completely developed; therefore, storm flows from the upper reaches would contain sediment and vegetative debris. The VCC planning area would not be developed under this alternative. The Entrada planning area consists of approximately 316.1

acres. Development of the Entrada site would result in approximately 176.2 acres (0.28 square miles) of non-erosive surfaces, including pavement and permanent vegetation that would reduce the sedimentation of site runoff which would result in a direct reduction of roughly 320 tons of sediment per year.

As detailed in **Subsection 4.2.3.1.3**, Beach Replenishment, the Santa Clara River exports an estimated 4.08 million tons per year from its mouth into the Santa Barbara Channel. In total, the RMDP and SCP would result in the net reduction of 7,070 tons of sediment per year, or approximately 0.2 percent reaching the Santa Barbara Channel, which would be a less-than-significant impact. In order to minimize this reduction in sediment delivery to Ventura County beaches, Mitigation Measure GRR-6 specifies that sediment from upland sources, such as debris basins and other sediment retention activities, would be redistributed in permitted upland and/or riparian locations along the Santa Clara River to reintroduce sediment for beach replenishment purposes. This sediment management activity would lessen the adverse effect of debris and sediment reduction on downstream beach erosion.

Based on this analysis, the reduction of sediment delivered to Ventura County beaches due to the RMDP components and build-out of the Specific Plan, VCC and Entrada planning areas would be less than significant relative to Significance Criterion 7 since the decrease in average annual sediment transported to the beaches would be less than 1 percent.

### 4.2.6 MITIGATION MEASURES

The County of Los Angeles has already imposed mitigation measures in response to the Specific Plan's impacts on hydrology, erosion, and sedimentation. These mitigation measures are found in the previously certified Newhall Ranch Specific Plan Revised Draft EIR (March 1999) and the adopted Mitigation Monitoring Plan for the Specific Plan (May 2003). The applicant has committed to implementing these Specific Plan mitigation measures to ensure that future development of the Specific Plan site would not result in significant erosion, siltation, or debris flow impacts.

For this analysis, the applicable Specific Plan mitigation measures have been reviewed and incorporated into the mitigation measures set forth below (see, parenthetical reference to the seven incorporated Specific Plan ["SP"] mitigation measures). The EIS/EIR also has developed new Project-specific mitigation to further minimize the geomorphology- and riparian-related impacts resulting from implementation of the RMDP component of the proposed Project. These measures also are listed below.

#### 4.2.6.1 Mitigation Measures Already Required by the Adopted Newhall Ranch Specific Plan EIR

The County of Los Angeles previously adopted mitigation measures to minimize geomorphology and riparian resources-related impacts within the Specific Plan area as part of its adoption of the Newhall Ranch Specific Plan and WRP. These mitigation measures are found in the previously certified Newhall Ranch Specific Plan Program EIR and the adopted Mitigation Monitoring Plan for the Specific Plan and WRP (May 2003). In addition, these mitigation measures are set forth in full below, and preceded by "SP," which stands for Specific Plan.

SP-4.2-1 All on and off-site flood control improvements necessary to serve the Newhall Ranch Specific Plan area to be constructed to the satisfaction of the County of Los Angeles Department of Public Works Flood Control Division.

SP-4.2-2 All necessary permits or letters of exemption from the U.S. Army Corps of Engineers, U.S. Fish and Wildlife Service, California Department of Fish and Game, and the Regional Water Quality Control Board for Specific Plan-related development are to be obtained prior to construction of drainage improvements. The performance criteria to be used in conjunction with 1603 agreements and/or 404 permits are described in Section 4.6, Biological Resources, Mitigation Measures 4.6-1 through 4.6-10 (restoration) and 4.6-11 through 4.6-16 (enhancement).

SP-4.2-3 All necessary streambed agreement(s) are to be obtained from the California Department of Fish and Game wherever grading activities alter the flow of streams under CDFG jurisdiction. The performance criteria to be used in conjunction with 1603 agreements and/or 404 permits are described in Section 4.6, Biological Resources, Mitigation Measures 4.6-1 through 4.6-10 (restoration) and 4.6-11 through 4.6-16 (enhancement).

SP-4.2-4 Conditional Letters of Map Revision (CLOMR) relative to adjustments to the 100-year FIA flood plain are to be obtained by the applicant after the proposed drainage facilities are constructed.

SP-4.2-5 Prior to the approval and recordation of each subdivision map, a Hydrology Plan, Drainage Plan, and Grading Plan (including an Erosion Control Plan, if required) for each subdivision must be prepared by the applicant of the subdivision map to ensure that no significant erosion, sedimentation, or flooding impacts would occur during or after site development. These plans shall be prepared to the satisfaction of the County of Los Angeles Department of Public Works.

SP-4.2-6 Install permanent erosion control measures, such as desilting and debris basins, drainage swales, slope drains, storm drain inlet/outlet protection, and sediment traps in order to prevent sediment and debris from the upper reaches of the drainage areas which occur on the Newhall Ranch site from entering storm drainage improvements. These erosion control measures shall be installed to the satisfaction of the County of Los Angeles Department of Public Works.

SP-4.2-7 The applicant for any subdivision map permitting construction shall satisfy all applicable requirements of the NPDES Program in effect in Los Angeles County to the satisfaction of the County of Los Angeles Department of Public Works. These requirements currently include preparation of a Urban Storm Water Mitigation Plan (USWMP) containing design features and Best Management Practices (BMPs) appropriate and applicable to the subdivision. In addition, the requirements currently include preparation of a Storm Water Management Pollution Prevention Plan (SWPPP) containing design features and BMPs appropriate and applicable to the subdivision. The County of Los Angeles Department of Public Works shall monitor compliance with these NPDES requirements.

#### 4.2.6.2 Mitigation Measures Relating to the VCC Planning Area

The previously certified VCC EIR (April 1990) did not address impacts related to geomorphology and riparian resources. However, as noted in **Subsection 4.2.1.2.1**, above, additional environmental review will be conducted by Los Angeles County with respect to the VCC planning area, because the applicant recently submitted the last tentative parcel map for build-out of the VCC planning area. Additional mitigation measures may be adopted by Los Angeles County if build-out of the VCC planning area were to result in significant impacts to geomorphology and riparian resources within the VCC planning area.

#### 4.2.6.3 Mitigation Measures Relating to the Entrada Planning Area

The County of Los Angeles has not yet prepared or released a draft EIR for the proposed development within the portion of the Entrada planning area that would be facilitated by approval of the SCP component of the proposed Project. As a result, there are no previously adopted mitigation measures for the Entrada planning area. However, the adoption and implementation of measures similar to those previously adopted for the Specific Plan area and/or recommended for the proposed Project would ensure that potential impacts to geomorphology and riparian resources within the Entrada planning area are reduced to the extent feasible.

#### 4.2.6.4 Additional Mitigation Measures Proposed by this EIS/EIR

Based on the analysis above, the following mitigation measures are proposed to ensure that impacts related to geomorphology and riparian resources remain less than significant. These proposed mitigation measures are to be implemented in addition to those previously adopted by the County of Los Angeles in connection with its approval of the Specific Plan, WRP, and VCC projects. These measures are preceded by "GRR," to designate that they are geomorphology and riparian resources-related mitigation.

GRR-1 Post-peak stormwater runoff discharges from open channels or drainage systems must be controlled to minimize localized erosion impacts to River geomorphology and riparian habitat. Discharge flows would be regulated using water control features that must capture the runoff from small, frequent flows (*i.e.*, one- and two-year events). Water and hydromodification control features must be designed in accordance with DPW criteria. Where applicable, energy dissipation structures must be incorporated at drainage outlets to the Santa Clara River to minimize discharge velocities and potential localized erosion.

GRR-2 Where practical in River and tributary drainages, bridge crossings shall minimize the number and size of piers and/or columns to minimize localized impacts to River and/or tributary geomorphology and riparian resources.

GRR-3 Structural features such as outlets, bank stabilization, grade stabilization structures, bridge abutments, culverts, and other features that may be subjected to River or tributary flows will be constructed of erosion resistant materials such as concrete, soil cement, or secured rip-rap to ensure long-term stability and reduce the need for routine maintenance and/or rehabilitation/replacement activities and be subject to approval by DPW.

GRR-4 Prior to final subdivision map or the issuance of any grading or building permit, instream tributary (open channels, where applicable) channel design features will be incorporated to control potential hydromodification impacts to geomorphology and riparian resources. The design will be based on erosion potential and other hydrologic modeling to determine appropriate equilibrium slope in the post-development condition as described in the Subregional Stormwater Mitigation Plan and be subject to approval by DPW.

GRR-5 Sediment/debris control structures must be constructed downstream of natural watersheds to protect developed area drainage systems from debris flows. The design capacity for sediment/debris control structures must take into account the classifications stated in the debris production maps provided in Appendix A of the DPW 1991 Hydrology Manual. Sediment/debris control structure capacity and transport rates must be based on the specification stated in the DPW Sedimentation Manual.

GRR-6 Sediment from upland sources, such as debris basins and other sediment retention activities, will be redistributed in DPW-designated and permitted upland or riparian locations along the Santa Clara River and/or tributaries to reintroduce sediment for beach replenishment purposes.

GRR-7 A Geomorphology Monitoring and Management Plan (Plan) will be prepared to ensure that the modified/re-engineered drainages along the major tributaries (Long, Lion, Potrero, Chiquito, and San Martinez Grande Canyons) comply with the mitigation objectives and design goals outlined in the Newhall Ranch Tributary Channel Design Guidelines (PWA 2008). Specifically, the Plan shall include the measures to be implemented to ensure the integrity of the structural elements and a state of "constrained dynamic equilibrium.[18]" The Plan shall specify the following: (1) a framework to collect baseline data to characterize conditions immediately after construction; (2) a post-development monitoring program; (3) a framework to develop erosion and sedimentation threshold parameters and performance standards that activate adaptive management measures across a series of potential future scenarios; and, (4) contingency plans and appropriate remedial measures in the event that management efforts are not successful. The Plan shall be subject to final approval by the U.S. Army Corps of Engineers, CDFG, and DPW and will include (but will not be limited to) the following:

1. Immediately after construction the following activities shall be carried out:

   A. An as-built survey shall be conducted for the completed channels to include a full longitudinal profile, cross-sections, and all in-channel structures.

   B. The channel floodplain and valley toe shall be mapped into three classes of channel migration zone: "green zones" where channel migration is permissible, "yellow

[18] In this context, "constrained dynamic equilibrium" indicates that the channels will be designed to periodically change width, depth, and location on the floodplain in response to changing rainfall and vegetation dynamics, but stay within a predefined corridor and not encroach on infrastructure or fill slopes.

zones" which should trigger site inspections by a qualified engineer or geomorphologist leading to possible stabilization actions, and "red zones" which should trigger immediate repair and stabilization efforts.

2. In years 1, 3, 5, 10, and 20 following construction and after a flow event exceeding the 10-year recurrence interval, the following activities shall be carried out:

   A. A re-survey of the channel longitudinal profile and cross-sections. The longitudinal profile shall include a point on the thalweg every 50 feet where there are no visible steps or gradient changes in the channel profile, with additional points at any gradient changes. The longitudinal profile shall be surveyed in more detail through in-channel structures such as step-pools, with particular attention to the scour pool geometry.

   B. A visual inspection of each step-pool structure shall be performed. The inspection shall look for evidence of soil piping or washing out between rocks, movement of rock out of position (*e.g.* into the scour pool), presence of visible geotextile or cut-off wall materials, evidence for outflanking of the structure, exposure of the base of the toe rock.

   C. The longitudinal profile shall be compared to the as-built profile and the as-built step-pool structures, so that scour relative to the depth of the rock armor can be noted.

   D. The low flow channel configuration shall be compared with the channel migration zones.

3. The monitoring data will be evaluated to determine whether remedial actions or more detailed studies are required. The criteria used to trigger more detailed investigations or maintenance/remedial actions will include (but will not be limited to) the following:

   A. If the low-flow channel migrates into the "yellow zone", then a qualified geomorphologist or civil engineer shall conduct a more detailed investigation to determine the probability of further migration into a "red zone". If channel migration towards a "red zone" is occurring at a rate less than 3 feet per year, then this would trigger more frequent site inspections. These inspections shall include annual inspections and inspections after every large flow event (2-year recurrence interval flow or greater) until the channel migration ceases or the channel migrates away from the "red zone". If the rate of migration towards a "red zone" exceeds 3 feet per year or is within 10-feet of a "red zone", then remedial actions will be implemented to stabilize the channel and restore channel functionality to comply with the basis of design criteria.

   B. If channel erosion exposes the toe protection of the step-pools, then a qualified geomorphologist or civil engineer shall conduct a more detailed investigation to and develop a remedial plan to stabilize the channel and structure (*e.g.* extend

toe protection deeper, or use grade control downstream to restore the channel bed elevation at the step-pool). Following review and approval of the plan, the remedial actions will be implemented.

C. If channel erosion results in a decrease in the channel elevation of 1-foot or greater over a length of more than 50 feet or forms "knickpoints", then a qualified geomorphologist or civil engineer shall conduct a more detailed investigation to determine whether the erosion/channel incision is likely to migrate and threaten the stability of project structures. If the results of the investigation indicate that the stability of the structures is in jeopardy, then a remedial plan will be developed to stabilize the channel and structure (*e.g.*, keying in additional boulder ramps to the channel bed). Following review and approval of the plan, the remedial actions will be implemented.

D. If channel aggradation occurs such that step-pool structures are buried by sediment and/or the low-flow channel is no longer well-defined, then a qualified geomorphologist or civil engineer shall conduct a more detailed investigation to determine whether the aggradational trend is short-term or long-term. For the purposes of this monitoring program, "short term" means that the structure was not buried in the previous monitoring survey and "long term" means that the structure was buried during the previous monitoring survey. If aggradation appears to be short-term, then a pilot channel shall be cut through the original step-pool alignment to ensure that subsequent erosive flows do not flank the step-pools and jeopardize the channel stability. The pilot channel shall have the same dimensions as the original design channel. If aggradation appears to be long-term and the aggradation does not threaten the stability of the channel, then the channel shall be allowed to form itself (no sediment removal shall be carried out). However, if the aggradation appears to be long-term and potentially threatens the stability of the channel, then a remedial plan will be developed to stabilize the channel. Following review and approval of the plan, the remedial actions will be implemented.

E. After all flood events exceeding the 5-year recurrence interval flow, then a qualified geomorphologist or civil engineer shall conduct an inspection of the channel to evaluate for signs of erosion, "knickpoints", flanking of structures, and piping or erosion around the project structures. If the results of the inspection indicate evidence of channel instability, then a more detailed site investigation shall be carried out to determine whether corrective action is required.

In addition to the measures identified above, the Plan shall describe the potential remedial techniques to prevent, mitigate, abate, or control undesirable geomorphic response. These measures will include (but will not be limited to) the following:

1. Repair, maintenance or replacement of creek structures and development improvements.

2. Stabilization (either partial or total) of eroded areas or failures of the creek slopes by removal and replacement with appropriate materials.

3. Construction of erosion control measures that, where feasible, will consist of bio-engineering techniques.

4. Placement of subsurface drainage devices (*e.g.*, underdrains, or horizontal drilled drains).

5. Slope correction (*e.g.*, gradient change, slope trimming or contouring).

6. Construction of additional surface ditches and/or ponds, sediment traps, or backfill of eroded channels.

All monitoring reports shall be submitted to the U.S. Army Corps of Engineers, CDFG, LA DPW, and/or other designated entities. Prior to implementing any remedial actions, applicable approvals and permits will be obtained from the U.S. Army Corps of Engineers, CDFG, and LA DPW. Following construction, Newhall will maintain responsibility for implementation of the Plan for an interim period and will be responsible for all monitoring and necessary maintenance/remedial actions. After this initial period, Newhall will transfer the maintenance and monitoring responsibilities to the LA DPW or other designated entity.

### 4.2.7 SUMMARY OF SIGNIFICANCE FINDINGS

#### 4.2.7.1 Santa Clara River

Using the significance criteria identified in this section, it has been determined that the proposed Project and alternatives would result in significant impacts to geomorphology and riparian habitat in the Santa Clara River. However, with implementation of the mitigation measures identified in **Subsection 4.2.6**, Mitigation Measures, these impacts would be reduced to less-than-significant levels. Impacts resulting from the proposed Project and alternatives along with the applicable mitigation measures are presented in **Table 4.2-41**, below.

#### 4.2.7.2 Tributaries to the Santa Clara River

Using the significance criteria identified in this section, it has been determined that the proposed Project and alternatives would result in significant impacts to geomorphology and riparian habitat in the tributaries. However, with implementation of the mitigation measures identified in **Subsection 4.2.6**, Mitigation Measures, these impacts would be reduced to less-than-significant levels. Impacts resulting from the proposed Project and alternatives along with the applicable mitigation measures are presented in **Table 4.2-42**, below.

**Table 4.2-41**
**Summary of Significant Impacts To The Santa Clara River In All Planning Areas**

| Impacts | Applicable Mitigation Measures | Drainage | Planning Area | Impact of Alternatives - Pre/Post-Mitigation | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Alt 1 Pre/ Post | Alt 2 Pre/ Post | Alt 3 Pre/ Post | Alt 4 Pre/ Post | Alt 5 Pre/ Post | Alt 6 Pre/ Post | Alt 7 Pre/ Post |
| 1: Short-term impacts from construction activities that would temporarily change the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner that would result in substantial erosion on- or off-site. | SP-4.2-1, SP-4.2-2, SP-4.2-3, SP-4.2-4, SP-4.2-5, SP-4.2-6, SP-4.2-7 | Santa Clara | RMDP | NI/NI | SI/M | SI/M | SI/M | SI/M | SI/M | SI/M |
| | | | Entrada | NI/NI | SI/M | SI/M | SI/M | SI/M | SI/M | SI/M |
| | | | VCC | NI/NI | SI/M | SI/M | SI/M | SI/M | SI/M | SI/M |
| 2: Substantial long-term erosion and/or downstream deposition following Project implementation. | SP-4.2-5, SP-4.2-6, SP-4.2-7, GRR-1, GRR-3, GRR-4 | Santa Clara | RMDP | NI/NI | SI/M | SI/M | SI/M | SI/M | SI/M | SI/M |
| | | | Entrada | NI/NI | SI/M | SI/M | SI/M | SI/M | SI/M | SI/M |
| | | | VCC | NI/NI | SI/M | SI/M | SI/M | SI/M | SI/M | SI/M |
| 3: Substantial reduction in geomorphic function (*i.e.*, channel stability). | SP-4.2-1, SP-4.2-2, SP-4.2-3, SP-4.2-4, SP-4.2-5. SP-4.2-6, GRR-1, GRR-2, GRR-3, GRR-4, GRR-5, GRR-6 | Santa Clara | RMDP | NI/NI | SI/M | SI/M | SI/M | SI/M | SI/M | SI/M |
| | | | Entrada | NI/NI | SI/M | SI/M | SI/M | SI/M | SI/M | SI/M |
| | | | VCC | NI/NI | SI/M | SI/M | SI/M | SI/M | SI/M | SI/M |
| 4: Scouring of the riverbed and floodplain to the point of causing a substantial increase in the frequency and magnitude of scouring of riparian vegetation. | SW-1, SW-2, SW-3, SW-5 | Santa Clara | RMDP | NI/NI | SI/M | NS/NS | NS/NS | NS/NS | NS/NS | NS/NS |
| | | | Entrada | NI/NI | NS/NS | SI/M | NS/NS | NS/NS | NS/NS | NS/NS |
| | | | VCC | NI/NI | NS/NS | SI/M | NS/NS | NS/NS | NS/NS | NS/NS |

**Table 4.2-41**
**Summary of Significant Impacts To The Santa Clara River In All Planning Areas**

| Impacts | Applicable Mitigation Measures | Drainage | Planning Area | Impact of Alternatives - Pre/Post-Mitigation | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Alt 1 Pre/ Post | Alt 2 Pre/ Post | Alt 3 Pre/ Post | Alt 4 Pre/ Post | Alt 5 Pre/ Post | Alt 6 Pre/ Post | Alt 7 Pre/ Post |
| 5: Result in decreased flow (short-term or long-term) from Middle Canyon Spring and adversely impact riparian resources supported by the spring. | | Santa Clara | RMDP | NI/NI | NA | NA | NA | NA | NA | NA |
| | | | Entrada | NI/NI | NA | NA | NA | NA | NA | NA |
| | | | VCC | NI/NI | NA | NA | NA | NA | NA | NA |
| 6: Substantially lengthen the duration of seasonal flow in the "Dry Gap. | GRR-6 | Santa Clara | RMDP | NI/NI | NS/NS | NS/NS | NS/NS | NS/NS | NS/NS | NS/NS |
| | | | Entrada | NI/NI | NS/NS | NS/NS | NS/NS | NS/NS | NS/NS | NS/NS |
| | | | VCC | NI/NI | NS/NS | NS/NS | NS/NS | NS/NS | NS/NS | NS/NS |
| 7: Result in an average annual reduction of greater than 1 percent of sediment delivered from the Santa Clara River to Ventura County beaches. | GRR-6 | Santa Clara | RMDP | NI/NI | NS/NS | NS/NS | NS/NS | NS/NS | NS/NS | NS/NS |
| | | | Entrada | NI/NI | NS/NS | NS/NS | NS/NS | NS/NS | NS/NS | NS/NS |
| | | | VCC | NI/NI | NS/NS | NS/NS | NS/NS | NS/NS | NS/NS | NS/NS |

SI/M = Significant impact, but mitigated to less-than-significant level
NA = Not applicable
NS = Not significant, or adverse. No mitigation required.
NI = No impact, and no mitigation required

**Table 4.2-42**
**Summary of Significant Impacts To Tributaries In All Planning Areas - Pre- and Post-Mitigation**

| Significance Criteria | Applicable Mitigation Measures | Planning Area | Drainage | Impacts of Alternatives - Pre- and Post-Mitigation | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Alt 1 | Alt 2 | Alt 3 | Alt 4 | Alt 5 | Alt 6 | Alt 7 |
| 1: Short-term impacts from construction activities that would temporarily change the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner that would result in substantial erosion on- or off-site. | SP4.2-1, SP-4.2-2, SP-4.2-3, SP-4.2-4, SP-4.2-5, SP-4.2-6, SP-4.2-7 | RMDP | Chiquito | NI/NI | SI/M | SI/M | SI/M | SI/M | SI/M | SI/M |
| | | | San Martinez Grande | NI/NI | SI/M | SI/M | SI/M | SI/M | SI/M | SI/M |
| | | | Long | NI/NI | SI/M | SI/M | SI/M | SI/M | SI/M | SI/M |
| | | | Potrero | | SI/M | SI/M | SI/M | SI/M | SI/M | SI/M |
| | | | Lion | NI/NI | SI/M | SI/M | SI/M | SI/M | SI/M | SI/M |
| | | | Minor Drainage | NI/NI | SI/M | SI/M | SI/M | SI/M | SI/M | SI/M |
| | | VCC | Castaic Creek | NI/NI | NI/NI | SI/M | SI/M | SI/M | SI/M | SI/M |
| | | | Hasley Creek | NI/NI | SI/M | SI/M | SI/M | SI/M | SI/M | SI/M |
| | | Entrada | Unnamed Canyon 1 | NI/NI | SI/M | SI/M | SI/M | SI/M | SI/M | SI/M |
| | | | Unnamed Canyon 2 | NI/NI | SI/M | SI/M | SI/M | SI/M | SI/M | SI/M |
| | | | Unnamed Canyon 3 | NI/NI | SI/M | SI/M | SI/M | SI/M | SI/M | SI/M |
| | | | Magic Mountain Canyon | NI/NI | SI/M | SI/M | SI/M | SI/M | SI/M | SI/M |
| 2: Substantial long-term erosion and/or downstream deposition following Project implementation. | SP-4.2-1, SP-4.2-3, SP-4.2-3, SP-4.2-4, SP-4.2-5, SP-4.2-6, SP-4.2-7; GRR-1, GRR-2, GRR-3, GRR-4, GRR-5, GRR-6, GRR-7 | RMDP | Chiquito | | SI/M | SI/M | | SI/M | SI/M | SI/M |
| | | | San Martinez Grande | NI/NI | SI/M | SI/M | SI/M | SI/M | SI/M | SI/M |
| | | | Long | NI/NI | NI/NI | SI/M | SI/MSI/M | SI/M | SI/M | SI/M |
| | | | Potrero | | SI/M | SI/M | SI/M | SI/M | SI/M | SI/M |
| | | | Lion | NI/NI | SI/M | SI/M | SI/M | SI/M | SI/M | SI/M |
| | | | Minor Drainage | NI/NI | SI/M | SI/M | SI/M | SI/M | SI/M | SI/M |
| | | VCC | Castaic Creek | NI/NI | NI/NI | SI/M | SI/M | SI/M | SI/M | SI/M |
| | | | Hasley Creek | NI/NI | SI/M | SI/M | SI/M | SI/M | SI/M | SI/M |

**Table 4.2-42**
**Summary of Significant Impacts To Tributaries In All Planning Areas - Pre- and Post-Mitigation**

| Significance Criteria | Applicable Mitigation Measures | Planning Area | Drainage | Impacts of Alternatives - Pre- and Post-Mitigation | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Alt 1 | Alt 2 | Alt 3 | Alt 4 | Alt 5 | Alt 6 | Alt 7 |
| 3: Substantial reduction in geomorphic function (*i.e.*, channel stability). | SP-4.2-5, SW-1, SW-2, SW-3, SP-4.2-5, GRR-1, GRR-2, GRR-3, GRR-4, GRR-5, GRR-6 | Entrada | Unnamed Canyon 1 | NI/NI | SI/M | SI/M | SI/M | SI/M | SI/M | SI/M |
| | | | Unnamed Canyon 2 | NI/NI | SI/M | SI/M | SI/M | SI/M | SI/M | SI/M |
| | | | Unnamed Canyon 3 | NI/NI | SI/M | SI/M | SI/M | SI/M | SI/M | SI/M |
| | | | Magic Mountain Canyon | NI/NI | SI/M | SI/M | SI/M | SI/M | SI/M | SI/M |
| | | RMDP | Chiquito | | SI/M | SI/M | | SI/M | SI/M | SI/M |
| | | | San Martinez Grande | NI/NI | SI/M | SI/M | SI/M | SI/M | SI/M | SI/M |
| | | | Long | NI/NI | SI/M | SI/M | SI/M | SI/M | SI/M | SI/M |
| | | | Potrero | | SI/M | SI/M | SI/M | SI/M | SI/M | SI/M |
| | | | Lion | NI/NI | SI/M | SI/M | SI/M | SI/M | SI/M | SI/M |
| | | | Minor Drainage | NI/NI | SI/M | SI/M | SI/M | SI/M | SI/M | SI/M |
| | | VCC | Castaic Creek | NI/NI | SI/M | SI/M | SI/M | SI/M | SI/M | SI/M |
| | | | Hasley Creek | NI/NI | SI/M | SI/M | SI/M | SI/M | SI/M | SI/M |
| | | Entrada | Unnamed Canyon 1 | NI/NI | SI/M | SI/M | SI/M | SI/M | SI/M | SI/M |
| | | | Unnamed Canyon 2 | NI/NI | SI/M | SI/M | SI/M | SI/M | SI/M | SI/M |
| | | | Unnamed Canyon 3 | NI/NI | SI/M | SI/M | SI/M | SI/M | SI/M | SI/M |
| | | | Magic Mountain Canyon | NI/NI | SI/M | SI/M | SI/M | SI/M | SI/M | SI/M |

**Table 4.2-42**
**Summary of Significant Impacts To Tributaries In All Planning Areas - Pre- and Post-Mitigation**

| Significance Criteria | Applicable Mitigation Measures | Planning Area | Drainage | Impacts of Alternatives - Pre- and Post-Mitigation | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Alt 1 | Alt 2 | Alt 3 | Alt 4 | Alt 5 | Alt 6 | Alt 7 |
| 4: Scouring of the riverbed and floodplain to the point of causing a substantial increase in the frequency and magnitude of scouring of riparian vegetation. | SW-2, SW-3, SW-5, BIO-1, BIO-6, BIO-7 | RMDP | Chiquito | NI/NI | SI/M | SI/M | SI/M | SI/M | SI/M | SI/M |
| | | | San Martinez Grande | NI/NI | SI/M | SI/M | SI/M | SI/M | SI/M | SI/M |
| | | | Long | NI/NI | SI/M | SI/M | SI/M | SI/M | SI/M | SI/M |
| | | | Potrero | NI/NI | SI/M | SI/M | SI/M | SI/M | SI/M | SI/M |
| | | | Lion | NI/NI | SI/M | SI/M | SI/M | SI/M | SI/M | SI/M |
| | | | Minor Drainage | NI/NI | SI/M | SI/M | SI/M | SI/M | SI/M | SI/M |
| | | VCC | Castaic Creek | NI/NI | SI/M | SI/M | NS/NS | NS/NS | NS/NS | NS/NS |
| | | | Hasley Creek | NI/NI | SI/M | SI/M | NS/NS | NS/NS | NS/NS | NS/NS |
| | | Entrada | Unnamed Canyon 1 | NI/NI | SI/M | SI/M | NS/NS | NS/NS | NS/NS | NS/NS |
| | | | Unnamed Canyon 2 | NI/NI | SI/M | SI/M | NS/NS | NS/NS | NS/NS | NS/NS |
| | | | Unnamed Canyon 3 | NI/NI | SI/M | SI/M | NS/NS | NS/NS | NS/NS | NS/NS |
| | | | Magic Mountain Canyon | NI/NI | SI/M | SI/M | NS/NS | NS/NS | NS/NS | NS/NS |
| 5: Result in decreased flow (short-term or long-term) from Middle Canyon Spring and adversely impact riparian resources supported by the spring. | BIO-74, BIO-77 | RMDP | Chiquito | NA | NA | NA | NA | NA | NA | NA |
| | | | San Martinez Grande | NA | NA | NA | NA | NA | NA | NA |
| | | | Long | NA | NA | NA | NA | NA | NA | NA |
| | | | Potrero | NA | NA | NA | NA | NA | NA | NA |
| | | | Lion | NA | NA | NA | NA | NA | NA | NA |
| | | | Minor Drainage | NI/NI | SI/M | SI/M | SI/M | SI/M | SI/M | SI/M |
| | | VCC | Castaic Creek | NI/NI | NA | NA | NA | NA | NA | NA |
| | | | Hasley Creek | NI/NI | NA | NA | NA | NA | NA | NA |

**Table 4.2-42**
**Summary of Significant Impacts To Tributaries In All Planning Areas - Pre- and Post-Mitigation**

| Significance Criteria | Applicable Mitigation Measures | Planning Area | Drainage | Impacts of Alternatives - Pre- and Post-Mitigation | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Alt 1 | Alt 2 | Alt 3 | Alt 4 | Alt 5 | Alt 6 | Alt 7 |
| 6: Substantially lengthen the duration of seasonal flow in the "Dry Gap. | | Entrada | Unnamed Canyon 1 | NI/NI | NA | NA | NA | NA | NA | NA |
| | | | Unnamed Canyon 2 | NI/NI | NA | NA | NA | NA | NA | NA |
| | | | Unnamed Canyon 3 | NI/NI | NA | NA | NA | NA | NA | NA |
| | | | Magic Mountain Canyon | NI/NI | NA | NA | NA | NA | NA | NA |
| | | RMDP | Chiquito | | NS/NS | NS/NS | NS/NS | NS/NS | NS/NS | NS/NS |
| | | | San Martinez Grande | NI/NI | NS/NS | NS/NS | NS/NS | NS/NS | NS/NS | NS/NS |
| | | | Long | NI/NI | NS/NS | NS/NS | NS/NS | NS/NS | NS/NS | NS/NS |
| | | | Potrero | | NS/NS | NS/NS | NS/NS | NS/NS | NS/NS | NS/NS |
| | | | Lion | NI/NI | NS/NS | NS/NS | NS/NS | NS/NS | NS/NS | NS/NS |
| | | | Minor Drainage | NI/NI | NS/NS | NS/NS | NS/NS | NS/NS | NS/NS | NS/NS |
| | | VCC | Castaic Creek | NI/NI | NS/NS | NS/NS | NS/NS | NS/NS | NS/NS | NS/NS |
| | | | Hasley Creek | NI/NI | NS/NS | NS/NS | NS/NS | NS/NS | NS/NS | NS/NS |
| | | Entrada | Unnamed Canyon 1 | NI/NI | NS/NS | NS/NS | NS/NS | NS/NS | NS/NS | NS/NS |
| | | | Unnamed Canyon 2 | NI/NI | NS/NS | NS/NS | NS/NS | NS/NS | NS/NS | NS/NS |
| | | | Unnamed Canyon 3 | NI/NI | NS/NS | NS/NS | NS/NS | NS/NS | NS/NS | NS/NS |
| | | | Magic Mountain Canyon | NI/NI | NS/NS | NS/NS | NS/NS | NS/NS | NS/NS | NS/NS |

**Table 4.2-42**
**Summary of Significant Impacts To Tributaries In All Planning Areas - Pre- and Post-Mitigation**

| Significance Criteria | Applicable Mitigation Measures | Planning Area | Drainage | Impacts of Alternatives - Pre- and Post-Mitigation | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Alt 1 | Alt 2 | Alt 3 | Alt 4 | Alt 5 | Alt 6 | Alt 7 |
| 7: Result in an average annual reduction of greater than 1 percent of sediment delivered from the Santa Clara River to Ventura County beaches. | GRR-6 | RMDP | Chiquito | NI/NI | NS/NS | NS/NS | NS/NS | NS/NS | NS/NS | NS/NS |
| | | | San Martinez Grande | NI/NI | NS/NS | NS/NS | NS/NS | NS/NS | NS/NS | NS/NS |
| | | | Long | NI/NI | NS/NS | NS/NS | NS/NS | NS/NS | NS/NS | NS/NS |
| | | | Potrero | NI/NI | NS/NS | NS/NS | NS/NS | NS/NS | NS/NS | NS/NS |
| | | | Lion | NI/NI | NS/NS | NS/NS | NS/NS | NS/NS | NS/NS | NS/NS |
| | | | Minor Drainage | NI/NI | NS/NS | NS/NS | NS/NS | NS/NS | NS/NS | NS/NS |
| | | VCC | Castaic Creek | NI/NI | NS/NS | NS/NS | NS/NS | NS/NS | NS/NS | NS/NS |
| | | | Hasley Creek | NI/NI | NS/NS | NS/NS | NS/NS | NS/NS | NS/NS | NS/NS |
| | | Entrada | Unnamed Canyon 1 | NI/NI | NS/NS | NS/NS | NS/NS | NS/NS | NS/NS | NS/NS |
| | | | Unnamed Canyon 2 | NI/NI | NS/NS | NS/NS | NS/NS | NS/NS | NS/NS | NS/NS |
| | | | Unnamed Canyon 3 | NI/NI | NS/NS | NS/NS | NS/NS | NS/NS | NS/NS | NS/NS |
| | | | Magic Mountain Canyon | NI/NI | NS/NS | NS/NS | NS/NS | NS/NS | NS/NS | NS/NS |

SI/M = Significant impact, but mitigated to less-than-significant level
NA = Not applicable
NS = Not significant, or adverse. No mitigation required.
NI = No impact, and no mitigation required

### 4.2.8 SIGNIFICANT UNAVOIDABLE IMPACTS

Implementation of the previously approved Newhall Ranch Specific Plan mitigation measures, and the recommended mitigation measures set forth above would reduce geomorphology and riparian resource impacts to less-than-significant levels. Thus, no significant unavoidable impacts are anticipated.