4.0 ENVIRONMENTAL IMPACT ANALYSIS

PURPOSE

This section provides information on the project site's existing conditions, project and cumulative impact potential, and cumulative mitigation measures (refer to EIR ***Sections 4.1, Geotechnical and Soil Resources****, through* ***4.23, Global Climate Change****). As proposed, Landmark Village would be developed over a five-year period. Mitigation measures are designed to reduce the project's impact potential. This section also describes the significant impacts which would occur after mitigation measures have been applied. Technical topics addressed in the EIR were defined by the Lead Agency through the Initial Study and Notice of Preparation process.*

4.1 GEOTECHNICAL AND SOIL RESOURCES

1. SUMMARY

Based on the analysis presented in this EIR section, there are no active faults, landslides, or surficial failures on or in close proximity to the Landmark Village project site, and the potential for earthquake-induced slope failures is considered negligible. Impacts associated with liquefaction and seismically induced settlement are considered less than significant. Due to the relative flatness of the project site, low liquefaction potential, subsurface soil stratigraphy, and proposed improvements in the river channel area, there would be no impacts relative to lateral spreading due to liquefaction. In addition, there would be no impacts relative to hydroconsolidation. However, unless mitigated, specific project-related significant geologic, soil, and geotechnical impacts could occur in the following areas:

- *Along cut/fill and bedrock/alluvium contacts, there is a future potential hazard due to the combination of dynamic compaction and differential settlement, along with differential materials response;*
- *Development of lots underlain by transitions between different material types (e.g., bedrock to fill, bedrock to alluvium, etc.);*
- *The clay-rich bedding planes of the Saugus Formation may represent a potential hazard from secondary seismogenic movement along bedding planes;*
- *Construction and development within areas of high groundwater;*
- *Soil conditions on the project site that would affect construction practices on future site development include expansive soils, soils with shrink-swell potential, corrosive soils, and low cohesion soils;*
- *Shallow weak soils;*
- *High water tables requiring dewatering;*
- *Low cohesion sands; and*
- *Landslide potential at the Edison access road at the Chiquito Canyon grading site.*

Applicable mitigation measures to address these impacts were identified in the certified Newhall Ranch Specific Plan Program EIR. This EIR recommends additional mitigation measures specific to the Landmark Village project site. In summary, with implementation of the mitigation measures set forth in this section, the proposed project will not result in significant unavoidable geologic, soil, or geotechnical impacts.

In compliance with Section 111 of the Los Angeles County Building Code, and according to the project geotechnical engineer (Seward), the site designated on the Geological/Geotechnical Maps, as shown on EIR ***Figures 4.1-1*** *through* ***4.1-3****, is feasible for development, would be safe against hazards from landslide, settlement, or slippage, and*

development of the site would not affect off-site property, provided the mitigation measures identified in this section are adopted and implemented during project construction. With implementation of the identified mitigation measures, the proposed project's geologic, soil, and geotechnical impacts would be mitigated to below a level of significance, and no unavoidable significant impacts would occur.

2. INTRODUCTION

a. Relationship of Project to Newhall Ranch Specific Plan Program EIR

Section 4.1 of the Newhall Ranch Specific Plan Program EIR identified and analyzed the existing conditions, potential impacts, and mitigation measures associated with the geologic, soil, and geotechnical resources for the entire Newhall Ranch Specific Plan. The Newhall Ranch mitigation program was adopted by the County in its findings and in the revised Mitigation Monitoring Plans for both the Specific Plan and Water Reclamation Plant (WRP). The Newhall Ranch Specific Plan Program EIR concluded that Specific Plan implementation would result in significant geologic, soil, and geotechnical impacts, but that the identified mitigation measures would reduce the impacts to below a level of significance. That EIR also determined that site-specific geologic, soil, and geotechnical analysis and evaluation would be required as the Specific Plan is implemented through the application and processing of tentative subdivision maps and other discretionary entitlements for Newhall Ranch. All subsequent project-specific development plans and tentative subdivision maps must be consistent with the Newhall Ranch Specific Plan, adopted May 2003, and the County of Los Angeles General Plan and Santa Clarita Valley Area Plan.

This project-level EIR is tiering from the previously certified Newhall Ranch Specific Plan Program EIR. **Section 4.1** assesses the Landmark Village project's existing conditions, the project's potential environmental impacts, the applicable mitigation measures from the Newhall Ranch Specific Plan Program EIR and any new mitigation measures recommended by this EIR.

b. References for this EIR Section

The technical analyses used in this section were prepared by Allan E. Seward Engineering Geology, Inc. (Seward).[1] The Seward technical reports prepared specifically for the Landmark Village project are as follows:

- *Geologic and Geotechnical Report*, Vesting Tentative Tract Map 53108, River Village, Newhall Ranch, 2 volumes, September 27, 2000, Job No. 00-1702R-4 (see Recirculated Draft EIR **Appendix 4.1**);

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1 Seward and R.T. Frankian & Associates were the consultants that performed the geotechnical reconnaissance and reporting associated with the Newhall Ranch Specific Plan Program EIR.

Figure 4.1-1 Geologic/Geotechnical Map

MAP BOX

Figure 4.1-2 Adobe Canyon Geologic/Geotechnical Map

MAP BOX

Figure 4.1-3 Chiquito Canyon Geologic/Geotechnical Map

MAP BOX

- *Geologic and Geotechnical Report – Addendum No. 1: Response to County Comments* (Review Sheets dated December 12, 2000 and January 2, 2001), Vesting Tentative Tract Map 53108, Map dated June 11, 2000, River Village, Newhall Ranch, February 10, 2001, Job No. 01-1702R-4 (see Recirculated Draft EIR **Appendix 4.1**); and

- *Geological and Geotechnical Report*, Adobe Canyon and Chiquito Canyon Preliminary Bulk Grading Study, November 14, 2003, Job No. 03-2022-9 (see Recirculated Draft EIR **Appendix 4.1**).

These project-specific technical reports are included in Recirculated Draft EIR **Appendix 4.1**. Altogether, these reports evaluate existing geologic, soil, and geotechnical conditions, identify potentially significant project-specific geologic, soil, and geotechnical impacts, and identify mitigation measures to reduce the impacts to below a level of significance.

3. SUMMARY OF THE NEWHALL RANCH SPECIFIC PLAN PROGRAM EIR FINDINGS

The Newhall Ranch Specific Plan Program EIR identified potentially significant geologic, soil, and geotechnical impacts that would result from implementation of the Specific Plan. The significant on-site and off-site geologic, soil, and geotechnical impacts identified in the Program EIR were landslides, surficial failures, cut slopes, expansive bedrock, hydroconsolidation, liquefaction potential, and seismic hazards.

In response to identified significant impacts, the County adopted 56 measures to address on-site geology, soils, slope stability, seismicity, and secondary seismic hazards. Based on the Newhall Ranch Specific Plan Program EIR and the entire record, the County's Board of Supervisors found that the significant geotechnical and soil resources impacts identified in that EIR would be mitigated to below a level of significance with implementation of the 56 mitigation measures that were adopted when the Program EIR was certified.[2]

4. EXISTING CONDITIONS

The proposed Landmark Village tentative tract map site is generally flat, except for existing banks between younger and older alluvium and ascending fill slopes and local bedrock outcrops along the south side of State Route 126 (SR-126). The tract map site ranges in elevation from approximately 900 feet along the Santa Clara River on the southwestern portion of the site to a high point of 1,005 feet on a knob along SR-126 (see **Figure 2.0-3, On-Site Topography**, for details of the site topography). Much of the site is currently used for agricultural purposes. Portions of the northern margin of the tract map site have

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2 See, Mitigation Measures 4.1-1 through 4.1-56 in both the certified Newhall Ranch Specific Plan Program EIR (March 9, 1999) and the adopted Mitigation Monitoring Plan for the Specific Plan (May 2003).

been disturbed by construction associated with SR-126, the abandoned Southern Pacific railroad line, and various pipelines. Debris, including concrete and asphalt concrete blocks, has been placed on several portions of the site. Five abandoned oil wells have been drilled on or immediately adjacent to the project site. At least 13 water wells also have been constructed, 11 of which are still in existence.

The Adobe Canyon borrow site is located within the Newhall Ranch Specific Plan area, in the northeastern portion of the Santa Susana Mountains just south of the Santa Clara River and easterly and adjacent to Long Canyon. This borrow site is generally in an undeveloped state with the exception of a few access roads for oil well drill pads. It is covered with natural grasses, chaparral and scattered oak trees. Portions of Long Canyon and the lower portion of Adobe Canyon have been used for agricultural purposes. Dumped fill associated with past oil well drilling activities exists at various locations within the borrow site. Elevations range from approximately 925 feet in the vicinity of the Santa Clara River to approximately 1,350 feet at the natural ridgeline in the vicinity of a future water tank site that is not part of the Landmark Village project. Properties adjacent to the borrow site are under the same ownership.

Off-site grading is also required in the low-lying hills north of SR-126 and the Santa Clara River, easterly of Chiquito Canyon Road and westerly of the Chiquita Canyon Landfill. This land is also located within the Newhall Ranch Specific Plan area. The site is covered with natural grasses and scattered chaparral with the exception of the alluvial area within Chiquito Canyon, which is commonly used for farming. The land is generally in an undeveloped state with the exception of a few access roads for oil well drill pads. Dumped fill associated with past oil well drilling activities is present at the eastern portion of the site. A Southern California Edison easement traverses the northern portion of the area requiring off-site grading. An existing electrical tower within this easement is located at the top of one of the proposed, semicircular cut-slopes. A dirt road currently exists to provide access to this tower. A second power line easement is present at the southern portion of the site.

Assessment of the geologic/geotechnical conditions included the excavation and logging of 64 Cone Penetration Tests (CPTs), eight rotary-wash borings, 13 hollow-stem-auger borings, four bucket-auger borings, and 27 pit trenches. Bulk and drive samples of representative materials at the site were collected for laboratory analysis. Two of the rotary-wash borings were sampled as correlation borings to verify the conditions indicated in adjacent CPTs. Thirty-eight additional trenches were excavated to assess the limits of buried debris. Piezometers were installed in five of the rotary-wash borings to monitor fluctuations in ground water depths.

a. Geologic Structure and Earth Materials

Most of the Landmark Village tract map and borrow site are underlain by Quaternary alluvium and older alluvium (see **Figures 4.1-1** through **4.1-3**, **Geologic/Geotechnical Maps**). Uncompacted artificial fill and debris are locally present on the tract map site and compacted fill was recently placed on the northern side of the site during the widening of SR-126. Bedrock of the Pico and Saugus Formations is only locally exposed along the southern side of SR-126. The underlying bedrock structure is dominated by an east-plunging anticline, which traverses the northern portion of the site and a parallel, east-plunging syncline, which is concealed below the southwestern margin of the site. Bedding exposed on the site is primarily on the south-limb of the anticline and typically strikes approximately N60E and dips 15–22 degrees southeast.

The bedrock beneath much of the Adobe Canyon borrow site has been uplifted and deformed by past tectonic forces into a northwest-trending syncline (downfold). The axial trace of this fold is located only at the extreme northeastern corner of the site. The geologic structure of the Saugus and the underlying Pico Formation bedrock exposed over much of the site (southern limb of the syncline) strikes northwest and is dipping at angles ranging between 32 and 48 degrees towards the northeast. The geologic structure of the bedding exposed along the northern limb of the syncline is striking towards the northeast and is dipping at angles ranging between 9 and 17 degrees southwest. Faulting has not been observed within the Adobe Canyon borrow site.

The Chiquito Canyon grading site improvements are located on the southern limb of the Del Valle anticline (upfold), which trends roughly east-west to northwest-southeast just north of the site. Both the Pico and Saugus Formation bedrock in the vicinity of the subject site is striking toward the northeast and dipping at angles ranging from 9 to 22 degrees towards the southeast. Faults have not been observed in the vicinity of this area.

The utility corridor is within the rights-of-way of several roadways. Soils within the rights-of-way consist of compacted artificial fill (Caf) that is underlain predominately by bedrock of the Pico and Saugus Formations. The Homestead Anticline located to the north of the corridor defines the geologic structure along the western reach of the utility corridor. Bedding south of this anticline dips moderately to steeply to the south and southeast. The northern limb of the Pico Anticline, which trends in an east-west direction, defines the geologic structure along the eastern segment of the utility corridor.

(1) Bedrock Formations

(a) Pico Formation (Tp/Tps)

The transition from the upper Pico Formation to the overlying Saugus Formation on the tract map site and utility corridor is gradational and interfingering. Geologic observation of the bedrock exposed in existing cuts, trenches and in a bucket-auger boring on the northwestern margin of the site indicates that this material is part of the Pliocene marine Pico Formation rather than the Saugus Formation. The Pico Formation observed at the site consists dominantly of moderately hard, light-gray to light greenish-gray sandstone and pebbly sandstone with local interbeds of light greenish-gray to olive-gray siltstone, sandy siltstone, and rare moderate-brown mudstone. The sandstones are generally well sorted and massive to locally well bedded with common low angle cross bedding. Pebbles are generally well rounded and commonly crystalline in composition. The siltstone and mudstone units are potentially expansive.

The Pliocene Pico Formation underlies the southern and western portion of the Chiquito Canyon grading site and is present only at the extreme southwestern corner of the Adobe Canyon borrow site. At the Chiquito Canyon grading site, this formation is gradational and interfingering with the overlying Saugus Formation. The Pico Formation observed at both the sites consists of moderately hard, light-gray to light greenish-gray sandstone and pebbly sandstone with local interbeds of light, greenish-gray to olive-gray siltstone, sandy siltstone, and rare moderate-brown mudstone. The sandstones are generally well sorted and massive to locally well bedded with common low angle cross bedding. Pebbles are generally well rounded and commonly crystalline in composition. The siltstone and mudstone units are potentially expansive. Thin, low-strength clay seams are present within this formation and can be problematic relative to slope stability.

(b) Saugus Formation (TQs)

The Plio-Pleistocene Saugus Formation is exposed in small cuts along SR-126 on the northeastern portion of the Landmark Village tract map site and utility corridor. The observed bedrock is dominated by moderately hard, light-gray to yellowish-gray sandstone and conglomerate with local interbeds of greenish-gray siltstone and sandy siltstone, and rare reddish-brown mudstone. Pebbles within this foundation are typically less rounded and more variable in composition than in the Pico Formation. Siltstone and mudstone units of the Saugus Formation are potentially expansive.

The lower portion of the Plio-Pleistocene Saugus Formation is exposed at both the Adobe Canyon borrow site and the Chiquito Canyon grading site. This formation is the dominant formation at the Adobe Canyon borrow site and is located at the eastern portion of the Chiquito Canyon grading site where it is gradational and interfingering with the underlying Pico Formation. The observed bedrock is dominated

by moderately hard, light-gray to yellowish-gray sandstone and conglomerate with local interbeds of greenish-gray siltstone and sandy siltstone, and uncommon reddish-brown mudstone. Pebbles within this foundation are typically less rounded and more variable in composition than in the Pico Formation. Siltstone and mudstone units of the Saugus Formation are potentially expansive. Thin, low strength clay seams occur in the reddish-brown mudstone units both as a result of original deposition and due to flexural slip along bedding during tectonic folding subsequent to deposition. These low strength clay layers may be fairly rare; however, where they occur they have proven problematic relative to slope stability.

(2) Surficial Deposits

(a) Quaternary Older Alluvium (Qoa)

Uplifted alluvium on the northern and eastern portions of the Landmark Village tract map site is designated as Quaternary older alluvium on **Figure 4.1-1**, **Geologic/Geotechnical Map**. Two levels of older alluvium are present on the site: an upper (older) level of older alluvium and a lower (younger) level of older alluvium.

(1) Upper (Older) Level of Older Alluvium

The upper (older) level of older alluvium or fan deposits occurs in a small area on the northeastern portion of the Landmark Village tract map site, and consists primarily of yellowish-gray, fine silty sand and sandy silt. A distinctive 5-foot-thick layer of coarse sand with cobbles and boulders was observed at the base of this unit. The upper portion of this deposit has been disturbed and partially removed by grading activities associated with the construction of SR-126.

(2) Lower (Younger) Level of Older Alluvium

The lower (younger) level of older alluvium occurs along the southern side of SR-126 on the western portion of the Landmark Village tract map site and widens toward the east across the entire site. This material typically consists of yellowish-gray poorly graded sand with gravel lenses and interbeds of light-brown silty sand and local grayish-brown lean clay with sand. The upper 1 to 3 feet of this material have generally been disturbed by agricultural activities.

Uplifted alluvium is present at the Adobe Canyon borrow site in the vicinity of Long and Adobe Canyons, as well as along the western portion of the Chiquito Canyon grading site in the vicinity of the proposed temporary debris basin. This uplifted alluvium is designated as Quaternary older alluvium on both of the geologic maps. These deposits generally consist of moderately consolidated to

unconsolidated poorly graded sand with gravel lenses, fine silty sand, sandy silt, and clay. The upper 1 to 3 feet of this material has generally been disturbed by agricultural activities.

(b) Quaternary Alluvium (Qal)

Quaternary alluvium mapped on the Landmark Village tract map site includes active and recently active river deposits associated with the Santa Clara River system. This material consists primarily of light yellowish-gray, poorly graded sand and gravelly interbeds and lenses with local interbeds of light-brown silty sand. The upper 1 to 2 feet of this material have locally been disturbed by agricultural activities.

At the Adobe Canyon borrow site, alluvium is present along the northern portion of the site in the vicinity of the Santa Clara River. At the Chiquito Canyon grading site, alluvium is present in the active Chiquito Canyon in drainage channel, as well as within the two northerly trending narrow canyons at the south central portion of that site. This material typically ranges from very fine-grained, silty sand to cobble size deposits.

(c) Quaternary Slopewash (Qsw)

Slopewash is a non-bedded, heterogeneous accumulation of soil and weathered bedrock deposited by gravity on slopes. Owing to the flat nature of the site, slopewash is uncommon on the tract map site. Slopewash materials were observed to a maximum depth of 12.5 feet on the northern margin of the site adjacent to the mapped bedrock outcrops. The observed slopewash consists of grayish-brown to brown silty sand with pebbles and scattered cobbles. This unit is not shown on **Figure 4.1-1**.

Slopewash is found on nearly all of the slopes at both the Adobe Canyon borrow site and the Chiquito Canyon grading site. This material has accumulated via gradual surface wash and periodic debris flows. The thickest accumulations occur at the toe of slopes and where broad swales join the main drainage areas. This material is generally poorly consolidated and commonly interfingers with the alluvium. The slopewash is designated as Qsw on **Figure 4.1-2**, **Adobe Canyon Geologic/Geotechnical Map**, and **Figure 4.1-3**, **Chiquito Canyon Geologic and Geotechnical Map**.

(3) Fill and Plowed Soils

(a) Compacted Artificial Fill (Caf)

Compacted artificial fill was placed along the utility corridor alignment and the northern margin of the Landmark Village tract map site during construction and widening of SR-126. The fill typically forms small fill slopes, which ascend from original ground on site up to the highway at a gradient of approximately 2:1 horizontal to vertical (h:v).

(b) Artificial Fill (af)

Artificial fill has been placed on the Landmark Village tract map site as a result of road construction, oil well drilling activities, utility line placement, agricultural activities, and the abandoned Southern Pacific railroad line. The more prominent fill areas are shown on **Figure 4.1-1**. Minor fill was placed to backfill trenches and borings excavated during geologic investigations.

Artificial fill exists at various locations on the Adobe Canyon borrow site and the Chiquito Canyon grading site. The fill ranges from minor spill fills to large dumped fill pads associated with oil well activities. At the Adobe Canyon borrow site, artificial fill is present at the southern portion of Adobe Canyon within the limits of the proposed grading. This artificial fill is associated with oil well drilling activities. At the Chiquito Canyon grading site, artificial fill is present at the proposed eastern temporary debris basin. This artificial fill is also associated with oil well drilling activities.

(c) Soil/Plow Pan

Plowing and other agricultural activities have disturbed the upper portion of the alluvium and older alluvium on the Landmark Village tract map site. The thickness of this material ranges from 1 to 3 feet. This material is not shown on **Figure 4.1-1**.

(4) Existing Debris

Debris has been stockpiled in the past on several portions of the Landmark Village tract map site, as shown on **Figure 4.1-1**. The debris varies from asphalt concrete to reinforced concrete mixed with pieces of pipes, plastic, artificial fill, etc. Some of the concrete blocks were observed to be up to 12 feet in maximum dimension. Areas where asphalt concrete is concentrated are delineated on **Figure 4.1-1**.

(a) Mass Movement Deposits

No landslides have been recognized on the Landmark Village tract map site during investigations by the project geotechnical engineer (Seward), or on published maps of the site, and no restricted use areas are currently recommended. Owing to the flat nature of the site, the potential for future landslides is considered low to nonexistent.

Several landslides have been mapped on the Adobe Canyon borrow site and the Chiquito Canyon grading site. These landslides are primarily translational failures controlled by the underlying bedding orientation. The landslides vary from small shallow failures to large landslides and were identified based on review of previously published and unpublished geologic data, geomorphic features observed on the aerial photos, the site topography illustrated on the attached geologic maps, reconnaissance field

mapping and subsurface explorations. Additional subsurface exploration will be required to confirm the existence of landslides, and to accurately delineate the lateral extent and depth of the landslide material prior to any future development of these areas.

The landslides mapped at both the Adobe Canyon and Chiquito Canyon sites have been divided into the two following categories:

- (Qls) Landslides that are mapped with moderate to great certainty are designated with a standard boundary and direction of movement arrows on the Geologic Map.
- (Qls?) Where the existence or lateral extent of the landslide is uncertain or inferred, the landslide is queried with a question mark. These landslides will require subsurface exploration to confirm their existence.

No landslides are known to exist along the utility corridor and none are expected given the compacted nature of the fill material comprising the roadbed and relatively gentle grade of roadways along the alignment.

b. Seismicity

The Southern California region is seismically active and commonly experiences strong ground shaking resulting from earthquakes along active faults. Earthquakes along these faults are part of a continuous, naturally occurring process that has contributed to the characteristic landscape of the region.

(1) On-Site Fault Zones

No active or potentially active faults have been recognized on either the Landmark Village tract map site or the off-site grading locations on published maps or during site investigations by the project geotechnical engineer (Seward). Because no faults are known to exist, no restricted use areas for faulting are currently recommended for the proposed Landmark Village project.

The Del Valle Fault traverses in a northwest direction across the western utility corridor segment. This Fault Zone is well exposed as a steeply southwest-dipping, 0.75-inch thick, clayey gouge zone with minor sub parallel faults disrupting the surrounding bedrock.

(2) Seismic Hazard Potential

Three common types of geologic hazards may be produced on the Landmark Village tract map site during a seismic event (earthquake) on an area fault. These include ground rupture, ground motion, and ground failure.

(a) Ground Rupture

Ground rupture or displacement, generally expected to occur along pre-existing faults, occurs as a fault breaks the ground surface during a seismic event. Ground rupture cannot be prevented; therefore, mitigation of this hazard involves avoiding construction over known existing faults. Where the locations of faults are unknown or suspected, they are investigated through subsurface exploration, delineated, and, if necessary, placed into a potentially hazardous fault zone where construction should be avoided.

Review of published geologic maps, Alquist-Priolo Maps, and the Los Angeles County Safety Element indicates that no active or potentially active faults have been previously recognized on the tract map site. Furthermore, the project geologist (Seward) observed no evidence of surface faulting or past ground rupture during investigations.

Neither the Adobe Canyon borrow site, nor the Chiquito Canyon grading site, lies within any of the state's Alquist-Priolo Earthquake Fault Zones. The Los Angeles County Seismic Safety Element does not show any faults at either of the locations. Regional geologic maps do not show any active faults (i.e., faults demonstrated to be active in the last 11,000 years) located on or trending towards these locations. No evidence of active faulting or ground rupture was observed on either of the two sites during reconnaissance field mapping and limited subsurface explorations. The closest known active fault (surface trace) to the Adobe Canyon borrow site is the San Gabriel Fault, located approximately 4.7 miles to the northeast. The closest known active fault (surface trace) to the Chiquito Canyon grading site is also the San Gabriel Fault, located approximately 3.5 miles to the northeast.

The County's Seismic Safety Element identifies the Del Valle Fault as potentially active. However, there is no known direct evidence of Holocene activity on the Del Valle Fault; therefore, the fault is not within an Alquist Priolo special studies zone.

(b) Ground Motion

Ground motion is generated during an earthquake when two blocks of the earth's crust slip past each other. Ground motion is generally greatest near the epicenter of an earthquake, and then decreases with increasing distance and increases with increasing magnitude. Measurement of ground motion is modified by a number of criteria, including focal depth, proximity to projected or actual fault rupture, fault mechanism, duration of shaking, local structure, source direction of earthquake, underlying earth material characteristics, and topography. The combination of these factors makes it difficult to accurately predict potential ground motions at a given site in the geographically and topographically complex Southern California region.

Potential ground motion from future earthquakes on nearby faults have been evaluated utilizing the procedures outlined in the California Department of Conservation, Division of Mines and Geology (CDCMG) Guidelines described in Special Publication 117 and Los Angeles County policies. Based on a probabilistic analysis, a peak horizontal acceleration of 0.87 times the force of gravity (g) was estimated as the design basis ground motion (10 percent chance of exceedance in 50 years) for use in liquefaction assessment of standard development at the Landmark Village tract map site. A 6.5 magnitude earthquake on the Santa Susana Fault would most likely produce this acceleration at the site. The peak ground acceleration from the upper bound earthquake was estimated to be 1.04g from a 6.5 magnitude earthquake.

For the Adobe Canyon borrow site and Chiquito Canyon grading site, a probabilistic analysis estimated peak horizontal ground acceleration with a 10 percent chance of exceedance in 50 years at 0.79g for the alluvial portions of the Adobe Canyon site and 0.87g for the alluvial portions of the Chiquito Canyon site.

(c) Ground Failure

Soil liquefaction occurs as a result of loss of shear strength or shearing resistance in loose and some medium dense, saturated cohesionless soils, and some sandy silts, during earthquake-induced ground shaking. A significant number of detailed liquefaction analyses were performed for the Landmark Village tract map site, and interpolated historic high ground water levels were assumed in the analyses. The results of the liquefaction assessment indicate that some relatively thin liquefaction-prone zones locally exist at the site at isolated depth intervals. More important than the identification of zones of potential liquefaction are the settlements caused by seismic excitation. Even though some thin deposits appear to be liquefiable, the potential seismically induced settlements in subsurface soils at the site are small. The maximum cumulative calculated settlement is 1.4 inch and differential settlements are expected to be no greater than 0.9 inch in a distance of 30 feet.

Most of the Adobe Canyon borrow site, Chiquito Canyon grading site and utility corridor are underlain by bedrock that is not susceptible to liquefaction. The alluvium present in the narrow tributary canyon areas of both sites (see, Geologic Maps) may be subject to liquefaction. The alluvial areas within the Adobe Canyon site and the alluvial area at the western portion of the Chiquito Canyon site are designated as potential liquefiable areas on the State of California Seismic Hazard Zones Map (Val Verde Quadrangle). However, liquefaction potential is not a significant impact relative to these locations. Detailed liquefaction assessments will be required for the alluvial areas prior to any future development of these areas.

Earthquake-induced slope failures include activation and reactivation of landslides, rock falls, debris flows, and surficial failures. The potential for earthquake-induced slope failures is moderate to high on the steep canyon slopes. Most of the hillside areas of both the Adobe Canyon and the Chiquito Canyon sites are designated on the State of California Seismic Hazard Zones Map (Val Verde Quadrangle) to have potential for earthquake-induced slope instability. The proposed cut and fill grading for each site eliminates most of these areas.

c. Groundwater

Groundwater levels on the Landmark Village tract map site range from a minimum depth of 6 feet on the western portion of the site to greater than 28 feet on the northeastern portion of the site. Review of the historic groundwater data obtained from Los Angeles County Flood Control District (LACFCD) water wells and the published Ground Water Contour Map by Robson (1972) indicates that historic high groundwater levels have ranged from 0 to greater than 20 feet along the tract map site and utility corridor. The shallowest groundwater levels occur in the alluvium on the western portion of the corridor and tract map site where the ground surface is lower; however, groundwater is deeper below the uplifted older alluvium. Historic low groundwater levels of greater than 60 feet have been measured at the site in LACFCD wells.

Groundwater beneath the Adobe Canyon borrow site and Chiquito Canyon grading site can be generally grouped into two categories: (1) groundwater contained in the alluvial deposits, and (2) groundwater contained in the bedrock and quaternary terrace deposits.

Historic groundwater records for the alluvial areas within the Adobe Canyon borrow site indicate that the groundwater has risen to within 12 to 30 feet of the existing ground surface in the vicinity of Long Canyon and along the margins of the Santa Clara River. In May and June 2000, exploratory borings drilled to depths of 35 and 40 feet within the alluvial areas of Long Canyon, just west of the proposed grading limits, did not encounter groundwater. Perched groundwater within elevated bedrock areas has not been observed on the Adobe Canyon site. Natural springs or seeps were not observed within the Adobe Canyon site during previous investigations.

Historic groundwater records for the alluvial areas within the Chiquito Canyon grading site indicate that the groundwater has risen to within 18 to 30 feet of the existing ground surface in the vicinity of the lower Chiquito Canyon area. In 1999 and 2003, exploratory borings drilled within Chiquito Canyon just west of the proposed grading limits did not encounter groundwater. Minor seeps were observed with some of the subsurface exploratory borings within landslide material; however, surface springs were not observed during surface field mapping of the site. Quarterly measurements over the last four years from a

piezometer located west of the site indicate that groundwater ranges from 38 to 47 feet below the ground surface in the canyon alluvium.

d. Oil Wells

Review of the 1999 Munger Map Book indicates that five oil wells have been drilled on, or just south of the Landmark Village tract map site. Oil well records obtained from the California Division of Oil, Gas, and Geothermal Resources (CDOGGR) indicate that all of these wells have been abandoned. The locations of these wells, as determined by metal detection surveys by CDOGGR, are illustrated on the tract map and on the Geologic/Geotechnical Maps (**Figure 4.1-1**).

In addition, one documented oil well is present within the proposed grading limits on the Adobe Canyon borrow site. An additional four documented oil wells are located in the vicinity surrounding the site. At the Chiquito Canyon grading site, there is one documented oil well present within the proposed grading limits at the location of the eastern temporary debris basin and one oil well located north of the grading limits. No known wells exist along the utility corridor.

e. Potential Corrosivity of Soils

On the Landmark Village tract map site, a total of eight samples were collected from on-site alluvium, older alluvium, and bedrock materials and tested for resistivity and acidity of a solution (pH). Soil electrical resistivity values of selected shallow soils suggest that on-site soils are mildly corrosive to corrosive to ferrous metals at a few locations and depths; pH data shows no significant acidity of tested soils. A total of nine samples of on-site alluvium, older alluvium, and bedrock were collected and submitted to Fruit Growers Lab for sulphate and chloride testing. Concrete exposure to sulfates in shallow soils would be negligible per 1997 Uniform Building Code (UBC) Classification.

Soils on the Adobe Canyon borrow site and Chiquito Canyon grading site may have some degree of corrosive characteristics to concrete and ferrous metals. Soil moisture, chemistry, and other physical characteristics all have important effects on corrosivity. No development is proposed on either the Adobe Canyon borrow site or the Chiquito Canyon grading site as part of the proposed Landmark Village project. Nonetheless, soils from the borrow sites would be placed on the Landmark Village tract map site. The utility corridor also traverses such soils. Unless mitigated, the potential corrosive characteristics of these soils could have a significant impact wherever development within Landmark Village is proposed on these soils.

f. Rippability

The granular and poorly cemented nature of alluvial deposits indicates that grading operations on the Landmark Village tract map site can be performed with conventional equipment. Heavy, single-shank ripping may be required within the more indurated portions of the Saugus and Pico Formation bedrock.

At the Adobe Canyon borrow site and Chiquito Canyon grading site, the bedrock is moderately consolidated, and grading operations should be able to be performed with conventional equipment. Heavy single shank ripping probably would be required if massive conglomerate units of the Pico and Saugus Formations are encountered.

5. PROPOSED PROJECT IMPROVEMENTS

Review of Landmark Village Vesting Tentative Tract Map No. 53108 indicates that the proposed final grades will be raised from 1 to 18 feet over much of the project site and approximately 5.8 million cubic yards of fill would be imported. The tallest cut-slope is proposed to be 25 feet high along the south side of SR-126 on the western portion of the site. All of the proposed fill slopes would be less than 25 feet in height.

The existing river banks on the margin of the tract map site range from 5 to 12 feet in height. Proposed grades would be raised to 15 to 20 feet above the adjacent channel areas. Bank protection is proposed to consist of a soil cement, gunite, or rip-rap liner that would be buried/concealed behind a 4:1 (h:v) fill slope.

The Preliminary Bulk Grading Study Map for the Adobe Canyon borrow site indicates primarily westerly (northwesterly and southwesterly) facing cut slopes with minor portions facing toward the south. These slopes would have gradients up to 2:1 (h:v), but typically are designed at 3:1 (h:v) gradients or flatter. The highest proposed cut slope would be approximately 100 feet high. The maximum vertical cut to proposed grade would be 175 feet, and would be located at the northeastern portion of the site south of the proposed temporary debris basin. The maximum proposed fill would be approximately 50 feet thick, located at the top of the proposed 3:1 (h:v) gradient fill slope west of the location of a future water tank not proposed as part of the Landmark Village project. The proposed graded area would consist of approximately 125 acres. Project-related grading would require the movement of approximately 4.2 million cubic yards of removal and reoccupation of existing material, and up to 5.8 million cubic yards of import from the Adobe Canyon borrow site within the approved Specific Plan boundary to meet the flood control requirements of the tract map site. Storm runoff from the relatively level pad areas that would be created would sheet flow to the two proposed temporary debris basins, one located within the

Adobe Canyon area, and one located at the northerly portion of the study. A proposed trapezoidal debris channel is illustrated near the central portion on the plan.

The Preliminary Bulk Grading Study Map for the Chiquito Canyon grading site indicates primarily south- to southwesterly facing cut slopes with the exception of one northerly facing cut slope located along the southern portion of the site adjacent to SR-126. These slopes have gradients up to 2:1 (h:v). The highest proposed cut slope would be approximately 186 feet high and a combination 2:1 and 3:1 (h:v) gradient slope located just south of the existing Edison transmission tower. The maximum vertical cut would be approximately 130 feet located at the toe of this 186-foot-high slope. Only minor fill (less than 12 feet thick) is proposed on the Bulk Grading Study map. The proposed graded area consists of approximately 45 acres. The Bulk Grading Study indicates that 1,519,000 cubic yards of raw cut material would be generated, and 5,900 cubic yards of fill material would be placed, leaving 1,513,200 cubic yards of fill material for export to the tract map site. Storm runoff from the relatively level pad areas that will be created would sheet flow to the various temporary debris basins illustrated on the plan. A new access road alignment is provided to the existing Edison transmission tower located at the top of the 186-foot-high cut slope. The existing power transmission lines located at the southern portion of the site would have to be relocated.

6. PROJECT IMPACTS

The analysis of potential geologic, soil, and geotechnical impacts associated with construction and operation of the proposed project, including the significance criteria applicable to assessing such impacts, is presented below.

a. Significance Criteria

Appendix G of the *California Environmental Quality Act (CEQA) Guidelines* indicates that the proposed project would result in a significant geologic and soils impact if the project would:

(a) Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:

(i) Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault;

(ii) Strong seismic ground shaking;

(iii) Seismic-related ground failure, including liquefaction; and

(iv) Landslides.

(b) Result in substantial soil erosion or the loss of topsoil;

(c) Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction or collapse;

(d) Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial risks to life or property; or

(e) Have soils incapable of adequately supporting the use of septic tanks or alternative waste water disposal systems where sewers are not available for the disposal of waste water.

In addition, the project Initial Study (Recirculated Draft EIR **Appendix ES**) suggests that a project would result in a significant geotechnical impact if:

- It is located in an active or potentially active fault zone or Alquist-Priolo Earthquake Fault Zone;
- It is located in an area containing a major landslide(s);
- It is located in an area having high slope instability;
- It is subject to high subsidence, high groundwater level, or hydrocompaction;
- The project is considered a sensitive use (school, hospital, public assembly site) located in close proximity to a significant geotechnical hazard; or
- The project would entail substantial grading and/or alteration of topography including slopes of over 25 percent.

An additional criterion against which the project is evaluated is construction within and upon expansive soils, soils with a high shrink-swell potential, corrosive soils, and other soils with properties that could have an adverse effect on future site development.

b. Construction Impacts

The proposed project would not be constructed in proximity to an active fault zone, a major landslide, or on an area of high slope instability; consequently, no construction activities would occur in areas posing these types of hazards. Any construction activities that would occur during the earlier phases of site development would be set back far enough away from existing structures such that any associated grading of temporary steep slopes that may be excavated during remedial grading (if any) or during placement of infrastructure would not affect the existing development. In addition, construction operations would be conducted pursuant to the requirements of the Occupational Safety and Health

Administration (OSHA) and the mitigation measures identified in this EIR. As a result, any potential impacts associated with temporary steep slopes that may be created during remedial grading (if any) or during placement of infrastructure in the utility corridor would be mitigated to below a level of significance through standard construction practices and OSHA requirements. Accordingly, construction of the proposed project is not expected to result in any significant geologic, soil or geotechnical impacts.

c. Operational Impacts

(1) Hazards Associated with Faults

There are no active faults on or in immediate proximity to the Landmark Village tract map site; however, the proposed project would be subject to ground shaking in the event of an earthquake that would result from regional fault activity. No landslides or surficial failures have been mapped on or in close proximity to the development site, and no natural slopes would remain on or adjacent to the proposed development.

While landslides have been mapped on both the Adobe Canyon borrow site and Chiquito Canyon grading site, no Landmark Village development is proposed at these locations and landslide materials to be excavated are considered safe for use as fill material. Therefore, the potential for earthquake-induced slope failures at the Landmark Village tract map site, the adobe Canyon borrow site and Chiquito Canyon grading site is considered negligible. Owing to the flat nature of the tract map site, potential hazards from shattered ridge effects are considered non-existent. Associated effects of such ground shaking on the site; however, can potentially include liquefaction, lateral spreading, dynamic compaction, differential materials response, and sympathetic movement. Each is discussed separately below.

(a) Liquefaction

Liquefaction is the process in which water-saturated, usually loose-to-moderately dense, fine-to-medium sands temporarily lose strength due to strong ground motion and behave as a viscous fluid. The results of the liquefaction assessment for the tract map site indicate that some relatively thin liquefaction-prone zones locally exist at the site at isolated depth intervals. However, more important than the identification of zones of potential liquefaction are the settlements caused by seismic excitation. Even though some thin deposits appear to be liquefiable, the potential seismically induced settlements in subsurface soils at the Landmark Village tract map site are small. The maximum cumulative calculated settlement is 1.4 inch and differential settlements are expected to be no greater than 0.9 inch in a distance of 30 feet. Certified compacted fill from proposed removals and recompaction, as shown on **Figure 4.1-1**, is anticipated to attenuate any minor settlements beneath the fill due to bridging effects. Due to the low magnitude of estimated conservative earthquake-induced total and differential settlements, and the proposed

recompacted layers, potential impacts associated with liquefaction and seismically induced settlement are considered less than significant.

The alluvial areas within Adobe Canyon borrow site and the alluvial area at the western portion of the Chiquito Canyon grading site are designated as potential liquefiable areas on the State of California Seismic Hazard Zones Map (Val Verde Quadrangle). However, no portion of the proposed fill areas over alluvium and slopewash are considered "structural fill"; therefore, the potential impacts associated with liquefaction of the proposed fill areas are not considered significant.

(b) Lateral Spreading

Lateral spreading is a type of liquefaction where sediments/materials spread laterally down slope due to temporary loss of shear strength. Lateral spreading may occur on slopes as shallow as 1 to 2 degrees.

No lateral spreading due to liquefaction is expected on the Landmark Village tract map site, the Adobe Canyon borrow site, or the Chiquito Canyon grading site for the following reasons:

- The tract map site is generally flat and both Adobe and Chiquito Canyons are primarily underlain by bedrock.
- Liquefaction potential and associated settlements are considered to be minor. It should be noted that the settlement calculations include multi-directional effects in the volumetric strains.
- Subsurface soils are essentially horizontally layered.
- The liquefaction-prone soils, which would remain below the recommended removals, are thin and discontinuous.
- A buried channel liner is proposed between the development and the river channel areas, which would require removals below the elevation of the river channel, and the compacted backfill would inhibit any potential lateral spreading within the development.

As a result, there would be no significant impacts associated with lateral spreading.

(c) Dynamic Compaction and Differential Materials Response

Differential materials response refers to the different responses various materials display when subjected to seismic waves. Dynamic compaction refers to seismically induced settlement and permanent movement of poorly consolidated materials.

Where materials with different densities or strengths are in contact, differential materials response to the seismic energy may cause distress along the contact. The combination of dynamic compaction and

differential settlement along with differential materials response is a source of future potential hazards along cut/fill and bedrock/alluvium contacts on the Landmark Village tract map site. Unless mitigated, development of lots underlain by transitions between different material types (e.g., bedrock to fill, bedrock to alluvium, etc.) could result in a potentially significant geotechnical impact.

Since the majority of the Adobe Canyon borrow site and Chiquito Canyon grading site are underlain by bedrock, seismically induced compaction and differential materials responses at those sites are not expected to result in a potentially significant impact.

(d) Sympathetic Movement

Strong ground motion may cause sympathetic movement along weak inclined planes, such as claybeds, or non-causative faults. Movement may be related to strong ground motion or flexual slip during folding of beds.

The specific location of future potential sympathetic movement along weak planes, such as inclined clay beds, cannot be reliably predicted on the Landmark Village tract map site at this time. Most of the site is underlain by horizontally bedded Quaternary Alluvium, which is not subject to bedding plane slippage. However, the clay-rich bedding planes of the Saugus Formation may represent a potential hazard from secondary seismogenic movement along bedding planes, and could result in a potentially significant geotechnical impact unless mitigated.

The majority of the Adobe Canyon borrow site and Chiquito Canyon grading site are underlain by inclined bedrock. Sympathetic movement along week bedding planes could occur at those sites, but this is not considered a significant impact given the intended use of the sites for soil removal.

(2) Hazards Associated with Major Landslides

No landslides or surficial failures have been mapped on or in close proximity to the Landmark Village tract map site; therefore, site development would not be subject to hazards associated with major landslides and no potentially significant impacts are anticipated. However, the Adobe Canyon borrow site and Chiquito Canyon grading site do contain such hazards as discussed in greater depth below.

Three suspected landslides have been mapped within the proposed grading limits for the Adobe Canyon borrow site. These landslides are likely translational failures[3] controlled by the bedding orientation. These landslides are queried on the Geologic Map because their existence or lateral extent is uncertain.

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3 A translational failure is characterized by movement of a relatively intact slide mass above a failure plane that is relatively deep when compared to that of a debris slide.

The suspected landslides are considered safe for the intended use as a borrow site (soil removal). Four landslides have been mapped within the proposed grading limits of the Chiquito Canyon site. These landslides are primarily translational failures controlled by the bedding orientation. Cut slopes and/or grading is proposed in landslide material, and landslides are located in areas where they potentially could affect the stability of the site. As long as on-site containment is provided for potential failures, where necessary, the intended grading on the Chiquito Canyon site would not result in potentially significant impacts. However, the new alignment proposed to provide continued access to the Edison tower traverses a mapped landslide. Landslide movement could be triggered if the grading operations on the Chiquito Canyon site destabilize a portion of a landslide. This landslide must be mitigated to the satisfaction of Southern California Edison and/or Los Angeles County Department of Public Works to maintain a serviceable access to the tower.

(3) Hazards Associated with High Slope Instability

(a) Cut and Fill Slopes

Review of the Landmark Village tract map indicates that proposed final grades will be raised from 1 to 18 feet over much of the site and approximately 5.8 million cubic yards of import are anticipated. The tallest cut-slope is proposed to be 25 feet high along the south side of SR-126 on the western portion of the site. No natural slopes are proposed to remain on the site. Gross stability analyses were performed for two cut-slopes anticipated to expose adverse bedding conditions. The analyzed cross-sections reflect critical conditions for stability (i.e., steeper adverse potential bedding plane(s) and greater slope height). In addition, surficial stability of cut-slopes and fill slopes (e.g., stability fills) were performed. Findings show that the analyzed cut-slopes and proposed grades, and compacted fill slopes comply with Los Angeles County requirements for gross stability under static and pseudostatic loading conditions and for surficial stability, as applicable, except that compacted on-site silty sand and cuts in Older Alluvium do not comply with surficial stability requirements. As a result, use of these soils within fill slopes and stability fills on the tract map site would result in a significant geotechnical impact unless mitigated.

The proposed cut slopes within the Adobe Canyon borrow site are designed at a gradient of 2:1 (h:v) or shallower, (approx. 26.5 degrees) with terrace drains every 25 feet for slopes greater than 3:1 (h:v) gradients. The highest proposed cut slope would be approximately 100 feet and the deepest proposed cut area would be approximately 175 feet. Due to the northeast-dipping geologic structure of the bedrock, and due to the steepness of dip of the bedrock (32 to 45 degrees), the proposed cut slopes would be favorably to neutrally oriented with respect to the geologic structure of the bedding. Even if potentially unstable cut slopes are found to exist at the site, they should be considered suitable for the intended use as a borrow site (soil removal) and no potentially significant impacts are anticipated.

Proposed fill slopes within the Adobe Canyon borrow site are designed at 2:1 (h:v) gradients or shallower with terrace drains every 25 feet. Review of the preliminary Bulk Grading Study indicates that the highest proposed fill slope on the site would be approximately 90 feet and the deepest proposed fill area would be approximately 50 feet. The fill slopes would be suitable for the intended use as a borrow site (soil removal) and no potentially significant impacts are anticipated.

The proposed cut slopes for the Chiquito Canyon grading site are designed at a gradient of 2:1 (h:v) or shallower with terrace drains placed every 25 feet. The highest proposed cut slope would be approximately 186 feet and the deepest cut would be approximately 130 feet. Due to the south-dipping geologic structure of the bedrock, all proposed southerly facing cut slopes would be potentially unstable. All proposed cuts are considered suitable for the intended use, with the exception of the proposed 186-foot-high cut slope located in the vicinity of the existing Edison Transmission Tower and the small cut slopes associated with the new Edison access road alignment. To offset this potentially significant impact to the tower slope, slope stability analyses should be performed relative to the existing transmission tower and the proposed descending cut slope to ensure compliance with the County's required minimum factors of safety. Appropriate mitigation should be implemented as needed for this slope. The small cut slopes along the new Edison access road alignment will require mitigation per Southern California Edison and/or L.A. County requirements. This mitigation will likely involve the construction of stability fills.

Proposed fill slopes for the Chiquito Canyon grading site are designed at 2:1 gradients or shallower with terrace drains every 25 feet. Review of the Preliminary Bulk Grading Study for the site indicates that only minor fill areas are proposed on the site. Fill is proposed within the minor topographic swale located at the western portion of the 186 feet high cut slope located beneath the existing Edison Tower. This fill slope is considered a sliver fill and should be evaluated along with the proposed 186-foot-high cut slope due to the anticipated adverse bedding condition present below the existing Edison transmission tower.

(b) Natural Slopes and Debris Flows

No natural slopes will remain on the Landmark Village tract map site following proposed grading. Therefore, the potential debris flow hazard at this site is considered negligible. Within the Adobe Canyon borrow site, all proposed natural slopes with daylighted bedding conditions and or steep gradients (greater than 2:1 [h:v]) adjacent to graded areas may be potentially unstable and/or subject to debris flow hazard. Based on a review of the Preliminary Bulk Grading Study Map, most of the natural slopes are self-supporting with respect to the geologic structure of the bedrock bedding planes and slope orientations; hence gross stability is generally favorable. However, the steep drainages and swales

present are subject to surficial debris flows. For the intended use as a borrow site, the proposed natural slope areas are generally considered suitable.

For the Chiquito Canyon grading site, all proposed natural slopes with daylighted bedding conditions and/or steep gradients (greater than 2:1 [h:v]) adjacent to graded areas may be potentially unstable. However, the proposed natural slopes are considered suitable for the intended use and no potentially significant impacts are anticipated. With respect to debris flows, the subject site contains numerous drainages and swales with alluvial and colluvial soil material. These drainages and swales may be subject to potential debris flow during heavy rains, especially in exceptionally wet years (scattered small debris flow scars were observed within the steeper portions of the site). However, as long as on-site containment can be provided, the debris flow hazard is considered safe for the intended use, and no potentially significant impacts are anticipated.

(4) Hazards Associated with High Subsidence, High Groundwater Level, and/or Hydrocompaction

No known areas of subsidence occur within the Landmark Village tract map site; therefore, there would be no impacts associated with subsidence.

Although the proposed grades shown on the tentative map would be at least 15 feet above historic high groundwater levels, groundwater may be encountered during removal of alluvium on the western portion of the site. Because the groundwater table will fluctuate up and down in response to natural recharge and pumping requirements, construction and development within areas of high groundwater could potentially result in a significant impact unless mitigated.

Based upon consolidation test data, the compressibility of the subsurface soils is considered to be generally low. Compressibility is lower at greater depths due to the coarser-grained texture and high relative density of the soils. Also, any potentially adverse effects due to compressibility would be reduced as a result of relatively low structural loads. Based upon laboratory data, no hydroconsolidation effects due to water incursion are expected at the site, and there would be no associated impacts.

Most of the Adobe Canyon and Chiquito Canyon areas are underlain by bedrock, which is not susceptible to subsidence or hydrocompaction and shallow ground water conditions are not expected at either site. Hydrocompaction may occur in the alluvial areas, but hydrocompaction is not considered a significant impact relative to the intended uses for each site.

(5) Hazards Associated with Placing a Sensitive Use in Close Proximity to a Significant Geotechnical Hazard

No significant geologic hazard (i.e., fault, landslide, areas of subsidence, etc.) exist on the Landmark Village tract map site; therefore, no sensitive uses would be placed in proximity to a significant geotechnical hazard and there would be no impact relative to this significance criterion. No sensitive uses are proposed on either the Adobe Canyon borrow site or Chiquito Canyon grading site as part of this project. Should future development occur at either location, more specific geologic issues would be addressed under a separate environmental review when development plans for future development projects are prepared.

(6) Hazards Associated with Substantial Grading and/or Alteration of Topography

Final grades for the Landmark Village tract map site would be raised from 1 to 18 feet over much of the site, requiring the import of approximately 5.8 million cubic yards of fill. The tallest cut-slope is proposed to be 25 feet high along the southern side of SR-126. All of the proposed fill slopes would be less than 25 feet in height. With respect to the borrow and grading sites, cut slopes would reach a maximum height of 186 feet within Chiquito Canyon, while a cut slope reaching 175 feet would occur within Adobe Canyon.

Although no numerical definition is given for the phrases "substantial grading" or "substantial alteration of topography," a considerable amount of grading would occur on the project site, and existing topography would be altered. Grading and topographic modification, if done improperly and without due consideration for on-site geologic and hydrologic considerations, could result in ground failure and damage to future uses on the site. Thus, grading associated with the proposed project would result in a potentially significant impact unless mitigated through compliance with all appropriate grading, soil compaction, and slope construction practices.

(7) Other Potentially Hazardous Geotechnical Conditions

Soil conditions that would affect construction practices and future site development include expansive soils, soils with shrink-swell potential, and corrosive soils. Construction within and over soils with these characteristics would adversely affect future development of the site unless mitigated.

(a) Expansive Soils

Based on preliminary testing of selected samples of finer-grained soils on the Landmark Village tract map site, the expansion potential of shallow soils is medium to high (per UBC classification). Although these

fine-grained soils are not typical to the site, and were encountered only at a few locations and depths in test pits excavated on the site, the fine-grained units of the Saugus Formation and Pico Formation, which are found within the two off-site grading site locations, are potentially very expansive. Because expansive soils can have an adverse effect on future development of the site, thereby resulting in potentially significant impacts, additional expansion testing should be conducted on the tract map and off-site grading site locations prior to the commencement of construction.

(b) Shrink-Swell Potential

The expected rate of shrinkage of the various near-surface materials encountered at the site, when these materials are excavated, relocated and compacted as controlled fill to an estimated average of 92 percent Relative Compaction (R/C), is estimated as follows:

- Artificial Fill (Af): 15%–20%;
- Alluvium (Qal): 12%–15%; and
- Older Alluvium (Qoa): 16%–20%.

The expected rate of bulking of excavated bedrock materials found on the site is estimated as follows:

- Saugus Sandstone (TQs): 0%–3%;
- Pico Sandstone (Tp): 0%–5%; and
- Pico Siltstone (Tp): 5%–10%.

Although bedrock would only provide a small fraction of the total on-site fill materials, the potential for adverse shrink-swell effects on future site development would be significant unless mitigated. However, much of the proposed import fill from the off-site grading site locations would be derived from the bedrock.

(c) Soil Corrosivity

Soil electrical resistivity values of selected shallow soils on the Landmark Village tract map and the two off-site grading site locations suggest that on-site soils are mildly corrosive to corrosive in the presence of ferrous metals at a few locations and depths; pH data shows no significant acidity of tested soils. Construction on and within these soils without consideration of their corrosive effects would have a potentially significant effect on future development. Preliminary sulfate testing indicates that the shallow on-site soils have a negligible corrosion potential to concrete. Additional testing should be completed at the grading plan stage to verify the preliminary test results and to assess the import soil sources.

7. MITIGATION MEASURES

Although the proposed Landmark Village project may result in potential geologic, soil, and geotechnical impacts prior to mitigation, the County already has imposed mitigation measures required to be implemented as part of the Newhall Ranch Specific Plan. These mitigation measures, as they relate to geologic, soil, and geotechnical resources, are found in the previously certified Newhall Ranch Specific Plan Program EIR (March 8, 1999) and the adopted Mitigation Monitoring Plan for the Specific Plan (May 2003). In addition, this EIR identifies recommended mitigation measures specific to the Landmark Village project site. The project applicant has committed to implementing both the applicable mitigation measures from the Newhall Ranch Specific Plan Program EIR and the mitigation measures recommended for the proposed Landmark Village project to ensure that future development of the project site and related off-site grading activities would be safe from geologic, soil, and geotechnical hazards, and that such development would not adversely affect adjacent properties.

a. Mitigation Measures Required by the Adopted Newhall Ranch Specific Plan, as they Relate to the Landmark Village Project

The following 56 mitigation measures (**Mitigation Measure Nos. 4.1-1** through **4.1-56**, below) were adopted by the County in connection with its approval of the Newhall Ranch Specific Plan (May 2003). Of the 56 mitigation measures, 36 measures are applicable to the Landmark Village project due to its geographic location and/or geologic conditions. The applicable mitigation measures will be implemented to mitigate the potentially significant geologic, soil, and geotechnical impacts associated with the proposed Landmark Village project. All mitigation will be assumed to be applicable unless otherwise noted. These measures are preceded by "SP," which stands for Specific Plan.

SP 4.1-1 The standard building setbacks from ascending and descending man-made slopes are to be followed in accordance with Section 1806.4 of the Los Angeles County Building Code, unless superseded by specific geologic and/or soils engineering evaluations. (Allan E. Seward Engineering Geology, Inc., 19 September 1994, p. 44.)

SP 4.1-2 The existing Grading Ordinance for planting and irrigation of cut-slopes and fill slopes is to be adhered to for grading operations within the project site. (Allan E. Seward Engineering Geology, Inc., 19 September 1994, p. 44.)

SP 4.1-3 In order to safeguard against major seismic-related structural failures, all buildings within the project boundaries are to be constructed in conformance with the Los Angeles County Uniform Building Code, as applicable.

SP 4.1-4 The location and dimensions of the exploratory trenches and borings undertaken by Allan E. Seward Engineering Geology, Inc. and R.T. Frankian & Associates are to be noted on all grading plans relative to future building plans, unless the trenches and/or

borings are removed by future grading operations. If future foundations traverse the trenches or borings, they are to be reviewed and approved by the project geotechnical engineer. (Allan E. Seward Engineering Geology, Inc., 19 September 1994, p. 45.)

SP 4.1-5 Wherever the Pacoima Formation is exposed, it may be potentially expansive; therefore, it is to be tested by the project soils engineer at the grading plan stage to determine its engineering characteristics and mitigation requirements, as necessary. (*This mitigation measure is not applicable because there is no Pacoima Formation on the tract map site or the borrow sites.*)

SP 4.1-6 Should any expansive soils be encountered during grading operations, they are not to be placed nearer the finished surface than 8 feet below the bottom of the subgrade elevation. This depth is subject to revision depending upon the expansive potential measured during grading. (R.T. Frankian & Associates, 19 September 1994, Appendix I.)

SP 4.1-7 If expansive materials are encountered at subgrade elevation in cut areas, the soils are to be removed to a depth of 8 feet below the "finished" or "subgrade" surface and the excavated area backfilled with non-expansive, properly compacted soils. This depth is subject to revision depending upon the expansive potential measured during grading. (R.T. Frankian & Associates, 19 September 1994, Appendix I.)

SP 4.1-8 At the time of subdivision, which allows construction, areas subject to liquefaction are to be mitigated to the satisfaction of the project geotechnical engineer prior to site development. (R.T. Frankian & Associates, 19 September 1994, Appendix I.)

SP 4.1-9 Subdrains are to be placed in areas of high ground water conditions or wherever extensive irrigation is planned. The systems are to be designed to the specifications of the Newhall Ranch Specific Plan geotechnical engineer.

SP 4.1-10 Subdrains are to be placed in the major and minor canyon fills, behind stabilization blankets, buttress fills, and retaining walls, and as required by the geotechnical engineer during grading operations. (R.T. Frankian & Associates, 19 September 1994, Appendix I.)

SP 4.1-11 Canyon subdrains may be installed in "V"-ditches or in a rectangular trench excavated to expose competent material or bedrock as approved by the geotechnical engineer. (*This mitigation measure applies to the Canyon fills proposed in the Adobe Canyon borrow site and is therefore not applicable.*)

SP 4.1-12 The vertical spacing of subdrains behind buttress fills, stabilization blankets, etc., are to be a maximum of 15 feet. The gradient is to be at least 2 percent to the discharge end. (R.T. Frankian & Associates, 19 September 1994, Appendix I.)

SP 4.1-13 Geological materials subject to hydroconsolidation (containing significant void space) are to be removed prior to the placement of fill. Specific recommendations relative to hydroconsolidation are to be provided by the Newhall Ranch Specific Plan geotechnical engineer at the subdivision stage. (Allan E. Seward Engineering Geology, Inc., 19 September 1994, p. 44.)

SP 4.1-14 Proposed structures on ridgelines will have a minimum 20-foot horizontal setback from the margin of the bedrocks to prevent perched or ground water levels where relatively impermeable materials can block downward migration. (*This mitigation measure is not applicable to the Landmark Village project. The measure calls for proposed "structures on ridgelines" to have minimum horizontal setback requirements; however, the Landmark Village project does not propose construction of structures on any ridgelines due to the topographic conditions found on the site.*)

SP 4.1-15 Subsurface exploration is required to delineate the depth and lateral extent of the landslides shown on the geologic map. This work shall be undertaken at the subdivision stage. (Allan E. Seward Engineering Geology, Inc., 19 September 1994, p. 15.) Landslides must be mitigated through stabilization, removal, and/or building setbacks as determined by the Newhall Ranch Specific Plan geotechnical engineer, and to the satisfaction of the Los Angeles County Department of Public Works.

SP 4.1-16 At the subdivision stage, the existence of landslides designated with "3" on **Figure 4.1-2**, Existing Landslide Areas, and within or adjacent to the development area is to be confirmed. (Allan E. Seward Engineering Geology, Inc., 19 September 1994, p. 15.) If landslides are confirmed in these areas, they are to be mitigated through stabilization, removal, and/or building setbacks as determined by the Newhall Ranch Specific Plan geotechnical engineer. (*This mitigation measure is not applicable to the Landmark Village project. The measure refers to the "existence of landslides" designated with a "3" on Figure 4.1-2 contained in the Newhall Ranch Specific Plan Program EIR. There are no such designated landslides within the boundaries of the Landmark Village tract map and borrow sites.*)

SP 4.1-17 The existence, or lack thereof, of landslides on or adjacent to the roadway alignments for the extension of Magic Mountain Parkway and Valencia Boulevard will be evaluated by subsurface investigations at the subdivision stage. (Allan E. Seward Engineering Geology, Inc., 13 December 1995, p. 11.) If landslides are confirmed in these areas, they are to be mitigated through stabilization, removal, and/or building setbacks as determined by the Newhall Ranch Specific Plan geotechnical engineer. (*This mitigation measure is not applicable to the Landmark Village project. The measure refers to "landslides" on or adjacent to roadway alignments, which are not located within the boundaries of the Landmark Village project, including the off-site grading areas.*)

SP 4.1-18 The potential hazards associated with debris flow scars and other possible surficial failures located in proximity to the roadway alignments for the extension of Magic Mountain Parkway and Valencia Boulevard will be evaluated at the subdivision stage. (Allan E. Seward Engineering Geology, Inc., 13 December 1995, p. 11.) These areas are to be mitigated as determined by the Newhall Ranch Specific Plan geotechnical engineer. (*This mitigation measure is not applicable to the Landmark Village project. The measure refers to "debris flow scars and other possible surficial failures" located in proximity to roadway alignments, which are not located within the boundaries of the Landmark Village project, including the off-site grading areas.*)

SP 4.1-19 Remove debris from surficial failures during grading operations prior to the placement of fill. (Allan E. Seward Engineering Geology, Inc., 19 September 1994, p. 16.)

SP 4.1-20 All soils and/or unconsolidated slopewash and landslide debris is to be removed prior to the placement of compacted fills. (Allan E. Seward Engineering Geology, Inc., 19 September 1994, p. 45.)

SP 4.1-21 Cut-slopes, which will expose landslide material, are to undergo geologic and geotechnical evaluation at the subdivision stage to determine their stability and degree of consolidation. (Allan E. Seward Engineering Geology, Inc., 19 September 1994, p. 15.) Several options are available to mitigate potential landslide failure in the proposed cut-slopes. Landslides may be stabilized with buttress fills or shear keys designed by the Newhall Ranch Specific Plan geotechnical engineer; landslide material can be entirely removed and replaced with a stability fill; or the slope can be redesigned to avoid the landslide. Landslides underlying cut pad or road areas may be removed or partially removed if the Newhall Ranch Specific Plan Geologist and geotechnical engineer conclude that the landslide is stable and sufficiently consolidated to build on. Landslides located on ascending natural slopes above proposed graded areas will also require evaluation for stability. Unstable landslides on natural slopes above graded areas will either require stabilization, removal, or building setbacks to mitigate potential hazards. (*This mitigation would apply to the revised access road proposed to replace the existing Edison road to the power line tower involves creating small cut slopes in landslide material.*)

SP 4.1-22 Additional geologic investigations are required prior to approval of future tentative maps which allow construction, or grading plans to determine the geologic and geotechnical feasibility of the fifteen (15) lots proposed in the High Country Special Management Area (SMA). (*This mitigation measure is not applicable to the Landmark Village project. The measure refers to the 15 lots proposed in the High Country SMA, which is not located within the boundaries of the Landmark Village project site, including the off-site grading areas.*)

SP 4.1-23 Prior to construction of the road embankment located within landslide Qls II, a compacted fill shear key will be constructed at the property boundary. (R.T. Frankian & Associates, 19 September 1994, p. 6.) (*This mitigation measure is not applicable to the Landmark Village project. The measure refers to a specific road embankment, which is not located within the boundaries of the Landmark Village project site, including the off-site grading areas.*)

SP 4.1-24 Landslides, which will not affect the proposed grading concept, are to be placed in Restricted Use Areas on the Final Maps. (Allan E. Seward Engineering Geology, Inc., 19 September 1994, p. 43.) (*This mitigation measure is not applicable because landslides in and immediately adjacent to the borrow sites are required by LACDPW to be placed in restricted use areas until site-specific geotechnical elevations are completed and proposed mitigation is recommended.*)

SP 4.1-25 Surficial stability of cut-slopes designated with a "G" are to be fully evaluated at the subdivision stage, due to the possibility of wedge failures or surficial material in the slope. Corrective grading measures are to be presented in detail as mitigation at both the subdivision and Grading Plan stages of development. (Allan E. Seward Engineering Geology, Inc., 19 September 1994, pp. 17, 43.) (*This mitigation measure is not applicable to the Landmark Village project. The measure refers to "surficial stability" of certain designated cut-slopes, which are not located within the boundaries of the Landmark Village project site, including the off-site grading areas.*)

SP 4.1-26 Cut slopes designated as "P" are potentially unstable and are to be fully evaluated at the subdivision stage to ascertain whether they are stable as designed. Corrective grading measures are to be presented in detail as mitigation at both the subdivision and Grading Plan stages of development. (Allan E. Seward Engineering Geology, Inc., 19 September 1994, pp. 17, 43.) (*This mitigation measure is not applicable to the Landmark Village project. The measure refers to "potentially unstable" designated cut slopes, which are not located within the boundaries of the Landmark Village project site, including the off-site grading areas.*)

SP 4.1-27 Cut-slopes designated with a "U" are to be further investigated at the subdivision stage to confirm underlying geologic conditions and slope stability. Corrective grading measures are to be presented in detail as mitigation at both the subdivision and Grading Plan stages of development. (Allan E. Seward Engineering Geology, Inc., 19 September 1994, pp. 17, 43.) (*This mitigation measure is not applicable to the Landmark Village project. The measure refers to designated "cut-slopes" requiring further investigation at the subdivision stage, which are not located within the boundaries of the Landmark Village project site, including the off-site grading areas.*)

SP 4.1-28 Cut-slopes associated with the construction of the proposed extensions of Magic Mountain Parkway and Valencia Boulevard are to be further investigated at the subdivision stage to confirm the underlying geologic conditions and slope stability. Corrective measures are to be required if it is determined that the cut-slopes will not be stable. (Allan E. Seward Engineering Geology, Inc., 13 December 1995, pp. 11 and 12.) (*This mitigation measure is not applicable to the Landmark Village project. The measure refers to "cut-slopes" associated with construction of certain proposed road extensions, which are not located within the boundaries of the Landmark Village project site, including the off-site grading areas.*)

SP 4.1-29 Orientations of the bedrock attitudes are to be evaluated by the Newhall Ranch Specific Plan engineering geologist to identify locations of required buttress fills. Buttress fill design and recommendations, if necessary, are to be presented as mitigation during the grading plan stage. (R.T. Frankian & Associates, 19 September 1994, Appendix I.)

SP 4.1-30 All fills, unless otherwise specifically designed, are to be compacted to at least 90 percent of the maximum dry unit weight as determined by ASTM Designation D 1557-91 Method of Soil Compaction. (R.T. Frankian & Associates, 19 September 1994, Appendix I.)

SP 4.1-31 No fill is to be placed until the area to receive the fill has been adequately prepared and approved by the geotechnical engineer. (R.T. Frankian & Associates, 19 September 1994, Appendix I.)

SP 4.1-32 Fill soils are to be kept free of all debris and organic material. (R.T. Frankian & Associates, 19 September 1994, Appendix I.)

SP 4.1-33 Rocks or hard fragments larger than 8 inches are not to be placed in the fill without approval of the geotechnical engineer, and in a manner specified for each occurrence. (R.T. Frankian & Associates, 19 September 1994, Appendix I.)

SP 4.1-34 Rock fragments larger than 8 inches are not to be placed within 10 feet of finished pad grade or the subgrade of roadways or within 15 feet of a slope face. (R.T. Frankian & Associates, 19 September 1994, Appendix I.)

SP 4.1-35 Rock fragments larger than 8 inches may be placed in windrows, below the limits given above, provided the windrows are spaced at least 5 feet vertically and 15 feet horizontally. Granular soil must be flooded around windrows to fill voids between the rock fragments. The granular soil is to be wheel rolled to assure compaction. (R.T. Frankian & Associates, 19 September 1994, Appendix I.)

SP 4.1-36 The fill material is to be placed in layers which, when compacted, is not to exceed 8 inches per layer. Each layer is to be spread evenly and is to be thoroughly mixed during the spreading to insure uniformity of material and moisture. (R.T. Frankian & Associates, 19 September 1994, Appendix I.)

SP 4.1-37 When moisture content of the fill material is too low to obtain adequate compaction, water is to be added and thoroughly dispersed until the soil is approximately 2 percent over optimum moisture content. (R.T. Frankian & Associates, 19 September 1994, Appendix I.)

SP 4.1-38 When the moisture content of the fill material is too high to obtain adequate compaction, the fill material is to be aerated by blading or other satisfactory methods until the soil is approximately 2 percent over optimum moisture content. (R.T. Frankian & Associates, 19 September 1994, Appendix I.)

SP 4.1-39 Where fills toe out on a natural slope or surface, a keyway, with a minimum width of 16 feet and extending at least 3 feet into firm, natural soil, is to be cut at the toe of the fill. (R.T. Frankian & Associates, 19 September 1994, Appendix I.)

SP 4.1-40 Where the fills toe out on a natural or cut slope and the natural or cut slope is steeper than 5 horizontal to 1 vertical, a drainage bench with a width of at least 8 feet is to be established at the toe of the fill. Fills may be placed over cut slopes if the visible contact between the fill and cut is steeper than 45 degrees. (R.T. Frankian & Associates, 19 September 1994, Appendix I.)

SP 4.1-41 When placing fills over slopes, sidewall benching is to extend into competent material, approved by the geotechnical engineer, with vertical benches not less than 4 feet. (R.T. Frankian & Associates, 19 September 1994, Appendix I.) Competent material is defined as being free of loose soil, heavy fracturing, or compressive soils.

SP 4.1-42 When constructing fill slopes, the grading contractor is to avoid spillage of loose material down the face of the slope during the dumping and compacting operations. (R.T. Frankian & Associates, 19 September 1994, Appendix I.)

SP 4.1-43 The outer faces of fill slopes are to be compacted by backing a sheepsfoot compactor over the top of the slope, and thoroughly covering all of the slope surface with overlapping passes of the compactor. Compaction of the slope is to be repeated after each 4 feet of fill has been placed. The required compaction must be obtained prior to placement of

additional fill. As an alternate, the slope can be overbuilt and cut back to expose a compacted core. (R.T. Frankian & Associates, 19 September 1994, Appendix I.)

SP 4.1-44 All artificial fill associated with past petroleum activities as well as other existing artificial fill, are to be evaluated by the Newhall Ranch Specific Plan geotechnical engineer at the subdivision and/or grading plan stage. (Allan E. Seward Engineering Geology, 19 September 1994, Inc., p. 45.) Unstable fills are to be mitigated through removal, stabilization, or other means as determined by the Newhall Ranch Specific Plan geotechnical engineer.

SP 4.1-45 Surface runoff from the future graded areas is not to run over any natural, cut, or fill slopes. (Allan E. Seward Engineering Geology, Inc., 19 September 1994, p. 20.)

SP 4.1-46 Runoff from future pads and structures is to be collected and channeled to the street and/or natural drainage courses via non-erosive drainage devices. (Allan E. Seward Engineering Geology, Inc., 19 September 1994, p. 20.)

SP 4.1-47 Water is not to stand or pond anywhere on the graded pads. (Allan E. Seward Engineering Geology, Inc., 19 September 1994, p. 20.)

SP 4.1-48 Oil and water wells that might occur on site are to be abandoned in accordance with state and local regulations. (Allan E. Seward Engineering Geology, Inc., 19 September 1994, p. 45.)

SP 4.1-49 If any leaking or undocumented oil wells are encountered during grading operations, their locations are to be surveyed and the current well conditions evaluated immediately. (Allan E. Seward Engineering Geology, Inc., 19 September 1994, p. 21.) Measures are to be taken to document the wells, abandonment, and remediate the well sites (if necessary) in accordance with state and local regulations.

SP 4.1-50 The exact status and location of the Exxon (Newhall Land & Farming) oil well #31 will be evaluated at the subdivision stage. If necessary, the well will be abandoned in accordance with state and local regulations. (Allan E. Seward Engineering Geology, Inc., 13 December 1995, p. 12.)

SP 4.1-51 Survey control will be required to precisely locate the Salt Creek and Del Valle Faults at the subdivision stage. (Allan E. Seward Engineering Geology, Inc., 19 September 1994, p. 33) (*This mitigation measure is not applicable to the Landmark Village project. The measure refers to certain faults, which are not located within the boundaries of the Landmark Village project site, including the off-site grading areas.*)

SP 4.1-52 Additional subsurface trenching will be performed within the Holser Structural Zone on Newhall Ranch during the subdivision stage to evaluate its existence. Within Potrero Canyon, additional subsurface evaluation will be performed during the subdivision stage to confirm that nontectonic alluvial movement was the cause of surface ground cracking during the January 17, 1994 earthquake, and to evaluate the potential for shallow-depth faults. (Allan E. Seward Engineering Geology, Inc. 19 September 1994, p. 42, as revised above.) (*This mitigation measure is not applicable to the Landmark Village project. The measure refers to subsurface trenching and additional subsurface evaluation required on areas of Newhall*

Ranch, which are not located within the boundaries of the Landmark Village project site, including the off-site grading areas.)

SP 4.1-53 Precise Building Setback Zones for the Newhall Ranch Specific Plan site are to be defined at the subdivision stage. (*This mitigation measure is not applicable to the Landmark Village project. The measure refers to "precise building setback zones," which are not applicable to the Landmark Village project site, including the off-site grading areas.*)

SP 4.1-54 Due to the potential activity of the Salt Creek and Del Valle Faults, site development is to remain outside of Building Setback Zones around fault traces, and the possible fault zone connecting them (see Figure 4.1-4). (Allan E. Seward Engineering Geology, Inc., 19 September 1994, p. 42.) (*This mitigation measure is not applicable to the Landmark Village project. The measure refers to certain faults, which are not located within the boundaries of the Landmark Village project site, including the off-site grading areas.*)

SP 4.1-55 To minimize potential hazards from shattered ridge effects, structures and storage tanks proposed on ridgelines are to have a minimum 20-foot setback from the margins of the bedrock. Designation of specific building setbacks will require evaluation at the subdivision stage. (Allan E. Seward Engineering Geology, Inc., 19 September 1994, p. 40.) Building setback zones are to be identified on all site plans and tract maps for the site. (*This mitigation measure is not applicable to the Landmark Village project. The measure refers to storage tanks on ridgelines within areas of Newhall Ranch, which are not applicable to the Landmark Village project site, including the off-site areas.*)

SP 4.1-56 The potential for ground motion and ground failure associated with a seismic event in proximity to the planned roadway alignments of Magic Mountain Parkway and Valencia Boulevard will be evaluated at the subdivision stage. (Allan E. Seward Engineering Geology, Inc., 13 December 1995, p. 11.) Mitigation to reduce associated significant impacts will also be identified at that time. (*This mitigation measure is not applicable to the Landmark Village project. The measure refers to planned roadway alignments within Newhall Ranch, which are not applicable to the Landmark Village project site, including the off-site grading areas.*)

b. Mitigation Measures Recommended for the Project by this EIR

The following project-specific mitigation measures are recommended to mitigate the potentially significant geologic, soil, and geotechnical impacts that may occur with implementation of the Landmark Village project. These mitigation measures are in addition to those adopted in the previously certified Newhall Ranch Specific Plan Program EIR. To indicate that the measures relate specifically to the Landmark Village project, each measure is preceded by "LV," which stands for Landmark Village.

(1) Tentative Tract Map Site

(a) Earthwork and Grading

LV 4.1-1 Prior to placing compacted fill, the ground surface shall be prepared by removing non-compacted artificial fill (af), Caf, loose alluvium, and other unsuitable materials. The geotechnical engineer and/or his representatives shall observe the excavated areas prior to placing compacted fill.

LV 4.1-2 After the ground surface to receive fill has been exposed, it shall be ripped to a minimum depth of 6 inches, brought to optimum moisture content or above and thoroughly mixed to obtain a near uniform moisture condition and uniform blend of materials, and then compacted to 90 percent per the latest American Society for Testing and Materials (ASTM) D1557 laboratory maximum density.

LV 4.1-3 Removal depths for alluvium, older alluvium, and overlying soil/plow pan materials range from 4 to 16 feet and shall be as indicated on the approved Geologic/Geotechnical Map.

LV 4.1-4 Soil removals on the southwestern portion of the site shall be scheduled if possible during the summer or fall months, to minimize impacts to Grading from shallow groundwater. The contractor shall be prepared to implement dewatering systems, if necessary.

LV 4.1-5 Pico and Saugus Formation bedrock shall be over-excavated 5 feet below proposed grade to eliminate cut-fill or bedrock-alluvium transitions in building pads. Expansive materials in the bedrock shall be over excavated 8 feet in building pad areas.

LV 4.1-6 Slopewash that is locally present on the site adjacent to slope areas on the northern margin of the site shall be removed and recompacted prior to the placement of compacted fill.

LV 4.1-7 Compacted artificial fill along the northern margin of the site shall be assessed for building suitability at the grading plan stage.

LV 4.1-8 Concrete, asphalt concrete and other debris stockpiled on the site shall be removed, and either ground up for use as sub-base material, or reduced into fragments small enough to be buried in the deeper portions of the fill.

LV 4.1-9 Where recommended removals encounter ground water, water levels shall be controlled by providing an adequate excavation bottom/slope and sumps for pumping water out as the excavation proceeds, or ground water may be lowered by installing shallow dewatering well points prior to grading. Partial removals of soils above the water table and soil improvement below the water table may be another option. Dewatering may be needed depending on the season when the removals are performed and the actual removal depths are determined. Contractors shall use piezometric data for planning dewatering measures.

LV 4.1-10 On-site soils, except any debris or organic matter, may be used as sources for compacted fills. Rock or similar irreducible material with a maximum dimension greater than 8 inches shall not be placed in the fill without approval of the geotechnical engineer. Rocks or hard fragments larger than 4 inches shall not compose more than 25 percent of the fill and/or lift. Any large rock fragments over 8 inches in size may be incorporated into the fill as rockfill in windrows after being reduced to the specific maximum rock fill size. Where fill depths are too shallow to allow large rock disposal, special handling or removal may be required. Much of the on-site alluvium and older alluvium is coarse-grained and lacks sufficient cohesion for surficial stability in fill slopes. Selective grading of fill materials with sufficient cohesion derived from on-site or imported fill shall be necessary for use in fill slopes.

LV 4.1-11 The engineering characteristics of imported fill material shall be evaluated when the source area has been identified.

LV 4.1-12 Most of the slopes proposed on the site are fill slopes. Stability fills are recommended for all of the cut-slopes on the site; therefore, no cut-slopes will remain after the completion of grading. All fill slopes shall be constructed on firm material where the slope receiving fill exceeds a ratio of 5:1 (h:v). Fill slope inclination shall not be steeper than 2:1 (h:v). The fill material within approximately one equipment width (typically 15 feet) of the slope face shall be constructed with cohesive material selectively graded from on-site or import fills. Stability fills are recommended where cut-slope faces will expose fill-over-bedrock or alluvium-over-bedrock conditions. These fills shall be constructed with a keyway at the toe of the fill slope with a minimum equipment width but not less than 15 feet, and a minimum depth of 3 feet into the firm undisturbed earth. Following completion of the keyway excavations, backfilling with certified engineered fill shall not proceed prior to the approval of the keyway by the project engineering geologist.

LV 4.1-13 Backcut slopes for Stability fills shall be no steeper than the final face of the proposed fill.

(2) Recommended Earthwork Specifications

LV 4.1-14 Areas that are to receive compacted fill shall be observed by the geotechnical engineer prior to the placement of fill.

LV 4.1-15 All drainage devices shall be properly installed and observed by the geotechnical engineer and/or owner's representative(s) prior to placement of backfill.

LV 4.1-16 Fill soils shall consist of imported soils or on-site soils free of organics, cobbles, and deleterious material provided each material is approved by the geotechnical engineer.

The geotechnical engineer shall evaluate and/or test the import material for its conformance with the report recommendations prior to its delivery to the site. The contractor shall notify the geotechnical engineer 72 hours prior to importing material to the site.

LV 4.1-17 Fill shall be placed in controlled layers (lifts), the thickness of which is compatible with the type of compaction equipment used. The fill materials shall be brought to optimum moisture content or above, thoroughly mixed during spreading to obtain a near uniform moisture condition and uniform blend of materials, and then placed in layers with a thickness (loose) not exceeding 8 inches. Each layer shall be compacted to a minimum compaction of 90 percent relative to the maximum dry density determined per the latest ASTM D1557 test. Density testing shall be performed by the geotechnical engineer to verify relative compaction. The contractor shall provide proper access and level areas for testing.

LV 4.1-18 Rocks or rock fragments less than 8 inches in the largest dimension may be utilized in the fill, provided they are not placed in concentrated pockets. However, rocks larger than 4 inches shall not be placed within 3 feet of finish grade.

LV 4.1-19 Rocks greater than 8 inches in largest dimension shall be taken off site, or placed in accordance with the recommendation of the soils engineer in areas designated as suitable for rock disposal.

LV 4.1-20 Where space limitations do not allow for conventional fill compaction operations, special backfill materials and procedures may be required. Pea gravel or other select fill can be used in areas of limited space. A sand and portland cement slurry (two sacks per cubic-yard mix) shall be used in limited space areas for shallow backfill near final pad grade, and pea gravel shall be placed in deeper backfill near drainage systems.

LV 4.1-21 The geotechnical engineer shall observe the placement of fill and conduct in-place field density tests on the compacted fill to check for adequate moisture content and the required relative compaction. Where less than specified relative compaction is indicated, additional compacting effort shall be applied and the soil moisture conditioned as necessary until adequate relative compaction is attained.

LV 4.1-22 The Contractor shall comply with the minimum relative compaction out to the finish slope face of fill slopes, buttresses, and stabilization fills as set forth in the specifications for compacted fill. This may be achieved by either overbuilding the slope and cutting back as necessary, or by direct compaction of the slope face with suitable equipment, or by any other procedure that produces the required result.

LV 4.1-23 Any abandoned underground structures, such as cesspools, cisterns, mining shafts, tunnels, septic tanks, wells, pipelines or other structures not discovered prior to grading shall be removed or treated to the satisfaction of the soils engineer and/or the controlling agency for the project.

LV 4.1-24 The Contractor shall have suitable and sufficient equipment during a particular operation to handle the volume of fill being placed. When necessary, fill placement equipment

shall be shut down temporarily in order to permit proper compaction of fills, correction of deficient areas, or to facilitate required field testing.

LV 4.1-25 The Contractor shall be responsible for the satisfactory completion of all earthwork in accordance with the project plans and specifications.

(a) Recommendations for Placement of Trench Backfill

LV 4.1-26 Trench excavations to receive backfill shall be free of trash, debris or other unsatisfactory materials prior to backfill placement, and shall be observed by the geotechnical engineer.

LV 4.1-27 Except as stipulated herein, soils obtained from the trench excavation may be used as backfill if they are essentially free of organics and deleterious materials.

LV 4.1-28 Rocks generated from the trench excavation not exceeding 3 inches in largest dimension may be used as backfill material. However, such material shall not be placed within 12 inches of the top of the pipeline. No more than 30 percent of the backfill volume shall contain particles larger than 1 inch in diameter, and rocks shall be well mixed with finer soil.

LV 4.1-29 Soils (other than aggregates) with a Sand Equivalent (SE) greater than or equal to 30, as determined by ASTM D 2419 Standard Test Method or at the discretion of the engineer or representative in the field, may be used for bedding and shading material in the pipe zone areas. These soils are considered satisfactory for compaction by jetting procedures.

LV 4.1-30 No jetting shall occur in utility trenches within the top 2 feet of the subgrade of concrete slabs-on-grade.

LV 4.1-31 Trench backfill other than bedding and shading shall be compacted by mechanical methods such as tamping sheepsfoot, vibrating or pneumatic rollers or other mechanical tampers to achieve the density specified herein. The backfill materials shall be brought to optimum moisture content or above, thoroughly mixed during spreading to obtain a near uniform moisture condition and uniform blend of materials, and then placed in horizontal layers with a thickness (loose) not exceeding 8 inches. Trench backfills shall be compacted to a minimum compaction of 90 percent relative to the maximum dry density determined per the latest ASTM D1557 test.

LV 4.1-32 The contractor shall select the equipment and process to be used to achieve the specified density within a trench without damage to the pipeline, the adjacent ground, existing improvements, or completed work.

LV 4.1-33 Observations and field tests shall be carried on during construction by the geotechnical engineer to confirm that the required degree of compaction within a trench has been obtained. Where compaction within a trench is less than that specified, additional compaction effort shall be made with adjustment of the moisture content as necessary until the specified compaction is obtained. Field density tests may be omitted at the discretion of the engineer or his representative in the field.

LV 4.1-34 Whenever, in the opinion of the geotechnical engineer, an unstable condition is being created within a trench, either by cutting or filling, the work shall not proceed until an investigation has been made and the excavation plan revised, if deemed necessary.

LV 4.1-35 Fill material within a trench shall not be placed, spread, or rolled during unfavorable weather conditions. When the work is interrupted by heavy rain, fill operations shall not be resumed until field tests by the geotechnical engineer indicate the moisture content and density of the fill are as specified.

(b) Drainage and Erosion Control Recommendations

LV 4.1-36 Water shall never be allowed to stand or pond on building pads, nor should it be allowed to run over constructed slopes, but is to be conducted to the driveways or natural waterways via non-erodible drainage devices. In addition, it is recommended that all drainage devices be inspected periodically and be kept clear of all debris. Drainage and erosion control shall be in accordance with the standards set forth in the Los Angeles County Uniform Building Code.

LV 4.1-37 Modification of the existing pad grades after approval of Fine Grading by the project supervising civil engineer can adversely affect the drainage of the lots. Lot drainage shall not be modified by future landscaping, construction of pools, spas, walkways, garden walls, etc., unless additional remedial measures (area drains, additional grading, etc.) are in compliance with Los Angeles County Codes.

LV 4.1-38 Positive surface drainage shall be maintained away from buildings. The recommended drainage patterns shall be established at the time of Fine Grading. Roof drainage shall be collected in gutters and downspouts, which terminate at approved discharge points.

LV 4.1-39 Permanent erosion control measures shall be initiated immediately following completion of grading.

LV 4.1-40 All interceptor ditches, drainage terraces, down-drains and any other drainage devices shall be maintained and kept clear of debris. A qualified engineer shall review any proposed additions or revisions to these systems, to evaluate their impact on slope erosion.

LV 4.1-41 Retaining walls shall have adequate freeboard to provide a catchment area for minor slope erosion. Periodic inspection, and if necessary, cleanout of deposited soil and debris shall be performed, particularly during and after periods of rainfall.

LV 4.1-42 The future developers shall be made aware of the potential problems, which may develop when drainage is altered through landscaping and/or construction of retaining walls, and paved walkways. Ponded water, water directed over slope faces, leaking irrigation systems, over-watering or other conditions that could lead to excessive soil moisture, shall be avoided.

LV 4.1-43 Slope surficial soils may be subject to water-induced mass erosion. Therefore, a suitable proportion of slope planting shall have root systems, which will develop well below 3 feet. Drought-resistant shrubs and low trees for this purpose shall be considered.

Intervening areas can then be planted with lightweight surface plants with shallower root systems. All plants shall be lightweight and require low moisture. Any loose slough generated during the process of planting shall be properly removed from the slope face(s).

LV 4.1-44 Short-term, non-plant erosion control measures shall be implemented during construction delays, adverse climate/weather conditions, and when plant growth rates do not permit rapid vegetation of graded areas. Examples of short-term, non-plant erosion control measures include matting, netting, plastic sheets, deep (5 feet) staking, etc.

LV 4.1-45 All possible precautions shall be taken to maintain a moderate and uniform soil moisture to avoid high and/or fluctuating water content in slope materials. Slope irrigation systems shall be properly operated and maintained and system controls shall be placed under strict control.

LV 4.1-46 A program of aggressive rodent control shall be implemented to control burrowing on slope areas.

(c) River Bank Slope Protection

LV 4.1-47 Bank protection is proposed to consist of a soil cement, gunite or rip-rap liner, which is buried/concealed behind a 4:1 (h:v) fill slope. Construction of the liner will involve the excavation of a 20-foot-deep slot as shown in the details on the tentative map. Where the toe of the 4:1 slope extends beyond the removals for the slot, the alluvium shall be overexcavated 3 feet prior to placement of overlying fill.

LV 4.1-48 Ground water will likely be encountered between a depth of 5 and 10 feet; therefore dewatering shall be undertaken to complete the lower 10 to 15 feet of the proposed slot excavation.

(d) Landscaping

LV 4.1-49 All final grades shall be sloped away from the building foundations to allow rapid removal of surface water runoff. No ponding of water shall be allowed adjacent to the foundations. Plants and other landscape vegetation requiring excessive watering shall be avoided adjacent to the building foundations. Should landscaping be constructed, an effective water-tight barrier shall be provided to prevent water from affecting the building foundations.

(e) Seismic Considerations

LV 4.1-50 Future structures shall be designed according to standards applicable to Seismic Zone 4 of the Uniform Building Code.

LV 4.1-51 Lots underlain by transitions between different material types (e.g., bedrock to fill, bedrock to alluvium, etc.) shall be over-excavated 5 feet to minimize potential adverse impacts associated with differential materials response.

LV 4.1-52 Over-excavation of clay-rich bedding planes of the Saugus Formation or Pico Formation and subsequent placement of a certified fill cap is recommended to mitigate potential hazards from expansive material, and to reduce potential hazards from potential secondary seismogenic movement along bedding planes.

(f) Proposed Slopes and Grades

LV 4.1-53 Stability Fills shall be analyzed at the grading plan stage based on testing of the actual materials proposed for the fill.

LV 4.1-54 Most of the alluvium and older Alluvium on the site are coarse-grained and have low cohesion. These materials shall not be used within the outer 4 feet of fill slopes and Stability Fills.

(g) Excavations, Shoring and Backfill

LV 4.1-55 Excavations deeper than 3 feet shall conform to safety requirements for excavations as set forth in the State Construction Safety Orders enforced by the State Division of Industrial Safety, CAL OSHA. Temporary excavations no higher than 12 feet shall be no steeper than 1:1 (h:v). For excavations to 20 feet in height, the bottom 3.5 feet may be vertical and the upper portion between 3.5 and 20 feet shall be no steeper than 1.5:1 (h:v). Excavations not complying with these requirements shall be shored. It is strongly recommended that excavation walls in sands and dry soils be kept moist, but not saturated at all times.

LV 4.1-56 Parameters for design of cantilever and braced shoring shall be provided at the grading plan stage.

LV 4.1-57 The bases of excavations or trenches shall be firm and unyielding prior to foundations or utility construction. On-site materials other than topsoil or soils with roots or deleterious materials may be used for backfilling excavations. Densification (compaction) by jetting may be used for on site clean sands or imported equivalent of coarser sand provided they have a Sand Equivalent greater than or equal to 30 as determined by ASTM D2419 test method. Recommended specifications for placement of trench backfill are presented in Appendix C of the September 27, 2000 geologic and geotechnical report.

(h) Foundation and Settlement Considerations

LV 4.1-58 The structural design shall include seismic geotechnical parameters in accordance with UBC requirements for Seismic Zone 4. These parameters shall be provided at the grading plan stage.

LV 4.1-59 Shallow spread footings for foundation support of up to three-story residential, commercial or light industrial developments can adequately be derived from non-organic native soils, processed as necessary, and bedrock or engineered fill compacted as previously recommended. The composition of footings for heavier structures, if applicable, shall be addressed at the grading plan stage. Tentatively, an allowable bearing capacity of 2,500 pounds per square foot can be used for shallow foundations

constructed in certified compacted fill originated from existing, near-surface soils (except vegetative soils). Lateral resistance of footing walls shall be provided at the grading plan stage.

LV 4.1-60 Figure C4 (Appendix C), "Cut Lot (Transitional)" and "Cut-Fill Lot (Transitional") of the September 27, 2000 geologic and geotechnical report provides a foundation grading detail for locations where foundations will straddle transition zones between cut and fill materials. If the remaining cut-fill transition is steep at depth below the building area, the geometry of the transition shall be reviewed during grading operations by the soils engineer on a site specific basis to evaluate the need for additional over-excavation removals and/or additional foundation reinforcement. Based on this review, appropriate action shall be taken as deemed necessary by the engineer. As a general guideline, steep cut/fill transitions would include slope gradients steeper than 4:1 (h:v) and overall variations in fill thickness of greater than 15 feet, which occur within 20 feet of final pad grade. Transitions between differing material types, such as bedrock and alluvium, also shall be overexcavated 5 feet as recommended in Section 1.2 of Appendix E of the September 27, 2000 Geologic and Geotechnical Report.

LV 4.1-61 To minimize significant settlements, upper soils in areas to receive fills shall be removed and recompacted to competent materials. Specific foundation design loads shall be provided at the grading plan stage.

(i) Drainage Control

LV 4.1-62 Whenever seepage of groundwater is observed, the condition shall be evaluated by the engineering geologist and geotechnical engineer prior to covering with fill material.

LV 4.1-63 Surface drainage control design shall include provisions for positive surface gradients to ensure that surface runoff is not permitted to pond, particularly above slopes or adjacent to building foundations or slabs. Surface runoff shall be directed away from slopes and foundations and collected in lined ditches or drainage swales, via non-erodible drainage devices, which is to discharge to paved roadways, or existing watercourses. If these facilities discharge onto natural ground, means shall be provided to control erosion and to create sheet flow.

LV 4.1-64 Fill slopes and stability fills, as applicable, shall be provided with subsurface drainage as necessary for stability.

(j) Expansive Soils

LV 4.1-65 Additional testing for expansive soils shall be performed at the grading plan stage and during finish grading so that appropriate foundation design recommendations for expansive soils, if applicable, can be made.

(k) Soil Corrosivity

LV 4.1-66 Testing for soil corrosivity shall be undertaken at additional locations within the project site at the grading plan stage. Final recommendations for concrete shall be in accordance

with the latest UBC requirements, and a corrosion specialist shall provide mitigating recommendations for potential corrosion of metals.

(l) Retaining Walls and Pavement Design

LV 4.1-67 Preliminary, retaining wall geotechnical design parameters and pavement design(s) shall be provided at the grading plan stage.

(3) Off-Site Grading and Borrow Site

LV 4.1-68 If the proposed fills over alluvium and slopewash at either the Adobe Canyon or Chiquito Canyon sites are to be considered "structural fill," subsurface studies shall be performed to determine actual liquefaction potential of these soils. If this potential exists, it shall be addressed by removal and recompaction of the alluvium above groundwater, in order to provide a cap to bridge effects.

LV 4.1-69 Where possible, removals that impact the mapped landslides shall be completed so as to not remove the existing landslide stability. If this is not possible, the conditions shall be geotechnically evaluated on a case-by-case basis at the Grading Plan stage in order to safely complete the necessary removals.

LV 4.1-70 Slope stability analysis shall be performed for the 186-foot-high cut slope along the base of the existing Edison tower within the Chiquito Canyon grading site. Corrective measures, such as construction of a buttress or stability fills, shall be implemented if the proposed cut slope does not comply with the required minimum factor of safety.

LV 4.1-71 If future development is proposed within either Adobe Canyon or Chiquito Canyon, subsurface exploration and analyses shall be conducted to determine landslide stability. Means to mitigate the potential effects of landslides, including complete or partial removal, buttressing, avoidance, or building setbacks shall be identified at that time.

LV 4.1-72 If future development is proposed within Chiquito Canyon, slope stability analysis shall be performed for the 186-foot-high cut slope along the base of the existing Edison tower within the Chiquito Canyon grading site. Corrective measures, such as construction of a buttress or stability fills, shall be implemented if the proposed cut slope does not comply with the required minimum factor of safety.

8. CUMULATIVE IMPACTS

Because any potential geotechnical impacts that may result with development of the Landmark Village tract map site would be site-specific in nature, and because development of the proposed project, as well as the development of all surrounding projects, is required to be consistent with applicable Los Angeles County Building Code requirements relative to potential geologic hazards, the proposed project would not result in significant cumulative geologic, soil or geotechnical impacts.

The cumulative impacts analysis presented in the certified Newhall Ranch Specific Plan Program EIR considered the cumulative geologic, soil, and geotechnical impacts associated with buildout of the entire Specific Plan, including the WRP. The Newhall Ranch Specific Plan Program EIR determined that geologic, soil, and geotechnical impacts tend to be site specific, rather than cumulative in nature and that each development site would be subject to, at minimum, uniform site development and construction standards relative to seismic and other geologic conditions prevalent within the region. When development plans would be developed for a specific site, appropriate and site-specific studies would be done to identify geotechnical and soils impacts, and to recommend appropriate mitigation.

This impact analysis has identified the geologic and soils impacts associated with development of the proposed tract map site and related off-site improvements, including the Adobe Canyon borrow site, the Chiquito Canyon grading site, and the utility corridor. Grading activities at these sites would facilitate future development; therefore, they are discussed in this cumulative impact analysis. While not a part of this project proposal, future development is proposed to occur on both the Adobe Canyon borrow site and the Chiquito Canyon grading site under the adopted Specific Plan. Within the Adobe Canyon borrow site, all proposed natural slopes with daylighted bedding conditions and or steep gradients (greater than 2:1 [h:v]) adjacent to graded areas may be potentially unstable and/or subject to debris flow hazard. Based on a review of the Preliminary Bulk Grading Study Map, most of the natural slopes are self-supporting with respect to the geologic structure of the bedrock bedding planes and slope orientations; hence gross stability is generally favorable. Building setbacks or remedial measures would be required where ascending or descending slopes are not stable as determined by geologic or geotechnical stability analysis. If any natural slopes are determined to be unstable, or subject to debris flow hazard, mitigation measures would need to be designed.

Three suspected landslides have been mapped within the proposed grading limits for the Adobe Canyon borrow site. These landslides are likely translational failures controlled by the bedding orientation. Future development on this borrow site would require subsurface exploration and analysis relative to potential adverse impacts from landslides prior to its development.

9. CUMULATIVE MITIGATION MEASURES

While not proposed as part of this project, future development in either Adobe Canyon or Chiquito Canyon could result in potentially significant geologic and soils impacts. The following mitigation measures are recommended for future development on these sites:

LV 4.1-71 If the proposed fills over alluvium and slopewash at either Adobe Canyon or Chiquito Canyon are to be considered "structural fill," subsurface studies shall be performed to determine actual liquefaction potential of these soils. If this potential exists, it shall be addressed by removal and recompaction of the alluvium above groundwater, in order to provide a cap to bridge effects.

LV 4.1-72 If future development is proposed within either Adobe Canyon or Chiquito Canyon, subsurface exploration and analyses shall be conducted to determine landslide stability. Means to mitigate the potential effects of landslides, including complete or partial removal, buttressing, avoidance, or building setbacks shall be identified at that time.

LV 4.1-73 If future development is proposed within Chiquito Canyon, slope stability analysis shall be performed for the 186-foot-high cut slope along the base of the existing Edison tower within the Chiquito Canyon grading site. Corrective measures, such as construction of a buttress or stability fills, shall be implemented if the proposed cut slope does not comply with the required minimum factor of safety.

10. SIGNIFICANT UNAVOIDABLE IMPACTS

a. Project Specific Impacts

With implementation of the mitigation measures recommended in this section, no significant unavoidable project-related geologic, soil, or geotechnical impacts have been identified or are anticipated.

b. Cumulative Impacts

With implementation of the cumulative mitigation measures recommended in this section, no significant unavoidable cumulative geologic, soil, or geotechnical impacts have been identified or are anticipated for the proposed project.

4.2 HYDROLOGY

1. SUMMARY

Site clearing and grading operations within the Landmark Village tract map site would have the potential to discharge sediment in the Santa Clara River during storm events. Temporary erosion control measures in disturbed areas of the project site during the construction phase (including grading in Adobe Canyon and Chiquito Canyon, and construction of the utility corridor) are recommended to reduce this potential impact to less than significant levels. Once developed, the Landmark Village project would reduce post-development stormwater flows during a capital storm event, as compared to existing conditions. Specifically, the amount of discharge from the project site (including the tributary watershed in which the project site lies) would decrease from 831 cubic feet per second (cfs) to 795 cfs. This 4 percent reduction in rainfall runoff would be due to the reduction in erosive areas on the project site that contribute sediment and debris to the runoff, as well as to one existing and three proposed upstream debris basins north of State Route 126 (SR-126). The proposed storm drainage improvements would meet the flood control requirements of the Flood Control and Watershed Management Divisions of the Los Angeles County (County) Department of Public Works (LACDPW) and reduce flood impacts to less than significant levels.

Discharge from the Adobe Canyon borrow site after grading would be reduced from 450 to 352 cfs during a capital storm event, which represents a 22 percent reduction. Discharge from the Chiquito Canyon grading site after grading would be reduced from 283 cfs to 197 cfs, which is a 30 percent reduction. These reductions in discharge would result from a reduced rate of runoff from the grading sites allowing for greater infiltration. They would also result from the proposed debris basins that would capture sediment and debris in runoff before it discharges to the river. As a result of the grading and the debris basins, discharge from the off-site grading areas would not result in downstream flooding or an exceedance of river capacity, and impacts relative to upstream and/or downstream flooding would be less than significant.

Discharge and debris flow from the utility corridor would be equal to or less than existing conditions.

Approximately 169 acres of the Landmark Village tract map site would be elevated above the capital floodplain (the remaining portions of the tract map site are already above the capital floodplain) and, therefore, none of the improvements proposed on the tract map site would be subject to flood hazard from the river or other nearby drainages. Neither the Adobe Canyon borrow site nor the Chiquito Canyon grading site include proposed structures within a 100-year or capital flood hazard area. By elevating the project site above the 100-year and capital flood hazard areas and by providing bank protection and erosion protection where necessary, no housing or structures would be exposed to flood hazards.

The proposed project would not result in risk of loss, injury, or death due to flooding, mudflow, tsunami, or seiche.

Project water quality impacts are discussed in this EIR in ***Section 4.3****,* ***Water Quality****. Project impacts on biological resources in the Santa Clara River as a result of changes to river hydraulics associated with proposed site grading, bank stabilization, and other floodplain modifications are addressed in this EIR in* ***Section 4.5****,* ***Floodplain Modifications****.*

2. INTRODUCTION

a. Relationship of Project to Newhall Ranch Specific Plan Program EIR

Section 4.2 of the Newhall Ranch Specific Plan Program EIR identified and analyzed the existing conditions, potential impacts, and mitigation measures associated with flood protection for the entire Newhall Ranch Specific Plan site. The Newhall Ranch Specific Plan Program EIR concluded that Specific Plan implementation would result in significant impacts, but that the identified mitigation measures would reduce the impacts to below a level of significance. The Newhall Ranch Specific Plan Program EIR also determined that site-specific Drainage Concept Plans would be required as the Specific Plan is implemented through the application and processing of tentative subdivision maps. All subsequent project-specific development plans and tentative subdivision maps must be consistent with the Newhall Ranch Specific Plan and the County of Los Angeles General Plan and Santa Clarita Valley Area Plan.

This project-level EIR is tiered from the previously certified Newhall Ranch Specific Plan Program EIR. **Section 4.2** discusses the Landmark Village project's existing conditions, the project's potential environmental impacts, and the applicable mitigation measures from the Newhall Ranch Specific Plan Program EIR, and any new mitigation measures recommended by this EIR for the Landmark Village project.

As compared to the Newhall Ranch Specific Plan Program EIR analysis, there are three minor modifications, with the project's proposed flood protection improvements. They are: (1) modifications to the location of the soil cement tie-in at Chiquito Canyon Creek; (2) avoidance of riparian resource areas near the proposed central park area on the Landmark Village tract map site; and (3) minor realignment of the bank protection both upstream and downstream of the Long Canyon Road Bridge. All three proposed modifications are instances in which flood protection is pulled further back from the river corridor (i.e., farther away from the river) than what was analyzed in the Newhall Ranch Revised Additional Analysis, Volume VIII (May 2003) in Recirculated Draft EIR **Appendix 4.10**.

b. References for this EIR Section

The information presented in this section relies on the Landmark Village tract map drainage concept and off-site grading areas drainage concept, both of which were prepared by PSOMAS (2005). It also relies on portions of the *Landmark Village Flood Technical Report*, prepared by Pacific Advanced Civil Engineering, Inc. (PACE), dated August 2006. These reports are presented in Recirculated Draft EIR **Appendix 4.2**. This section addresses the potential hydrologic impacts of the proposed project, including the potential impacts to river hydraulics resulting from elevating the project site out of the Federal Emergency Management Agency (FEMA) 100-year and capital flood hazard areas, and the proposed bank stabilization. Potential impacts to the biological resources within and adjacent to the Santa Clara River and its tributary drainages are addressed in this EIR in **Section 4.5**, **Floodplain Modifications**. The proposed project's potential water quality impacts are addressed in this EIR in **Section 4.3**, **Water Quality**.

In addition to the above project-specific documents, the following references were used in this analysis. Documents referred to, referenced, or cited in this EIR section are incorporated by reference and are available for public review at the County of Los Angeles, Department of Regional Planning, 320 West Temple Street, Los Angeles, California:

- Center for Watershed Protection. *The Practice of Watershed Protection* (2000).
- Chow, VT. *Open Channel Hydraulics*. McGraw Hill Civil Engineering Series (1959).
- *Federal Emergency Management Agency (FEMA) Flood Insurance Map 065043-0340* (October 20, 2002).
- Los Angeles County Department of Public Works *Hydrology Manual* (December 1991) and *Sedimentation Manual* (June 1993).
- Los Angeles County Department of Public Works. *Development Planning for Storm Water Management, A Manual for the Standard Urban Storm Water Mitigation Plan (SUSMP)* (September 2002).
- Los Angeles County of Public Works *Level of Flood Protection and Drainage Protection Standards* (1986).
- Los Angeles County Department of Public Works, *Santa Clara River Enhancement and Management Plan, Flood Protection Report* (June 1968 Final Draft).
- PACE, Inc. – *Newhall Ranch Santa Clara River HEC-RAS Modeling report,* March 2006.
- PACE, Inc. – *Landmark EIR – Newhall Ranch Santa Clara River LA County & FEMA Updated Floodplain and Floodway Studies,* - May 2006
- PSOMAS. Surveyed Topography Data for River Village (1999).

- U.S. Army Corps of Engineers. Santa Clara River Adopted Discharge Frequency Values (adopted May 3, 1994 by the U.S. Army Corps of Engineers, the Ventura County Flood Control Department and the Los Angeles County Department of Public Works).
- Valencia Company, Natural River Management Plan (Permitted Projects and Activities under the U.S. Corps of Engineers 404 Permit, California Department of Fish and Game 1603 Agreement and 2081 Permit, November 1998).
- Sikand. Newhall Ranch Specific Plan Master Drainage Concept, Santa Clara River (April 2001).
- Sikand. Newhall Ranch Santa Clara River HEC-RAS Study (June 28, 2000).
- Sikand. Supplemental Report for Newhall Ranch Santa Clara River HEC-RAS Study (July 2000).
- Simons, Li & Associates. Summary Report, Fluvial Study of Santa Clara River and the Tributaries (November 1990).
- U.S. Geological Survey (USGS). Sediment Discharge in the Santa Clara River Basin, Ventura and Los Angeles Counties, California, Water Resource Investigations 79-78 (August 1979).

3. SUMMARY OF THE NEWHALL RANCH SPECIFIC PLAN PROGRAM EIR FINDINGS

With respect to flood impacts, the Newhall Ranch Specific Plan Program EIR concluded that implementation of the Specific Plan's Conceptual Backbone Drainage Plan would result in an approximate 30 percent decrease in total debris volume and a 12 percent decrease in total burned and bulked runoff in the 20,724-acre tributary watershed where Newhall Ranch is located. Specifically, the existing amount of burned and bulked flows total 52,729 cfs for the capital storm, and the current total debris volume is estimated at 1,203,790 cubic yards (cy). Implementation of the Specific Plan would reduce the amount of burned and bulked discharge by 6,179 cfs to 46,550 cfs, and the amount of debris volume generated by 361,420 cy to a total of 842,370 cy.

In order to avoid flooding impacts along the Santa Clara River, those areas along the river that are proposed for commercial and residential development would be elevated above the existing FEMA 100-year and LACDPW capital flood hazard areas and, where necessary, erosion protection provided, thereby, removing the development from flood hazards.

The floodplain modifications proposed in the Specific Plan included three bridge crossings over the river, soil cement (and other bank protection methods) along portions of the banks in the river corridor of the Specific Plan site, and removal of mostly agricultural acreage from the floodplain by raising the land areas and installing bank protection. It was concluded that the proposed Specific Plan improvements

would alter flows in the river; however, the effects would only be expected during infrequent flood events that reached the buried banks (e.g., 100-year and capital flood events).

The analysis also found that implementation of the Specific Plan would cause an increase in flows, water velocities, water depth, changes in sediment transport, and changes in the flooded areas of the river; however, these hydraulic effects were found to be localized and minor in magnitude and event. The analysis also determined that, under the Specific Plan, the river would still retain sufficient width and maintain natural hydraulic conditions necessary to allow the existing fluvial processes to continue.

Based on the prior analysis, implementation of the Specific Plan was found to not increase site discharge during a capital storm, not result in upstream or downstream flooding, and not subject any on-site or off-site improvements to flood hazards. Therefore, the development proposed in the Specific Plan was found to result in less than significant on-site and off-site flooding impacts.

The Newhall Ranch Specific Plan Program EIR also included several mitigation measures to ensure that the Specific Plan's Conceptual Backbone Plan is implemented with the results intended in the Specific Plan and that the improvements are consistent with the requirements of the LACDPW. With implementation of these measures, it was determined that there would be no on-site or off-site significant flood impacts from either the Newhall Ranch Specific Plan or cumulative development within its tributary areas.

4. METHODOLOGY

The following section discusses Los Angeles County's capital flood methodology. The County's methodology for calculating the project's impacts on river hydraulics is presented in this EIR in **Section 4.5**, **Floodplain Modifications**, and the methodology used for calculating water quality impacts is addressed in **Section 4.3**, **Water Quality**. This impact analysis addresses three development scenarios:

1. Existing;
2. Existing with Project; and
3. Cumulative Buildout.

The hydrologic and hydraulic methodology used for the first two scenarios are summarized in this section to provide the reader with background information on the approach used to calculate pre- and post-development runoff quantities, the capacities of proposed improvements, and the effects of development on the Santa Clara River. The third scenario is a cumulative build-out scenario that was previously addressed in the Newhall Ranch Specific Plan Program EIR.

a. Explanation of County Capital Flood[1]

In 1931, the Los Angeles County Flood Control District (now the Flood Control Division of the LACDPW) began development of a comprehensive plan of flood control facilities to collect and convey flows from the mountainous canyons, the alluvial fans, and the urbanized coastal plain.

The major needs in designing the system were the reduction of damage due to high canyon flows, the conveyance of large flows of water in a major storm, and the ability to meet future flood control needs. The design of the flood protection system for the County is based upon the LACDPW's 50-year capital flood hydrology. The reader should note that the LACDPW 50-year capital event design flow rate is well in excess of the FEMA 100-year flow rate.

The Department's 50-year capital flood (or Qcap) hydrology is based on a "design," or theoretical storm event, which is derived from 50-year frequency rainfall values and is patterned after actual major extra-tropical storms observed in the Los Angeles region. The 50-year capital frequency design storm is assumed to occur over a period of four days, with the maximum rainfall falling on the fourth day. For the sake of clarity and to minimize confusion, the prior sections and remaining sections of this document will drop the reference to "50-year capital flood" and only use the term "capital flood."

Analysis of recorded major storms reveals that, during the 24-hour period of maximum rainfall, rainfall intensity typically increases during the first 70 to 90 percent of the period and decreases in the remaining time. Furthermore, approximately 80 percent of the amount of the 24-hour rainfall occurs within the same 70 to 90 percent of the period. In developing the capital flood, the 50-year frequency design storm is assumed to fall on saturated soils. In converting rainfall to runoff, rainfall that is not lost due to the hydrologic processes of interception, evaporation, transpiration, depression storage, infiltration, or percolation is assumed to be surface runoff. The effect of snowfall or snowmelt on rainfall-runoff relationships is a consideration in only a very limited portion of the County (i.e., the higher elevations) where snowfall accumulates in winter.

Another assumption made in developing a capital flood design flow rate is that natural portions of the watershed have been burned by fire. When a watershed burns, the soil infiltration rate decreases due to the loss of vegetation and physical changes in the soil. The County has run field infiltrometer tests in order to quantify the effect that burning has on the coefficient of runoff. The effect of burning the watershed can increase the design runoff rate from 10 percent to 20 percent.

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1 Los Angeles County Department of Public Works, *Hydrology Manual* (Alhambra, California, December 1990).

The final factor in adjusting the capital flood design flow rate is referred to as a bulking factor. In the area where a watershed is burned, the runoff would carry with it a large layer of eroded topsoil. This sediment, along with the associated burned trees and brush, is referred to as debris. In order to account for these quantities of debris, the design flow rate is artificially increased using a prescribed bulking factor, which is a function of not only soil type, but also the steepness of the terrain and the size of the drainage basin. The bulking factors for larger drainage basins range from about 1.20 to 1.50, or from 20 percent to 50 percent over and above the burned flow rate.

In September 2003, LACDPW revised the hydrologic method that accounts for fire effects on runoff computations. In the previous practice, a completely burned watershed was assumed. That policy was updated to employ a statistical approach that relates historical fire data and vegetation recovery rates to changes in the runoff coefficient of soil. In so doing, a fire factor (*FF*) was developed to represent the effectively burned percentage of a given watershed. This factor is used to adjust runoff coefficients for the capital flood by indexing between an unburned and completely burned soil coefficient for a given soil.

Because the prior capital flood methodology was used for the Newhall Ranch Specific Plan, the previous capital discharge is used in this impact analysis for comparison. In the design stages for the Landmark Village project, the updated 2003 capital discharge will be employed as this updated version is anticipated to be adopted between now and approval of the proposed project. Because the 2003 capital discharge is lower than previous calculations, using updated values in the design phase will result in reduced calculated flood flows and a reduced calculated potential for flood-related impacts. Any changes in design of bank protection resulting from utilizing the updated capital discharge would only reduce the top of bank protection elevation and toe of the bank protection depth. Final design of bank protection would adhere to LACDPW capital flood design standards. The LACDPW has revised capital flood flow rates for the Santa Clara River (PACE – Newhall Ranch Santa Clara River HEC-RAS Modeling, March 2006). In general, these revised flow rates are 15 to 20 percent less than the previous values for the Santa Clara River within the study reach (see **Table 4.2-2** later in this document).

In summary, the County's Qcap 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, thereby yielding a peak flow rate that is greater than a 50-year storm over an unburned-unbulked drainage basin. The probability of all of the theoretical assumptions identified in the County's capital flood occurring at the same time is extremely small, and yields greater design flows than the FEMA methodology for calculating the 100-year and 500-year floods. As a result, the County's methodology is more conservative than the FEMA 100-year flow rate.

b. Method of Drainage Analysis

The engineering term for the methods used to properly size pipes and channels is "hydraulic analysis." In order to determine the proper sizes of pipes and channels, assumptions must be made regarding the amount of rainfall to design for and the amount and type of development that would take place in a drainage basin. An estimate also must be made of how often that amount of rainfall could be surpassed. This is referred to as the event exceedance probability, or its reciprocal value, return period. For example, a storm that has a 10 percent exceedance probability is a storm that has a 10 percent chance of exceeding a particular rainfall runoff in any given year. The reciprocal of this number (1/10) is also known as a 10-year return period storm. An important concept to keep in mind is that a pipe or channel is "designed" for a rate of flow (measured in cfs), not a volume of flow (measured in cubic feet or acre-feet). A dam or a lake is designed for storing or containing a fixed volume of water. A pipe of a fixed size, on the other hand, can carry different flow rates, depending on the pressure placed on the water.

In designing a storm drain system, the size of a pipe that would safely carry a predicted rate of flow (expressed in cfs) must be calculated. A 1-foot-square box that is 1 foot deep (a cubic-foot) can hold 7.5 gallons of water. Based on this fact, the amount of stormwater passing through a pipe or channel in one second can be calculated by multiplying the cross sectional area of the flow in the pipe (in square feet) by the rate of storm flows through the pipe in feet per second (fps). This three-dimensional rate of flow is referred to as "cubic feet per second" or cfs.

With the above concepts in mind, the effects of development on natural ground can be considered. Buildings, driveways, patios, sidewalks, and roads all create new impervious covers to the natural ground, and prevent water from being absorbed, or infiltrating, into the ground. The water that would normally infiltrate into the ground would, therefore, run off at higher than normal flow rates. Thus, the surface discharge from developed areas is greater than from undeveloped areas.

LACDPW requires that all designs utilize exceedance probability calculations for design and analysis. By employing this methodology, this impact analysis meets County design standards.

c. Explanation of Design Hydrology

The following provides additional discussion of the effects of soil type, imperviousness, and burning and bulking on storm discharge quantities.

(1) Effects of Soil Type and Amount of Imperviousness on Runoff Rates

The rate of runoff is directly related to the type of soil (see **Sections 4.1, Geotechnical and Soil Resources**, and **4.18, Agricultural Resources**, for further discussion regarding on-site soils). Certain soil types accept water faster (are more permeable) than other soils. Therefore, the types of soils present on a site are used in the calculations of runoff. Different soil types have very different water infiltration (or absorption) rates. If a sandy soil (highly permeable) is paved over, the coefficient of runoff would greatly increase, whereas if a clay soil (not highly permeable) is paved over, runoff values would go up, but not as high as in the case of sandy soil because the sandy soil absorbs water faster; therefore, the paving would create a greater disparity between the previously low runoff coefficient for the permeable sandy soil and the new higher runoff coefficient based on the impermeable pavement. In small storms, some soils can absorb 100 percent of the rainfall. For example, soil type 015, Tujunga Fine Sandy Loam, can completely absorb a 0.5-inch per hour (in/hr) storm and almost completely absorb a heavy/intense 1.0 in/hr storm, thereby yielding extremely low runoff rates. For a 200-acre parcel, different soil types such as the very pervious 015 (Tujunga Fine Sandy Loam) or the highly impervious 012 (Ramona Clay Loam) will produce radically different runoff quantities for the same rainfall events. For example, an intense storm releasing 1.0 in/hr of water will be quickly absorbed by the very pervious soil type 015 (Tujunga Fine Sandy Loam), and, therefore, the water runoff rate from the parcel would be 20 cfs. For the same size parcel with a very impervious soil, such as soil type 012 (Ramona Clay Loam), the water runoff rate for a 1.0 in/hr storm would increase to 168 cfs.

(2) Effects of Burning and Bulking

In an undeveloped watershed, capital flood flow rates assume a burned condition, which causes the coefficient of runoff to increase. Further, after increasing the coefficient of runoff for burning, the flow rate is then multiplied by a bulking factor, which is used to account for the amount of mud and debris that would be contained within the flow from the burned watershed. In the case of the proposed Landmark Village project, the increase in the runoff coefficient, or flow rates, to account for burning is the equivalent of10 to 20 percent. Furthermore, application of the bulking factor to account for debris production would increase runoff quantities by 20 to 50 percent over and above the burned flow rate. Computer modeling for this project was used to estimate the runoff for the 50-year capital storm events. The analysis considered burned hydrology, but no additional bulking factors were used in the proposed (post-development) on-site runoff conditions because sediment-trapping devices are proposed upstream of the project site and north of SR-126.

(3) Effects of Development

As previously mentioned, development places impervious materials over soils that had previously absorbed stormwater. Once the impervious materials are placed over the soil, little direct infiltration occurs and runoff discharge increases. Because development does not typically completely cover the ground surface, portions of each developed parcel (e.g., front, side, and rear yards, landscaping, open space, etc.) remain pervious to infiltration by stormwater. Percent imperviousness for each proposed land use for the project site is presented in **Table 4.2-1, Percent Imperviousness for Selected Land Uses**.

Table 4.2-1
Percent Imperviousness for Selected Land Uses

Land Use	Percent Imperviousness
Single Family Residential	42%
Multi Family Residential	68%
School	82%
Commercial	92%
Park	15%
Roadway	100%
Open Space/Off-Site Grading	0%

*Source: PSOMAS, Landmark Village Tentative Tract Map 53108 Drainage Concept (2005) (see Recirculated Draft EIR **Appendix 4.2**).*

(4) Santa Clara River Hydraulics

The floodplain conditions of the river were modeled using River Analysis System (RAS) software developed by the U.S. Army Corps of Engineers (ACOE) Hydrologic Engineering Center (HEC). Inputs to the HEC-RAS model include channel geometry, boundary conditions, hydraulic roughness, and hydrology (see the PACE report in Recirculated Draft EIR **Appendix 4.2** for a detailed description of this model). The original river modeling prepared by Sikand Engineering and utilized in the Newhall Ranch Revised Additional Analysis, Volume VIII (May 2003) in Recirculated Draft EIR **Appendix 4.10**, used the HEC-RAS predecessor hydraulic model "HEC-2." The original HEC-2 model was converted and input into HEC-RAS.

The modeling prepared for the proposed project is consistent with that prepared for the Newhall Ranch Specific Plan. Discharges include the 50 percent (2-year), 20 percent (5-year), 10 percent (10-year), 5 percent (20-year), 2 percent (50-year), and 1 percent (100-year) annual probability return periods. In addition, the LACDPW capital flow (which is a 0.05 percent to 0.02 percent (2,000-year to 5,000-year)

recurrence interval also has been evaluated. The numerical modeling includes velocity distributions for over 100 river cross sections. Manning's roughness values for the model bed were taken from analysis of aerial photography of the project site and vary horizontally along each model cross section. The proposed conditions analysis was conducted by modifying the existing conditions model such that the proposed bank protection (described below) was placed within the model as encroaching levees. The impacts of the proposed Long Canyon Road Bridge and the on-site and off-site bank protection (and erosion protection) for the entire Landmark Village project site has been evaluated and are included as a part of the numerical modeling analysis.

The project model for the river was created by modifying existing cross-section geometrics to simulate the hydraulic effects of the proposed bank protection (soil cement, rip-rap and concrete), erosion protection, and the Long Canyon Road Bridge abutments and piers. The encroachment due to the soil cement was conservatively approximated by the insertion of vertical walls or "levee markers" in the HEC-RAS model to define the horizontal location of the proposed bank protection levees in the hydraulic model (model levees set at equivalent elevation on slope of riverbank). The modeling of the proposed Long Canyon Road Bridge span, concrete slope protection, pier spacing, and abutment locations is consistent with the Newhall Ranch Revised Additional Analysis, Volume VIII (May 2003). For modeling and impact analysis consideration, these conservative bridge configurations would have the greatest impact on river hydraulics. It should be pointed out, however, that this river hydraulic analysis is based on the project-specific design details, not assumptions from the previous *Newhall Ranch* Specific Plan evaluation.

Existing Santa Clara River discharge rates for the 2-, 5-, 10-, 20-, 50-, and 100-year storm events were obtained from a 1994 ACOE study entitled, *Santa Clara River Adopted Discharge Frequency Values*. This study is based upon a frequency analysis of stream flow data along the Santa Clara River and, therefore, approximates river flows from observed data. These values are presented in **Table 4.2-2, Existing Santa Clara River Conditions – Discharge by Return Period**. It is important to note that these values include discharges from upstream tributaries and direct runoff from the watershed.

Table 4.2-2
Existing Santa Clara River Conditions
Discharge by Return Period (cfs)

Location	Station	2-Year[1]	5-Year[1]	10-Year[1]	20-Year[1]	50-Year[1]	100-Year[1]	ML Map Qcap[2]	Revised Qcap[3]
Upstream of Castaic Creek Confluence	35245	1,720	5,240	9,490	15,600	27,500	40,300	138,000	116,236
At Castaic Confluence	32265	2,527	8,232	14,942	24,157	41,141	58,207	163,000	140,776
Downstream of Chiquito Creek Confluence	22195	2,558	8,333	15,123	24,453	41,646	58,922	165,000	141,426
At Grande Canyon Creek Confluence	17360	2,581	8,408	15,263	24,675	42,025	59,457	166,500	141,426
Downstream of Potrero Creek Confluence	15125	2,600	8,480	15,400	24,900	42,400	60,000	168,000	142,475

Source: Pacific Advanced Civil Engineering, Inc., Landmark Village Flood Technical Report *(August 2006).*

[1] *These recurrence intervals were obtained from ACOE.* Santa Clara River Adopted Discharge Frequency Values *(adopted May 3, 1994 by the ACOE, the Ventura County Flood Control Department, and the LACDPW).*

[2] *This recurrence interval is from the LACDPW ML Maps 43-ML-24 and 43-ML-25 of floodplain and floodway. This published Q_{cap} flow rate from LACDPW was recently revised downward.*

[3] *Revised Capital Flood Flow Rates from LACDPW 2005 - see PACE March 2006 Santa Clara River HEC-RAS Modeling report (EIR, Recirculated Draft EIR* ***Appendix 4.2****).*

5. PLANS AND POLICIES FOR FLOOD CONTROL

Storm runoff from the project site, and discharges of runoff into and/or encroachment upon natural drainages, wetlands, and/or floodplains are subject to the Federal Clean Water Act (CWA) (33 U.S.C. Section 1251 et seq.) and associated regulations; the State Porter-Cologne Water Quality Control Act (Water Code Section 13000 et seq.) and associated regulations; Sections 1600–1607 of the California Fish and Game Code; and the requirements established by the ACOE, the CDFG, the State Water Resources Control Board (SWRCB), the Regional Water Quality Control Board (RWQCB), and the Flood Control and Watershed Management Divisions of the LACDPW. Many of these regulations control water quality and floodplain modifications, and, where applicable, are addressed in this EIR in **Section 4.3**, **Water Quality**, and **Section 4.5**, **Floodplain Modifications**, respectively.

a. The Federal Clean Water Act

The project would be subject to federal permit requirements under the federal Clean Water Act.

In 1972, the federal Water Pollution Control Act (later referred to as the CWA) was amended to require that the discharge of pollutants to "waters of the U.S." from any point source be effectively prohibited,

unless the discharge is in compliance with a National Pollutant Discharge Elimination System (NPDES) Permit. In 1987, the CWA was again amended to add Section 402(p), requiring that the U.S. Environmental Protection Agency (U.S. EPA) establish regulations for permitting of stormwater discharges (as a point source) by municipal and industrial facilities and construction activities under the NPDES permit program. The U.S. EPA published final regulations directed at municipal separate storm sewer systems (MS4s) serving a population of 100,000 or more, and stormwater discharges associated with industrial activities, including construction activities, on November 16, 1990. The regulations require that MS4 discharges to surface waters be regulated by a NPDES Permit (Phase I Final Rule, 55 Fed. Reg. 47990). The U.S. EPA published final regulations directed at stormwater discharges not covered in the Phase I Final Rule, including small construction projects of 1 to 5 acres, on December 8, 1999 (Phase II Final Rule, 64 Fed. Reg. 68722).

Section 404 of the CWA regulates activities that result in the location of a structure, excavation, or discharge of dredged or fill material into "waters of the U.S.," which include wetlands along with non-wetland habitats, such as streams (including intermittent streams), rivers, lakes, ponds, etc. The Santa Clara River, including that portion of the river that flows through the Landmark Village tract map site, is designated by the U.S. Geological Survey as "waters of the U.S." Four other drainages within or adjacent to the project site are also considered "waters of the U.S." and fall under ACOE jurisdiction. These include Castaic Creek, Chiquito Canyon Creek, San Martinez Grande Canyon Creek, and Potrero Canyon Creek (see **Section 4.4**, **Biota**, for further information).

The CWA authorizes the U.S. EPA to permit a state to serve as the NPDES permitting authority in lieu of the U.S. EPA. The State of California has in-lieu authority for an NPDES program. The Porter-Cologne Water Quality Control Act authorizes the SWRCB, through the RWQCB, to regulate and control discharges into waters of the state. The SWRCB entered into a memorandum of agreement with the U.S. EPA on September 22, 1989, to administer the NPDES program governing discharges to "waters of the U.S."

To facilitate compliance with federal regulations, the SWRCB has issued two statewide general NPDES permits for stormwater discharges: one for stormwater from industrial sites (not applicable to the Landmark Village project), and the other for stormwater from construction sites (NPDES No. CAS000002, General Construction Activity Storm Water Permit, reissued on August 19, 1999 as amended and further modified by Resolution No. 2001-046 on April 26, 2001). Under the General Construction Activity Storm Water Permit as reissued, facilities discharging stormwater associated with construction projects with a disturbed area of 5 or more acres are required either to obtain individual NPDES permits for stormwater discharges, or to be covered by a statewide general permit by completing and filing a Notice of Intent (NOI) with SWRCB. However, a recent ruling (March 2003) amended the requirements to include all

projects that disturb 1 acre or more. The General Construction Activity Storm Water Permit addresses both stormwater and non-storm water discharges from construction sites.

The applicant under the General Construction Activity Storm Water Permit must ensure that a Storm Water Pollution Prevention Plan (SWPPP) is approved, and file a NOI with SWRCB to comply with the state permit prior to issuance of a grading permit.

The RWQCB is the enforcement authority in the Los Angeles Region for the two statewide general permits, and all NPDES stormwater and non-stormwater permits. Construction sites and discharges are also regulated under local laws and regulations.

The project is also subject to the waste discharge requirements of the RWQCB Municipal Permit (General MS4 Permit) Order No. R4-2006-0074, NPDES No. CAS004001 (amended September 14, 2006). The County of Los Angeles is a Permittee under the General MS4 Permit and, therefore, has legal authority to enforce the terms of the permit within its jurisdiction. The General MS4 Permit is intended to ensure that combinations of source control and treatment control Best Management Practices (BMPs) are implemented to protect the quality of receiving waters. It includes requirements governing the design, construction, and operation of developments.

b. United States Army Corp of Engineers

Additional project improvements within the jurisdiction of the ACOE would require permits under Section 404 of the CWA. Section 404 of the CWA regulates activities that result in the location of a structure, excavation, or discharge of dredged or fill material into "waters of the U.S.," which include wetlands along with non-wetland habitats, such as streams (including intermittent streams), rivers, lakes, ponds, etc. The Santa Clara River, including that portion of the river that flows through the Landmark Village project site, is designated by the U.S. Geological Survey as "waters of the U.S." Both Chiquito and Castaic Creeks are also considered "waters of the U.S." and fall under ACOE jurisdiction (see **Section 4.4, Biota**, for further information on these drainages). Construction of a portion of the bank stabilization, outlet structures (discussed in **Section 4.5, Floodplain Modifications**), and the Long Canyon Road Bridge fall within the ACOE's jurisdiction.

c. California Department of Fish and Game

CDFG has jurisdiction over the Santa Clara River as well as Chiquito and Castaic Creek plus 44 acres of riparian vegetation found on site and within the study area. Additional project improvements under the jurisdiction of the CDFG would require permits pursuant to Sections 1600–1607 of the California Fish and

Game Code. Under this state law, CDFG regulates activities that would alter the flows, beds, channels, or banks of streams[2] and lakes.

d. Los Angeles County Department of Public Works (LACDPW)

The Flood Control Division of the LACDPW regulates storm runoff from developed areas. The LACDPW issued a memorandum in 1986 entitled, "*Level of Flood Protection and Drainage Protection Standards*" for development projects in Los Angeles County. The memorandum established Los Angeles County policy on levels of flood protection and requires that the following facilities be designed for the capital flood: (a) all facilities not under State of California jurisdiction that intercept flood waters from natural drainage courses; (b) all areas mapped as floodways; (c) all facilities that are constructed to drain natural depressions or sumps; and (d) all culverts under major and secondary highways. In addition, all facilities in developed areas that are not covered by the capital flood protection conditions must be designed for the urban flood, or runoff from a 25-year frequency design storm. Because the project would intercept flood flows from natural areas to the north of SR-126, the project's storm drainage facilities that would accept these flows must be sized and designed for the capital flood.

In addition to meeting this required level of flood protection, all development in the Santa Clara River watershed must meet standards adopted by the LACDPW for the Santa Clara River and its major tributaries in the County *Sedimentation Manual*. Further, properties adjacent to the river that include improvements along and across a segment of the river (including the project) must meet the standards adopted in the Newhall Ranch Specific Plan Program EIR and Revised Additional Analyses, Volume VIII (May 2003) in Recirculated Draft EIR **Appendix 4.10**.

Additionally, LACDPW has required the project applicant to prepare detailed hydraulic and fluvial modeling (for the capital flood event) for the proposed study reach of the Santa Clara River. LACDPW had three stated purposes for requesting the Newhall Ranch Santa Clara River fluvial analysis:

(1) Verify applicability of the Los Angeles County Design Manual (and Hydrology and Sedimentation Manual) top and toe elevation calculations for this reach of the Santa Clara River;

(2) Establish proposed riverbank protection horizontal and vertical (top and toe elevations of the bank protection) alignments to facilitate a complete review of the various Newhall Ranch tentative tract map submittals; and

(3) Provide level of understanding of the Newhall Ranch Santa Clara River reach fluvial mechanics as related to existing conditions and the proposed Newhall Ranch development conditions to identify any major project impacts.

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2 The term "stream" can include intermittent and ephemeral streams, rivers, creeks, dry washes, sloughs, blueline streams, and watercourses with subsurface flows.

The fluvial study examined local, long-term and episodic components of riverbed adjustment. The study found that localized impacts from proposed bridge piers would occur, however, these impacts would not be significant. The study also found that the Landmark Village project would not change the fluvial mechanics of the Santa Clara River and, therefore, would not create a significant impact.

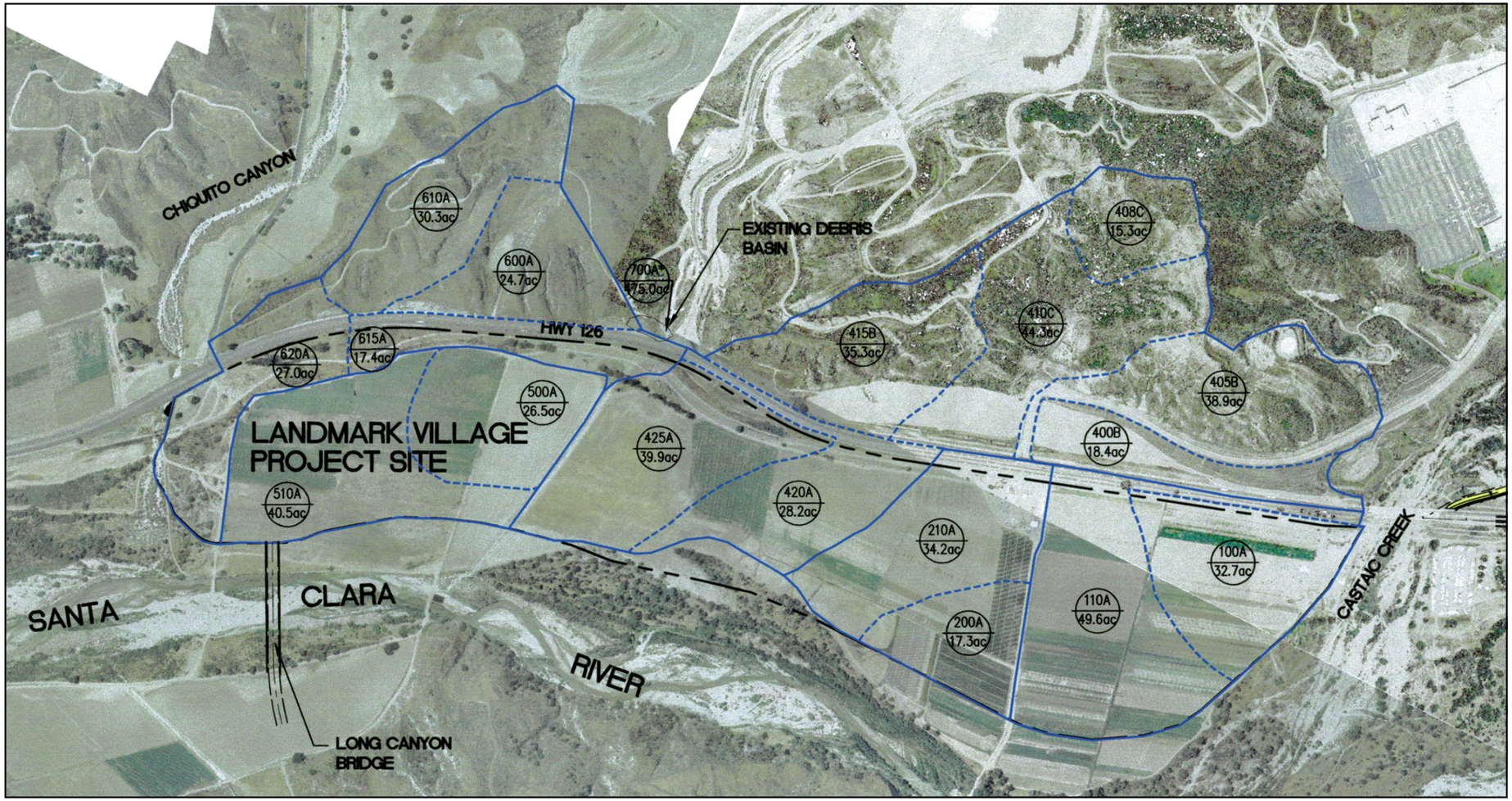
6. EXISTING CONDITIONS

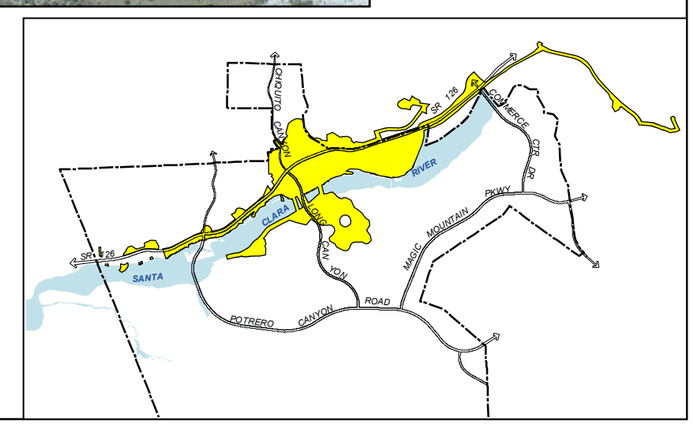
The entire Landmark Village project site is located within the Santa Clara River basin. It flows through the northern portion of the Newhall Ranch site from east to west. The river has a Qcap of 116,236 cfs at a point upstream of Castaic Creek, and a Qcap of 140,776 cfs just west of the confluence of Castaic Creek and the Santa Clara River (values based on 2005 revised capital flood flow rates issued by LACDPW).

The entire watershed of the Santa Clara River basin at the Pacific Ocean is 1,634 square miles in area. The watershed drains portions of the Los Padres National Forest from the north, the Angeles National Forest from the northeast and east, and the Santa Susana Mountains from the south and southeast. At the downstream end of the Newhall Ranch Specific Plan site, the Santa Clara River drainage area is 644 square miles. The Landmark Village tract map site represents approximately 0.46 square mile (0.07 percent) of the 644-square-mile watershed (292.6 acres/640 acres per square mile = 0.46 square mile).

The Landmark Village tract map site is located immediately northwest of the confluence of Castaic Creek and the Santa Clara River. The Santa Clara River forms the southern and western boundaries of the project site, while the eastern project boundary abuts Castaic Creek. There are a total of six drainages located in the vicinity of the project, excluding the river. These include Castaic Creek, Chiquito Canyon Creek, San Martinez Grande Canyon Creek, Potrero Canyon Creek, a drainage from the adjacent landfill, and an unnamed jurisdictional drainage within the project site. Natural tributaries that drain into or adjacent to the project site include Chiquito Canyon Creek on the river's north bank, Long Canyon Creek on the south bank, and Castaic Creek, which enters the river upstream of the project site. The Chiquito Canyon Creek drainage is approximately 4.8 square miles, with a stream length of approximately 22,000 feet. The Long Canyon Creek drainage area is approximately 1.5 square miles, with a stream length of approximately 18,350 feet. The Castaic Creek watershed, the largest of the tributary watersheds, is approximately 209 square miles (including the area above the dam).

The Adobe Canyon borrow site is located south of the Landmark Village tract map site and east of Long Canyon, while the Chiquito Canyon grading site is located north of Landmark Village and SR-126. Rainfall in the tributary area is an annual average of 17 inches and generally occurs in the winter months. Runoff flows to and through the Landmark Village site is via sheet flows and natural concentrated flows (see **Figure 4.2-1, Existing Tributary Drainage Areas**).





Legend:

- 000A / 00.0ac ← Sub-Basin Number / Sub-Basin Area
- Residential Project Boundary
- Drainage Area Boundary
- Sub-Basins Boundary

800 400 0 800

APPROXIMATE SCALE IN FEET

SOURCE: Pacific Advanced Civil Engineering, Inc., Landmark Village Flood Technical Report (June 2005)

FIGURE **4.2-1**

Existing Tributary Drainage Areas

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The reach of the Santa Clara River adjacent to, and downstream of, the project site has perennial surface flows primarily created by tertiary treated effluent discharges from two upstream water reclamation plants operated by the County Sanitation Districts of Los Angeles County and by urban runoff. Natural flows in the river usually only occur in the winter due to storm runoff. Because rainfall within the Santa Clarita Valley varies from year-to-year, river flows can also vary significantly from year-to-year.

The reach of the river within and adjacent to the project site has multiple channels (braided). High sediment loads, bank erodibility, and intense and intermittent runoff conditions characterize this kind of system. The river has the potential for aggradation (deposit sediment) and degradation (scour or remove sediment) in various locations along the study reach based upon hydraulic conditions present in the various sub reaches of the river. Historical data analysis has found that the riverbed within the Landmark Village study area has aggraded up to 3 feet and degraded as much as 8 feet. Fluvial modeling, with the proposed Landmark Village bank protection improvements and the Long Canyon Road Bridge, identified the potential for up to 2 feet of aggradation and 5 feet of degradation during the capital flood event, or within the range documented by the historical data. Velocities and water surface elevations in the river vary from section-to-section of the river based on various hydraulic and hydrologic parameters. In general, velocity and water depth along the river will increase with higher discharge. An example of these relationships is provided in Table 3.1 of the PACE August 2006 report (Recirculated Draft EIR **Appendix 4.2**). The data in that table indicate that velocities measured in fps, more than double, on average, from the 2-year to the 100-year storm event, while cross-sectional flow area increases ten-fold on average. In contrast, discharge increases almost 24 times from the 2-year to the 100-year storm event. Velocity and water depth percent increases do not correspond to the percent discharge increases because the wide river channel allows flood flows to spread out within the river cross-section thus reducing the increases in velocity and depth.

Provided below is information regarding the existing drainage characteristics of the off-site tributary area, and the Landmark Village project site, as well as the amount of runoff, which flows through and from the site into the river.

a. Tract Map Site (VTTM 53108)

The entire tributary drainage area for the Landmark Village site (excluding the Chiquita Canyon Landfill drainage-area) is approximately 568 acres and is comprised of six drainage-areas that independently drain toward the Santa Clara River (see **Figure 4.2-1**). The 475-acre Chiquita Canyon Landfill tributary

area extends predominantly in the northerly direction from the site and runoff from the tributary area flows through the site.[3]

The majority of the off-site drainage area is undeveloped land with moderate slopes. Runoff from this area flows through drainage channels underneath SR-126 and then largely sheet flows southwesterly through the Landmark Village site to the river. Runoff from the Chiquita Canyon Landfill tributary area flows into a debris basin located north of SR-126 prior to discharging through a drainage channel under SR-126, and onto and through the Landmark Village site.

Existing discharges from the project site are somewhat concentrated by both natural and man-made features as flow is conveyed to the river. However, these natural and man-made drainage features do not include drainage structures. Rather, surface water flows have naturally formed paths of least resistance and concentrate at existing topographic depressions or cut channels through the site that serve as concentrated discharge locations. There are currently no existing drainage or erosion/sedimentation control improvements located within the site other than minor agricultural drainage ditches and an insignificant amount of loose rock and earthen riverbank protection.

Capital flood runoff quantities for the drainage-areas are provided in **Table 4.2-3, Existing Drainages and Runoff Discharge – VTTM 53108**. In accordance with LACDPW requirements, the burned and bulked storm event (the capital storm) was used to calculate the discharge. Under existing conditions, burned and bulked flows from the six drainage-areas (excluding the Chiquita Canyon Landfill) total 831 cfs.

Table 4.2-3
Existing Drainages and Runoff Discharge
VTTM 53108

Drainage Areas	Acreage	Time of Concentration (minutes)	Q50u[1] (cfs)	Q50b[2] (cfs)	Q50bb[3] (cfs)
Drainage Area 1					
100A	32.7	22	27	41	52
110A	49.6	20	44	58	74
Cumulative[4]	82.3			87	111

3 The Chiquita Canyon Landfill drainage (sub-basin 700 AB, 475 AC) drains through the Landmark Village tract map site, but the project would not impact this drainage and it will remain a separate, unmodified open drainage; however, it would be placed into a closed drainage system upon completion of the Landmark Village project. Runoff from the project site would not discharge into this system.

Drainage Areas	Acreage	Time of Concentration (minutes)	Q50u[1] (cfs)	Q50b[2] (cfs)	Q50bb[3] (cfs)
Drainage Area 2					
200A	17.3	17	17	24	30
210A	35.8	24	28	39	50
Cumulative[4]	53.1			60	76
Drainage Area 3					
400B	18.4	24	14	20	25
405B	38.9	28	27	39	50
408C	15.3	8	25	32	41
410C	44.3	19	41	57	72
415B	35.3	11	46	62	79
420A	34.4	24	27	37	47
425A	39.9	20	35	48	61
Cumulative[4]	226.5			206	260
Drainage Area 4					
500A	26.5	20	23	33	42
510A	40.0	24	31	44	53
Cumulative[4]	66.5			65	83
Drainage Area 5					
CTQ-1A	6.1	8	10	13	16
CTQ-2A	3.6	6	7	9	11
CTQ-3A	1.8	5	4	5	6
CTQ-4A	12.3	10	17	22	28
CTQ-5A	4.4	5	10	12	15
CTQ-6A	24.9	15	27	36	46
CTQ-7A	2.1	5	5	6	8
CTQ-8A	2.8	5	6	7	10
CTQ-9A	31.8	14	36	48	61
CTQ-10A	15.6	11	21	27	35
CTQ-10A	10.2	17	18	18	19
CTQ-12A	11.7	10	26	26	28
Drainage Area 6					
620A	12.4	22	10	14	18
Cumulative (Areas 5 & 6)[4]	**140**			**243**	**301**
CumulativeTotals[4]	**568.1**			**660**	**831**

Source: PSOMAS, Landmark Village Tentative Tract Map 53108 Drainage Concept *(2005).*

[1] *Q50u - 50-year rainfall, unburned and unbulked (clear flow) runoff intensity.*

[2] *Q50b - 50-year rainfall, burned flow runoff intensity.*

[3] *Q50bb - 50-year rainfall, burned and bulked flow runoff intensity. Bulked flow runoff applies a 1.27 multiplier to burned runoff coefficient.*

[4] *Cumulative data is the result of LACDPW Modified Rational Method tabulations, shown in Recirculated Draft EIR* ***Appendix 4.2***, PSOMAS, *Landmark Village Tentative Tract Map 53108 Drainage Concept* (2005)

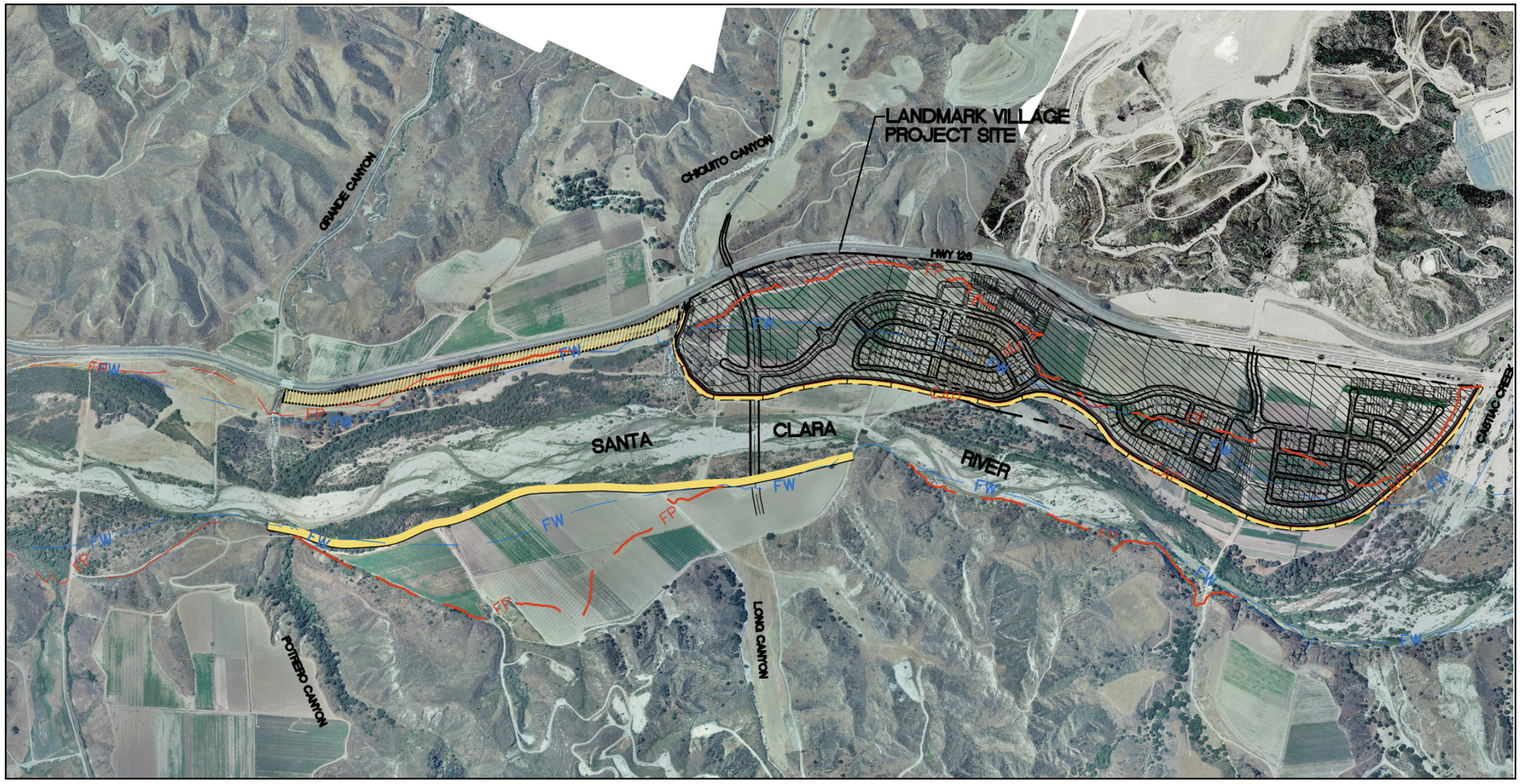
The capital flood within the river along the project site is approximately 140,776 cfs just west of the confluence of Castaic Creek and the Santa Clara River. The peak (burned and bulked) flow rate from the entire tributary area (including the Chiquita Canyon Landfill drainage area) is approximately 1,660. Existing burned and bulked flow from the project site is approximately 831 cfs. Therefore, capital flood flows from the project site are approximately less than one percent of the river capital flood discharge rate.

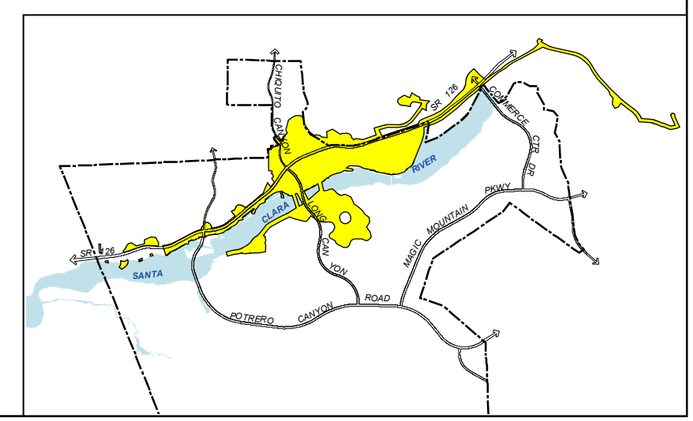
A portion of the project site lies within the County's capital floodplain for the river (see **Figure 4.2-2, Existing County Capital Flood Plain Boundaries**) and within the 100-year floodplain identified by FEMA Flood Insurance Rate Map (FIRM) No. 065043-0340 (October 20, 2002) for the unincorporated areas of Los Angeles County (see **Figure 4.2-3, Existing FEMA Flood Plain Boundaries**). The 100-year floodplain boundaries are based on historical runoff records as measured with stream gauges. Mapping the 100-year floodplain is important because FEMA uses the data to establish standards for flood insurance coverage under the Natural Flood Insurance Program (NFIP). Under Flood Insurance Agency (FIA) criteria, the 100-year flood elevation is the "base flood" and any land that is outside of this 100-year, or base flood, elevation is considered reasonably (2-yr, 5-yr, 10-yr, 20-yr, 50-yr, FEMA 100-yr and LACDPW capital) safe and free from flood hazards.

As a result of Hurricanes Rita and Katrina in 2005, Congress has allocated funding to FEMA to study and identify flood hazard areas throughout the U.S. (particularly in and around large population centers). The Santa Clara River and its major tributaries have been identified as a study area from the headwaters in Acton to the Pacific Ocean.

FEMA and their contracted consultants are heading the effort with Los Angeles and Ventura counties to update the floodplain and floodway for the Santa Clara River and the major tributaries. The floodplain is determined as the peak limits of flooding of a river, channel, etc. during a particular design storm event. The floodway limits are typically inside the floodplain for each design storm event. The floodway is a theoretical limit line where the insignificant (non-flow caring) floodplain fringe is eliminated. By definition, the floodway is the encroachment of the floodplain from both directions to raise the water surface up to 1.0 foot.

In the case of the Santa Clara River at the Newhall Ranch study area, there are two sets of floodplain limit lines. The FEMA Flood Insurance Rate Maps for the 100-year event (±60,000 cfs) were recently updated and adopted by FEMA (2002), but FEMA has not mapped a 100-year floodway in this reach of the river. LACDPW has a mapped floodplain and floodway for the Santa Clara River for the capital flood event (±140,000 cfs), which is the LACDPW design storm event.





Legend:

- Existing Flood Way Boundary
- Existing Flood Plain Boundary
- Proposed Soil Cement Bank Protection
- Proposed Utility Corridor Bank Protection

800 400 0 800

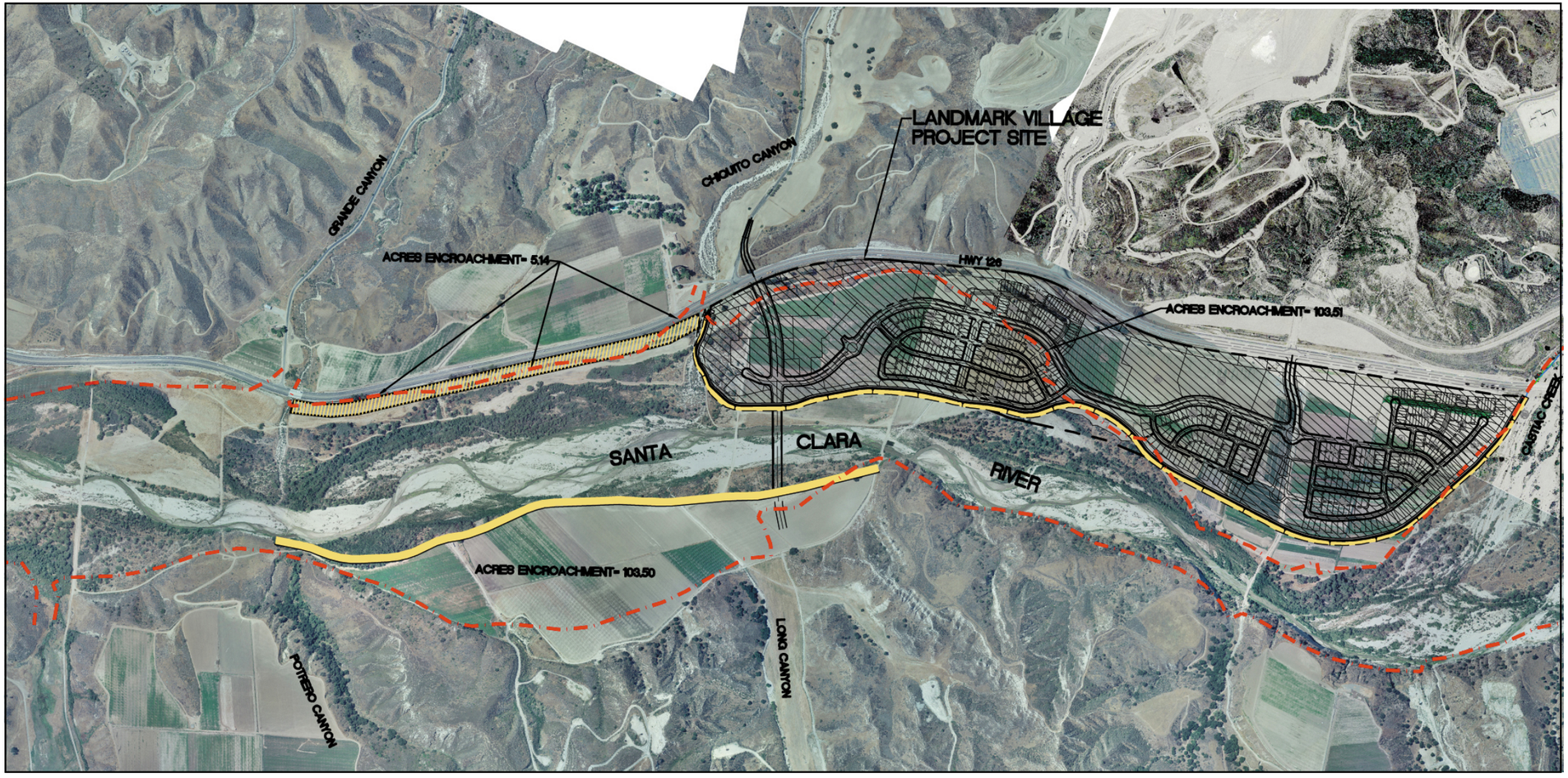
APPROXIMATE SCALE IN FEET

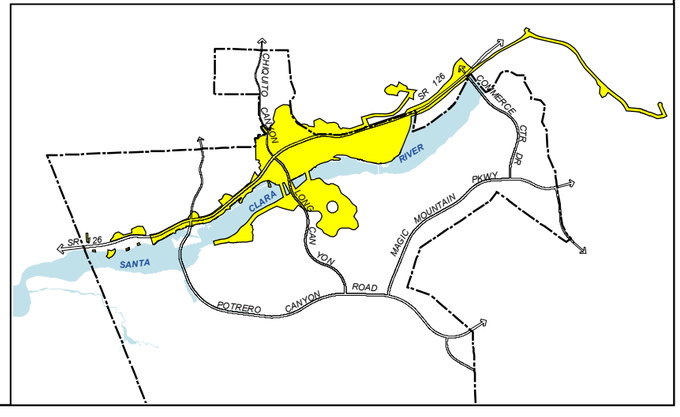
SOURCE: Pacific Advanced Civil Engineering, Inc., Landmark Village Flood Technical Report (June 2005)

FIGURE **4.2-2**

Existing County Capital Flood Plain Boundaries

32-92•01/09





Legend:

- FEMA Zone A
- Proposed Soil Cement Bank Protection
- Proposed Utility Corridor Bank Protection

800 400 0 800

APPROXIMATE SCALE IN FEET

SOURCE: Pacific Advanced Civil Engineering, Inc., Landmark Village Flood Technical Report (June 2005)

FIGURE **4.2-3**

Existing FEMA Flood Plain Boundaries

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All of the Newhall Ranch Santa Clara River designs have been required to meet the higher (±140,000 cfs) capital flood event. The Capital flood flow rate is ±2.5 times greater than the FEMA 100-year flow rate and, therefore, the design criteria required to meet the LADPW capital storm is much more conservative and will meet/exceed the 100-year FEMA criteria.

Updated hydrology (run-off flow rate) will be reevaluated and the 1995 Joint Los Angeles and Ventura County study is being considered as the basis for the reevaluation (the 1995 study results were similar to the existing FEMA 100-year flow rate of ±60,000 cfs). LACDPW has stated to FEMA that Newhall has provided updated Capital Floodplain Modeling results and LACDPW has approved the results for the existing condition. As part of the Newhall Ranch Specific Plan, a detailed floodplain and floodway analysis will be prepared for the updated existing conditions and the proposed Newhall Ranch development. This information will ultimately be adopted by FEMA for use as the published floodplain and floodway for the river in this reach.

It is not expected that the newly defined FEMA initiative to reevaluate the flood hazards (floodway and floodplain) along the Santa Clara River will impact any portion of the Newhall Ranch Specific Plan. As part of the Newhall Ranch Specific Plan, updated floodplain and floodway mapping will be provided to LACDPW and FEMA for review and approval.

The existing floodplains for the seven storm events are shown in Figures 3.2A through 3.2F of the PACE report (Recirculated Draft EIR **Appendix 4.2**). The currently mapped capital floodplain (ML Map) lines are shown in Figure 4.5 of the PACE report. The updated capital floodplain limits are shown in the PACE March 2006 Santa Clara River HEC-RAS Modeling report (Recirculated Draft EIR **Appendix 4.2**).

The difference in elevation between the channel bottom and the 100-year floodplain along the margins of the river varies greatly at the project site. This difference ranges from approximately 4.3 to 16.3 feet and is dependent upon the width of the river channel. For example, in wider portions of the river channel where flows spread out with low velocities, there is only a small elevational difference between the channel bottom and the adjacent floodplain boundary. In contrast, the channel is often deep where it is narrower, creating a large elevational difference between the channel bottom and the floodplain water surface.

The substrate of the river channel (i.e., top layer of the river bottom) is primarily sand, which is actively eroded and deposited in flood events. Previous studies (Simons and Li) have demonstrated that sediment deposition and scouring along the upper Santa Clara River are generally in equilibrium, and that there are no major trends of channel degradation or aggradation. However, some localized areas may experience either greater scouring or deposition. Updated studies (PACE 2006) provide more detailed analysis of long-term, general (capital) and local aggradation and degradation trends in the river for the existing and proposed project conditions. The results of this analysis are similar to previous

reports in that the river is in a relative state of equilibrium and the proposed project impacts are not significant because they do not substantially modify existing conditions.

b. Adobe Canyon Borrow Site

There are eight sub-basins within the approximately 213-acre tributary for the Adobe Canyon borrow site that independently drain into Long Canyon and eventually discharge to the Santa Clara River to the north (see **Figure 4.2-4, Existing Drainage Patterns – Adobe Canyon Borrow Site**). Most of these sub-basins drain northwesterly, while the remaining drain northerly and northeasterly to Long Canyon. The majority of the tributary area is undeveloped with steep to moderate slopes. Runoff from this borrow site is shown in **Table 4.2-4, Existing Drainages and Runoff Discharge – Adobe Canyon Borrow Site**. Total burned and bulked runoff during a capital storm under existing conditions would be approximately 450 cfs.

Table 4.2-4
Existing Drainages and Runoff Discharge – Adobe Canyon Borrow Site

Sub-Basins	Acreage	Time of Conc. (minutes)	Q50u[1] (cfs)	Q50b[2] (cfs)	Q50bb[3] (cfs)
ADB-1A	35.8	11	47	62	90
ADB-2A	40.0	12	49	65	95
ADB-3A	24.0	12	30	39	50
ADB-4B	16.7	13	20	26	33
ADB-5B	39.9	20	34	48	61
ADB-7C	27.4	14	31	41	52
ADB-8C	12.9	11	17	22	28
ADB-9C	16.6	9	25	32	41
Totals	**213.3**		**253**	**335**	**450**

Source: PSOMAS, Off-Site Borrow Areas Drainage Concept (Recirculated Draft EIR **Appendix 4.2**) (Under Conditional Use Permit). .

[1] *Q50u - 50-year rainfall, unburned and unbulked runoff intensity*

[2] *Q50b - 50-year rainfall, burned runoff intensity*

[3] *Q50bb - 50-year rainfall, burned and bulked runoff intensity*

LEGEND:

- ADB–1A / 35.8 ac — SUB–BASIN NUMBER / SUB–BASIN AREA (ac)
- SUB–BASIN BOUNDARY
- DRAINAGE AREA BOUNDARY
- RIGHT OF WAY
- EASEMENT
- 950 — PROPOSED CONTOUR
- DAYLIGHT LINE
- SD — STORM DRAIN
- EXISTING CMP INLET
- FLOWPATH
- DEBRIS FLOWPATH
- RC03 — RIVER CORRIDOR–2003 (FORMERLY SEA 23)
- FEMA — FEMA
- Q50 — Q–CAP
- DEBRIS TRIBUTARY LIMIT
- SPINE FLOWER
- COAST LIVE OAK (Quercus agrifolia)
- VALLEY OAK (Quercus lobata)
- SCRUB OAK (Quercus berberidifolia)
- SOUTHERN CALIFORNIA BLACK WALNUT (Juglans california)
- HOLLYLEAF CHERRY (Prunus ilicifolia)
- EXISTING TREE CANOPY
- Qu(sub)= 9 cfs — EXISTING SUB–BASIN Q(unburned)
- Tc(sub)= 15 min — EXISTING TIME OF CONCENTRATION

Qb = BURNED Q
Qbb = BURNED+BULKED Q
DP = DEBRIS PRODUCTION

DRAINAGE CONCEPT NOTES:

1. HYDROLOGY INFORMATION AND STORM DRAIN ALIGNMENTS SHOWN ARE NOT NECESSARILY APPROVED.
2. ALL STREET DRAINAGE REQUIRMENTS WIIL COMPLY WITH THE SATISFACTION OF THE DEPARTMENT OF PUBLIC WORKS.
3. DEDICATION OF THE NECESSARY EASEMENTS FOR THE STORM DRAIN SYSTEM SHOWN WILL BE TO THE SATISFACTION OF THE DEPARTMENT OF PUBLIC WORKS.
4. PAVED VEHICULAR ACCESS WILL BE PROVIDED TO ALL INLETS, OUTLETS AND BASINS TO THE SATISFACTION OF THE DEPARTMENT OF PUBLIC WORKS.
5. APPROVAL OF THE DRAINAGE CONCEPT DOES NOT CONSTITUTE DETERMINATION THAT THE OFFSITE IMPROVEMENTS ARE REQUIRED WITHIN THE MEANING OF GOVERNMENT CODE SECTION 66462.5, (EXCEPT AS NOTED).
6. DELINEATE THE FLOOD HAZARD AREA AND DEDICATE TO THE COUNTY OF LOS ANGELES THE RIGHT TO RESTRICT BUILDING WITHIN THAT AREA ON THE FINAL MAP.
7. THE PROPOSED DEBRIS BASINS AND STORM DRAIN FACILITIES WILL BE PRIVATELY MAINTAINED.

Note:
For a detailed map, please refer to the corresponding map pocket in Appendix 4.2

300 150 0 300
APPROXIMATE SCALE IN FEET

EXISTING ADOBE PROJECT DRAINAGE

SUB-BASIN NUMBER	TIME OF CONCENTRATION (minutes)	50-YEAR STORM EVENT INCREMENTAL SUB-BASINS: SUB-BASIN AREA (acres)	Qu (cfs)	Qb (cfs)	Qbb (cfs)	DP (cy)	DEBRIS BASIN (cy)
ADB–1A	11	35.8	47	62	90	4582	
ADB–2A	12	40.0	49	65	95	5120	
ADB–3A	12	24.0	30	39	50	648	
ADB–4B	13	16.7	20	26	33	451	
ADB–5B	20	39.9	34	48	61	1077	
ADB–7C	14	27.4	31	41	52	740	
ADB–8C	11	12.9	17	22	28	348	
ADB–9C	9	16.6	25	32	41	448	
TOTAL		213.3	253	335	450^A	13415	

K = Burn Factor from Appendix G–2, K=0.677*(1^–0.102)
Qb = A*I*(1–K)+K*Qu

Subareas 1A and 2A:
Qbb = 1.465*Qb
DP = A*128 cy (DPA Zone 5)

Subareas 3A, 4B, 5B, 7C, 8C, 9C:
Qbb = 1.27*Qb
DP = A*27 cy (DPA Zone 9)

NOTES:

A BURNED AND BULKED FLOW

SOURCE: PSOMAS, Off-Site Borrow Areas (Under Conditional Use Permit) Drainage Concept (March 14, 2005).

FIGURE **4.2-4**

Existing Drainage Patterns – Adobe Canyon Borrow Site

32-92•01/09

c. Chiquito Canyon Grading Site

As previously mentioned, the approximately 127-acre Chiquito Canyon grading site is located within a 568-acre drainage area to the north of the Landmark Village tract map site. There are 12 sub-basins within the approximately 127-acre Chiquito Canyon grading site drainage area that independently drain toward the Santa Clara River (see **Figure 4.2-5, Existing Drainage Patterns – Chiquito Canyon Grading Site**). Runoff from most of these sub-basins drains predominantly southerly toward existing culverts under SR-126, and eventually through the tract map site, while runoff from one sub-basin drains toward Chiquito Canyon to the west. The majority of the area is undeveloped land with steep to moderate slopes. Runoff discharge from the Chiquito Canyon Grading Site is shown in **Table 4.2-5, Existing Drainages and Runoff Discharge – Chiquito Canyon Grading Site**. Total burned and bulked runoff during a capital storm under existing conditions would be 283 cfs.

Table 4.2-5
Existing Drainages and Runoff Discharge – Chiquito Canyon Grading Site

Sub-Basins	Acreage	Time of Conc. (minutes)	Q50u[1] (cfs)	Q50b[2] (cfs)	Q50bb[3] (cfs)
CQT-1A	6.1	8	10	13	16
CQT-2A	3.6	6	7	9	11
CQT-3A	1.8	5	4	5	6
CQT-4A	12.3	10	17	22	28
CQT-5A	4.4	5	10	12	15
CQT-6A	24.9	15	27	36	46
CQT-7A	2.1	5	5	6	8
CQT-8A	2.8	5	6	7	10
CQT-9A	31.8	14	36	48	61
CQT-10A	15.6	11	21	27	35
CQT-11A	10.2	17	18	18	19
CQT-12A	11.7	10	26	26	28
Totals	**127.3**		**187**	**229**	**283**

Source: PSOMAS, Off-Site Borrow Areas Drainage Concept (Recirculated Draft EIR **Appendix 4.2**) (Under Conditional Use Permit).

[1] *Q50u - 50-year rainfall, unburned and unbulked runoff intensity*

[2] *Q50b - 50-year rainfall, burned runoff intensity*

[3] *Q50bb - 50-year rainfall, burned and bulked runoff intensity*

7. PROPOSED IMPROVEMENTS

a. Related Improvements

The Landmark Village tract map site is proposed on approximately 292 acres of land, located within the boundaries of the approved Newhall Ranch Specific Plan. To facilitate development of this site, several off-site project-related components would be implemented on an additional 1,063.4 acres of land mostly within the boundaries of the approved Specific Plan. These project-related components include the following:

- a cut and fill grading operation, which includes fill imported to the Landmark Village tract map site from a 181-acre borrow site located south of the Santa Clara River, and grading to accommodate roadway improvements to SR-126 and debris basins for stormwater flows collected by the project's storm drainage system on approximately 120 acres of land, located directly north of SR-126 within Chiquito Canyon (and related haul routes);
- a utility corridor, extending both east and west of the tract map site, which would extend municipal services to the tract map site;
- a water tank to convey potable and recycled water to the tract map site; and
- construction of the Long Canyon Road Bridge, bank stabilization, Turf reinforcement mats (TRMs) or similar, Chiquito Canyon/SR-126 culvert extension and storm drainage improvements.

At project buildout, off-site storm flows would continue to flow under SR-126 through existing culverts and through the site, and on-site runoff would continue to flow through the site to the river. The runoff, however, would be channeled through a stormwater conveyance system that would be constructed through the site down to the river. Three additional debris basins would be constructed within the tributary area north of SR-126 that would capture debris and sediment from runoff prior to its discharge under the SR-126 through the existing storm drains. (Runoff from the tributary area of the landfill already discharges into an existing debris basin.) Runoff from the developed portions of the Landmark Village site would be conveyed through a combination of grading, storm drainpipes, vegetated swales, catch basins, retention/detention basins, water quality basins, outlet structures, and debris basins. The proposed on-site drainage improvements are described below and their locations are illustrated in **Figure 4.2-6, Landmark Village Drainage Concept**.

Legend:

CQT–5A — SUB–BASIN NUMBER
4.4 ac — SUB–BASIN AREA (ac)

- EXISTING LOT LINE
- EXISTING EASEMENT
- 1100 EXISTING CONTOUR
- DAYLIGHT LINE
- SUB–BASIN BOUNDARY
- DRAINAGE AREA BOUNDARY
- RIGHT OF WAY
- EASEMENT
- EXISTING STORM DRAIN CULVERT
- EXISTING FLOWPATH
- Qu(sub)= 9 cfs — EXISTING SUB–BASIN Q (unburned)
- Tc(sub)= 15 min — EXISTING TIME OF CONCENTRATION

Qb = BURNED Q
Qbb = BURNED+BULKED Q
DP = DEBRIS PRODUCTION

DRAINAGE DESIGN CRITERIA:

1. 50–YEAR 24–HOUR ISOHYET: 5.8
2. SOIL TYPE: 020
3. DESIGN STORM: 50 YEAR RETURN PERIOD
4. PERCENT IMPERVIOUS VALUES: SINGLE FAMILY – 42%, MULTI–FAMILY – 68%, COMMERCIAL – 92%, SCHOOL – 82%, OPEN SPACE – 0%, PARK – 15%, ROADWAY – 100%
5. DPA= 09
6. BULK FACTOR= 1.27

DRAINAGE CONCEPT NOTES:

1. HYDROLOGY INFORMATION AND STORM DRAIN ALIGNMENTS SHOWN ARE NOT NECESSARILY APPROVED.
2. ALL STREET DRAINAGE REQUIRMENTS WIIL COMPLY WITH THE SATISFACTION OF THE DEPARTMENT OF PUBLIC WORKS.
3. DEDICATION OF THE NECESSARY EASEMENTS FOR THE STORM DRAIN SYSTEM SHOWN WILL BE TO THE SATISFACTION OF THE DEPARTMENT OF PUBLIC WORKS.
4. PAVED VEHICULAR ACCESS WILL BE PROVIDED TO ALL INLETS, OUTLETS AND BASINS TO THE SATISFACTION OF THE DEPARTMENT OF PUBLIC WORKS.
5. APPROVAL OF THE DRAINAGE CONCEPT DOES NOT CONSTITUTE DETERMINATION THAT THE OFFSITE IMPROVEMENTS ARE REQUIRED WITHIN THE MEANING OF GOVERNMENT CODE SECTION 66462.5, (EXCEPT AS NOTED).
6. DELINEATE THE FLOOD HAZARD AREA AND DEDICATE TO THE COUNTY OF LOS ANGELES THE RIGHT TO RESTRICT BUILDING WITHIN THAT AREA ON THE FINAL MAP.
7. THE PROPOSED DEBRIS BASINS AND STORM DRAIN FACILITIES WILL BE MAINTAINED BY LOS ANGELES COUNTY.

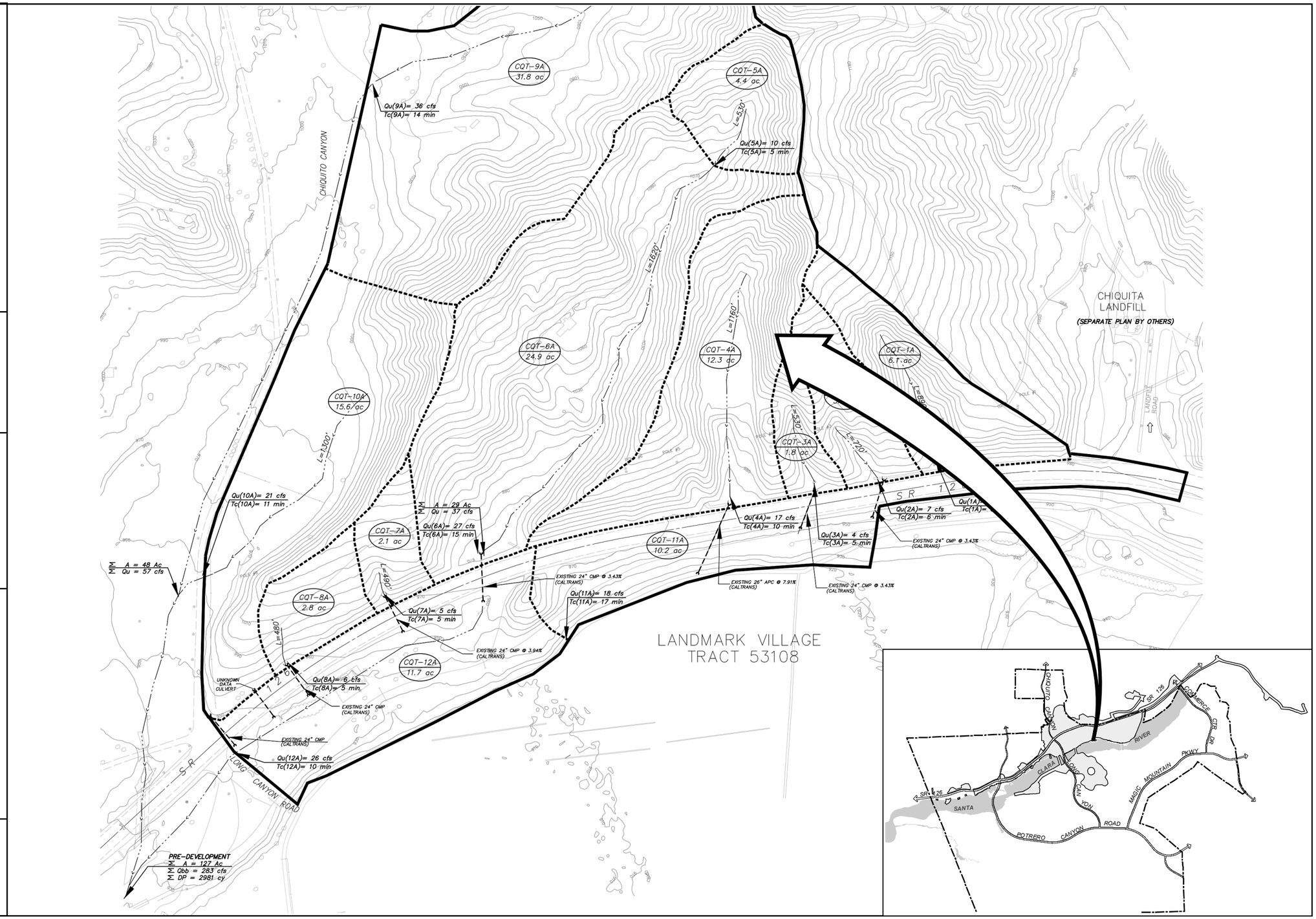
EXISTING CHIQUITO PROJECT DRAINAGE

SUB–BASIN NUMBER	TIME OF CONCENTRATION (minutes)	INCREMENTAL SUB–BASINS 50–YEAR STORM EVENT: SUB–BASIN AREA (acres)	Qu (cfs)	Qb (cfs)	Qbb (cfs)	DEBRIS PRODUCTION (cy)
CQT–1A	8	6.1	10	13	16	165
CQT–2A	6	3.6	7	9	11	97
CQT–3A	5	1.8	4	5	6	49
CQT–4A	10	12.3	17	22	28	332
CQT–5A	5	4.4	10	12	15	119
CQT–6A	15	24.9	27	36	46	672
CQT–7A	5	2.1	5	6	8	57
CQT–8A	5	2.8	6	7	10	76
CQT–9A	14	31.8	36	48	61	859
CQT–10A	11	15.6	21	27	35	421
CQT–11A	17	10.2	18	18	19	54
CQT–12A	10	11.7	26	26	28	81
TOTAL		127.3	187	229	283	2981

K = Burn Factor from Appendix G–2, K=0.677*(1^–0.102)
Qb = A*I*(1–K)+K*Qu
Qbb = 1.27*Qb
DP = A*27 cy (DPA Zone 9)

Note:
For a detailed map, please refer to the corresponding map pocket in Appendix 4.2

300 150 0 300
APPROXIMATE SCALE IN FEET



SOURCE: PSOMAS, Off-Site Borrow Areas (Under Conditional Use Permit) Drainage Concept (March 14, 2005).

FIGURE **4.2-5**

Existing Drainage Patterns – Chiquito Canyon Grading Site

32-92•01/09

Legend:

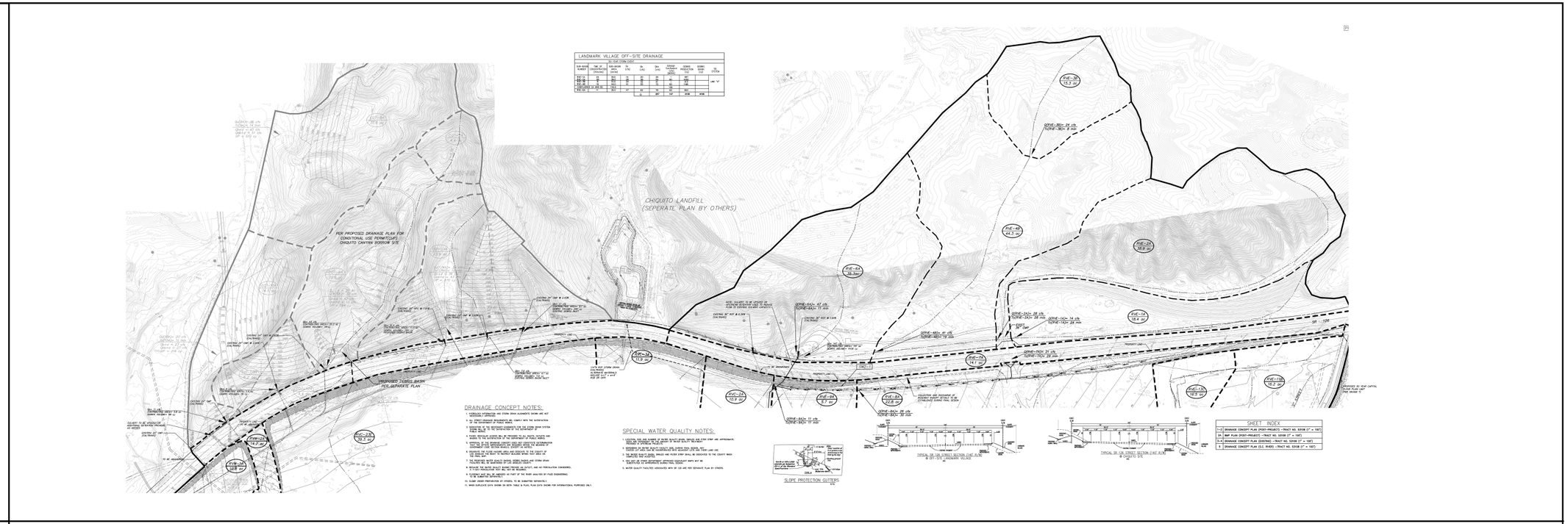
- 110A — SUB-BASIN NUMBER
- 007.3 ac — SUB-BASIN AREA (ac)
- PROJECT BOUNDARY
- SUB-BASIN BOUNDARY
- DRAINAGE AREA BOUNDARY
- RIGHT OF WAY
- EASEMENT
- 950 — PROPOSED CONTOUR
- DAYLIGHT LINE
- SD — STORM DRAIN
- EXISTING CMP INLET
- CATCH BASIN
- FZone — FEMA LINE
- LACO_FLOOD — LOS ANGELES COUNTY FLOODWAY
- Q-CAP (Existing)
- Q-CAP (Proposed)
- BURIED BANK STABILIZATION
- DEBRIS BASIN CONTRIBUTING AREA
- FLOWPATH
- DEBRIS FLOWPATH
- Q(sub)= 9 cfs — POST DEVELOPMENT SUBAREA Qdesign
- Tc(sub)= 15 min. — POST DEVELOPMENT TIME OF CONCENTRATION

Q	Q unburned/develop
Qd	Q developed
Qb	Q burned
Qbb	Q burned+bulked
DP	DEBRIS PRODUCTION

DRAINAGE DESIGN CRITERIA

1. 50-YEAR 24-HOUR ISOHYET: 5.8
2. SOIL TYPE: 020
3. DESIGN STORM: 50 YEAR RETURN PERIOD
4. PERCENT IMPERVIOUS VALUES: SINGLE FAMILY = 42%, MULTI-FAMILY = 65%, COMMERCIAL = 92%, INDUSTRIAL = 72%, OPEN SPACE = 0%, PARK = 15%, ROADWAY = 100%
5. DPA= 09
6. BULK FACTOR= 1.27

Note:
For a detailed map, please refer to the corresponding map pocket in Appendix 4.2



Legend:

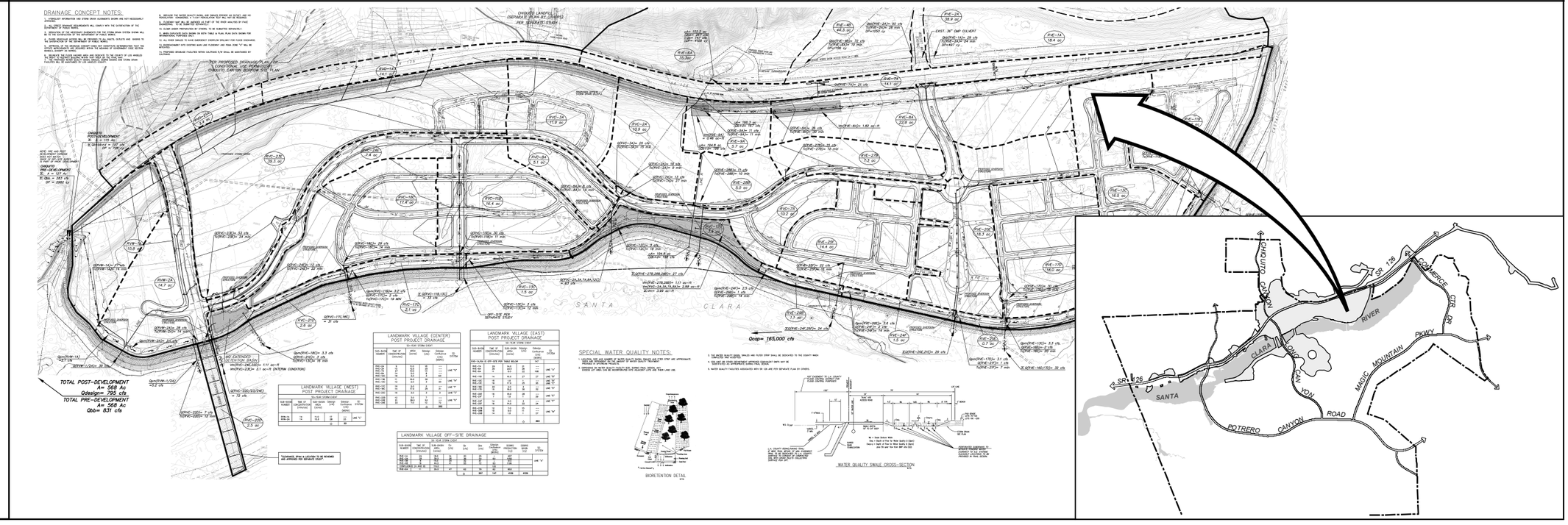
- PROJECT BOUNDARY
- SUB-BASIN BOUNDARY
- DRAINAGE AREA BOUNDARY
- RIGHT OF WAY
- EASEMENT
- 955 — PROPOSED CONTOUR
- DAYLIGHT LINE
- SD — STORM DRAIN
- EXISTING CMP INLET
- CB — CATCH BASIN
- FZone — FEMA LINE
- LACO_FLOOD — LOS ANGELES COUNTY FLOODWAY
- Q-CAP (Existing)
- Q-CAP (Proposed)
- BURIED BANK STABILIZATION
- DEBRIS BASIN CONTRIBUTING AREA
- FLOWPATH
- DEBRIS FLOWPATH
- PROPOSED DEBRIS FLOWPATH
- Q(sub)= 9 cfs — POST DEVELOPMENT SUBAREA Qdesign
- Tc(sub)= 15 min. — POST DEVELOPMENT TIME OF CONCENTRATION
- BIORETENTION
- PRE-TREATMENT/TRASH COLLECTION
- ON-SITE STORM DRAIN
- OFF-SITE STORM DRAIN
- DRAINAGE DIVIDE
- FLOW DRAINAGE POINTS FOR PROJECT AREA
- FLOW DRAINAGE POINTS FOR PROJECT AREA
- WQ DRAIN
- CONVEYANCE SWALE (RIPRAP/METAL)
- PRE-TREATMENT/BIOFILTRATION
- RVC-00X — SUB-BASIN ID NUMBER
- 0.0 ac — SUB-BASIN AREA (ac)
- Q — Q unburned/develop
- Qd — Q developed
- Qb — Q burned
- Qbb — Q burned+bulked
- DP — DEBRIS PRODUCTION

DRAINAGE DESIGN CRITERIA:

1. 50-YEAR 24-HOUR ISOHYET: 5.8
2. SOIL TYPE: 020
3. DESIGN STORM: 50 YEAR RETURN PERIOD
4. PERCENT IMPERVIOUS VALUES: SINGLE FAMILY = 42%, MULTI-FAMILY = 65%, COMMERCIAL = 92%, INDUSTRIAL = 72%, OPEN SPACE = 0%, PARK = 15%, ROADWAY = 100%
5. DPA= 09
6. BULK FACTOR= 1.27

600 300 0 600

APPROXIMATE SCALE IN FEET



SOURCE: PSOMAS, Landmark Village Tentative Tract Map 53108 Drainage Concept (March 14, 2005).

FIGURE **4.2-6**

Landmark Village Drainage Concept

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Development on the tract map site is proposed on approximately 103.5 acres within the FEMA floodplain and on approximately 169 acres of the capital floodplain (see **Figure 4.2-3** and **Figure 4.2-7, Existing FEMA 100-Year and Capital Floodplain Delineations**). This development would be elevated a minimum of 1 foot above both floodplain elevations and, therefore, would not be subject to flood hazard from the river during the FEMA 100-year or LACDPW capital storm events. An additional 109 acres of encroachment into the FEMA floodplain boundaries are associated with bank improvements to protect against erosion downstream of the Landmark Village tract map site. Because a portion of the proposed development would be within the existing FEMA 100-year floodplain, adjustments to the FEMA published maps Flood Insurance Rate Maps (FIRMs) are required. These adjustments are administered by FEMA, and revisions to the mapping are made by applicants applying for a "Letter of Map Revisions" (LOMR). LOMRs are documents issued by FEMA that remove property and/or structures from special flood hazard areas. It is a common accepted practice, both nationwide and within Los Angeles County, to process revisions to the FEMA floodplain maps (i.e., LOMRs). The issuance of a LOMR would eliminate the property and/or structures from the applicable FEMA 100-year map. Any property and/or structures that are elevated above the FEMA 100-year floodplain zone are considered reasonably safe and free from flood hazard. Figure 4.4F in the PACE report (Recirculated Draft EIR **Appendix 4.2**) illustrates the proposed final FEMA 100-year floodplain zone, consistent with the proposed developed topography and proposed bank protection. The Conditional Letter of Map Revision (CLOMR) process would precede project construction and LOMR submittal.

Please see this EIR, **Section 4.4**, **Biota**, and **Section 4.5**, **Floodplain Modifications**, for a detailed discussion of the biotic and floodplain impacts for the 2-yr, 5-yr, 10-yr, 20-yr, 50-yr, 100-yr and capital flood events associated with the proposed bank stabilization. **Figure 4.2-6** illustrates the post-development drainage patterns for the Landmark Village tract map site. As required by the LACDPW, all on-site drainage systems carrying runoff from developed areas would be designed for the 25-year design storm (urban flood), while storm drains under major and secondary highways, open channels (main channels), debris carrying systems, and sumps would be designed for the 50-year capital flood.

The bank stabilization, stormwater drainage outlet structures, and the Long Canyon Road Bridge abutments and piers all represent construction within the river.

(1) Storm Drains

Storm drains (pipes and reinforced concrete boxes) designed for either the 25-year or 50-year capital storm would consist of both privately or publicly maintained systems (e.g., Homeowner Associations, Assessment Districts or the County of Los Angeles). The minimum publicly maintained mainline pipe size would be 18-inch connector pipes for clear flows.

(2) Open Channels

Small open channels would consist of rectangular and trapezoidal concrete channels and/or vegetated swales, and be designed for either the 25-year or 50-year capital storm, depending on the source of the runoff. The channels sized for the 50-year capital storm would have greater capacity than those sized for the 25-year storm.

(3) Low Flow Pipes and Outlets

To reduce pollution impacts from the low flow runoff, a series of pipes and outlets would be provided to intercept first flush runoff from developed portions of the tract map site. Pollutants expected to be generated on the site, their potential water quality impacts, and water quality control are addressed in this EIR, **Section 4.3**, **Water Quality**.

(4) Catch Basins

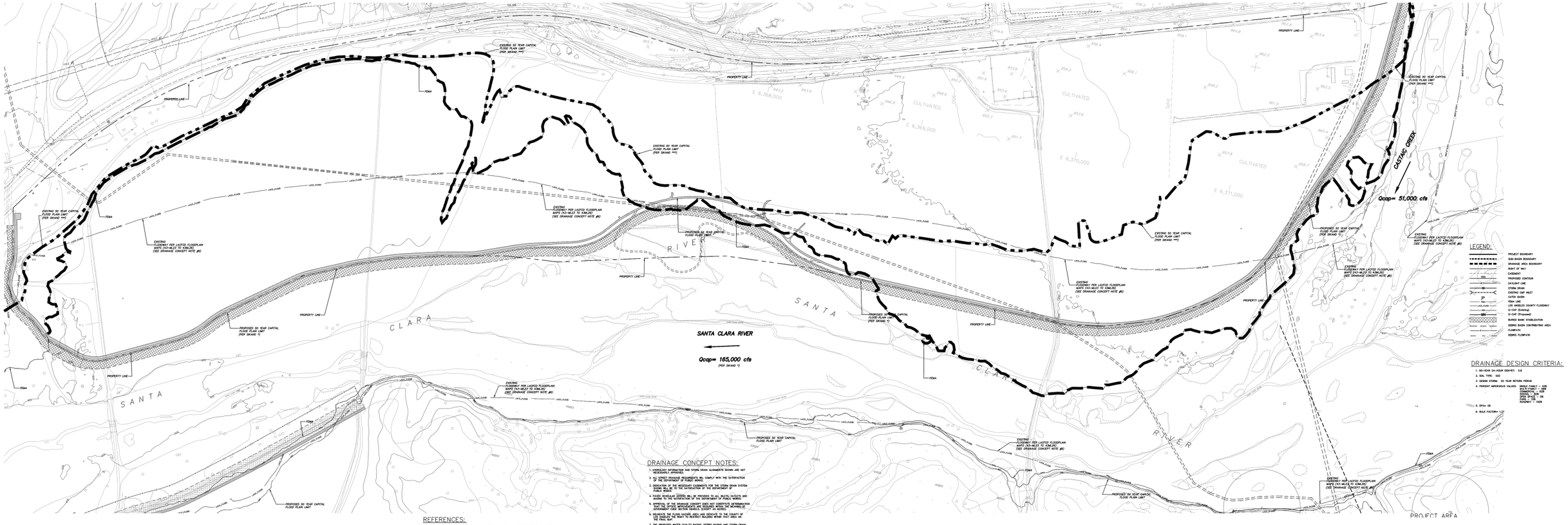
Catch basins would be provided to intercept flows beyond the 10- and 25-year storms and at strategic locations to minimize flooding at street intersections and at sump locations.

(5) Debris Basins

To reduce debris discharged through and from the tract map site, three additional debris basins north of SR-126 (and within Newhall Ranch) are proposed to intercept flows from undeveloped upland areas prior to their discharge under SR-126 and into the on-site storm system. The locations of these debris basins are illustrated in **Figure 4.2-6**.

(6) Erosion Control

Tract map-related erosion control that would occur in and adjacent to the river includes bank stabilization and various stormwater drainage outlet structures. Bank stabilization would be comprised of soil cement, rip-rap, and reinforced concrete. Bank protection would occur on both the northern and southern banks of the river, as well as the northern and southern sides of the bridge. It may be buried or exposed (soil cement, reinforced concrete or rip-rap), and rip-rap may be grouted or not grouted. TRMs or other suitable non-hardened bank protection is proposed along the northern riverbank between the Landmark Village site and the proposed water reclamation plant (WRP) site to protect the proposed utility corridor. These erosion control devices are discussed below under the **"Utility Corridor" subsection**. Additional bank protection (approved and included as part of the Natural River Management Plan) upstream of the Landmark Village project adjacent to the Old Road and downstream of the existing Valencia WRP is necessary to provide protection for the utility corridor.



Legend:

— — — = FEMA Floodplain

—·—·— = Capital Floodplain (Q-Cap)

Note:

For a detailed map, please refer to the corresponding map pocket in Appendix 4.2

600 300 0 600

APPROXIMATE SCALE IN FEET

SOURCE: PSOMAS – June 2005

FIGURE **4.2-7**

Existing FEMA 100-Year and Capital Floodplain Delineations

32-92•05/06

(a) Energy Dissipaters

Runoff from the tributary area (including the Chiquita Canyon Landfill drainage area) would pass through the site via storm drains and, in some instances, detention and water quality basins, before it would discharge into the river at 14 separate locations. The Drainage Concept shows 14 storm discharge locations along the southern site boundary (see **Figure 4.2-6**). Eleven outlet structures into the river would be constructed in conjunction with the soil cement improvements. To reduce storm flow velocities and to prevent erosion at stormwater discharge points into the river, energy dissipaters consisting of either rip-rap or other larger reinforced concrete standard impact type energy dissipaters would be constructed at storm system outlets into the river. The energy dissipaters would slow the rate of flow of runoff into the river to prevent erosion of the stream channel. Additional dissipaters would be located at the outlet of Chiquito Creek and Long Canyon Creek. Dissipaters would be designed based upon storm drain outlet hydraulic conditions, such as discharge, velocity and pipe size, and location within the river.

(b) Soil Cement/Bank Stabilization

Soil cement is a highly compacted mixture of soil (well-graded soil mixture), cement, and water (by weight approximately 88 percent soil, 7 percent cement and 5 percent water). As the cement hydrates, it hardens the compacted soil into a strong, durable, low-permeability material. Soil cement bank protection has been used in highly erosive conditions by various flood control agencies for over 50 years. Buried soil cement bank protection is a modern flood control technique used to protect against bank erosion and scouring while allowing natural vegetation to occur in the soil over the soil cement resulting in a "soft bank" solution. In the event that the soil over the soil cement and overlying vegetation are removed through river erosion, the exposed soil cement would provide a naturalized and aesthetic bank protection method in contrast to traditional rip-rap or concrete. A typical cross section for buried soil cement bank protection is shown on Figure 1.5 of the PACE August 2006 report (Recirculated Draft EIR **Appendix 4.2**) and, in **Section 1.0, Project Description,** of this EIR. As shown, this approach uses soil cement bank protection at the toe (bottom) of the bank protection, which is buried well below the existing bed of the river. Typically, the toe must be 10 to 20 feet below the bed of the river in order to resist capital flood scouring. Construction of the bank protection requires temporary excavation and backfilling of the soil in and around the bed and bank of the river. A temporary construction zone of up to 75 feet would occur at the base of the bank protection in order to excavate to the toe of the bank protection. The original channel elevation (and in some instances additional backfill is added to bury the soil cement bank protection slope face that would extend above the bed and bank of the river) would be restored after construction and disturbed areas would be re-vegetated with native plant species maintaining the natural habitat presently found along the river. The soil cement bank protection is required to protect residential and commercial development and the Long Canyon Road Bridge.

In most locations, the horizontal alignment of the soil cement bank protection would be placed outside the existing river channel, which would create additional new river channel. For example, soil cement bank protection proposed on the north side of the river near the confluence with Castaic Creek would be constructed on agricultural land, north of the existing river corridor. The land located between the existing riverbank and the newly created stabilized bank would be excavated to widen the existing river corridor, which would increase the area available for riverbed vegetation and habitat and increase the capacity of the river to convey the passage of flood flows.

While the Landmark Village Drainage Concept includes the use of buried soil cement bank protection to stabilize river and creek banks, at specific locations on the project site, such as at outlet structures, access ramps, or bridge abutments, grouted rip-rap or reinforced concrete bank protection would be used to provide bank stabilization and to minimize erosion. Approximately 68 percent of the river and creek banks on the project site would be provided with any one or a combination of bank stabilization techniques (hard and soft types). At a minimum, approximately 75 percent of the river and creek banks that would be stabilized would be protected using buried soil cement bank protection. The remaining 20 percent would be comprised of TRMs (or other non-hardened bank protection methods), while approximately 5 percent would consist of rip-rap or reinforced concrete.

A total of approximately 11,000 linear feet of buried soil cement protection would be constructed on the north side of the river (along the project's proposed development area and 1,200 linear feet east of the proposed WRP bank protection), plus an additional 6,400 linear feet of buried soil cement protection would be constructed on the south side of the river adjacent to the Long Canyon Road Bridge and the property immediately downstream of the project site, for a total of 18,600 linear feet. The soil cement is primarily necessary to protect the proposed residential and commercial development on the project site, the Long Canyon Road Bridge, and the property immediately downstream of the project site from potential erosion due to project implementation. In addition 6,600 linear feet of TRMs (or other non-hardened bank protection methods) would be installed downstream of the project site along the northern edge of the river corridor to protect the utility corridor from Chiquito Canyon to San Martinez Grande Canyon.

Additionally, there is approximately 2,000 linear feet of soil cement bank protection that would be constructed in conjunction with the utility corridor adjacent to the Old Road directly north of the Valencia WRP. This bank stabilization was analyzed in the EIR/EIS prepared for the approved Santa Clara River Natural River Management Plan.

Please see **Section 1.0**, **Project Description**, of this EIR for further discussion and illustrations of bank stabilization techniques.

(c) Long Canyon Road Bridge Abutment

Long Canyon Road Bridge over the Santa Clara River would include abutments and bank stabilization on the northern and southern sides of the bridge, which would protect against the erosive forces of the river. The bridge abutments would be approximately 500 linear feet of river length of reinforced concrete transitioning to soil cement through approximately 50-100 linear feet of rip-rap bank protection.

(d) Castaic Creek/SR-126 Bridge Abutments

The Castaic Creek/SR-126 Bridge is to be widened to three lanes in each direction. Concurrently, the existing bridge abutments would be widened and extend up to approximately 500 linear feet on both sides of Castaic Creek. The buried bank stabilization would tie into the abutment with an approximate 50–100 linear foot section of rip-rap.

b. Off-Site Improvements

(1) Adobe Canyon Borrow Site

Grading in Adobe Canyon would involve grading and shaping of the hills and depressions that form the ridge separating Long and Adobe Canyons. Much of this work would occur along the top and bluffs of an unnamed plateau located just west of Sawtooth Ridge. The proposed grading would excavate the southeastern portion of this plateau creating a gentler slope leading up to the top of the ridge resulting in a manufactured slope angle ranging from 5:1 to 2:1 (horizontal/vertical). The grading would also alter the western facing slope leading up to the plateau creating a bench separated by two manufactured slopes stepping down the west facing ridgeline defining Adobe Canyon at a 3:1 grade. Additional earthwork is planned at the terminus of Adobe Canyon where a series of excavations would result in a manufactured slope at a relatively uniform 3:1 grade. A series of benches, swales and debris basins would also be constructed to collect, convey and release runoff in a controlled manner.

(2) Chiquito Canyon Grading Site

The Chiquito Canyon grading site, located just north of SR-126 and west of the intersection with Chiquito Canyon Road, is proposed on the ridgeline of a northeast-southwest trending hillside, which gently slopes toward the intersection in a "finger" shape. The terrain becomes progressively steeper and more rugged towards the northwestern portion of the ridge, with the peak elevation reaching 1,160 feet above mean sea level. The grading would lower the "finger" of land extending toward the intersection of Chiquito Canyon Road with SR-126 and create a manufactured slope at a uniform 3:1 grade. A series of benches, swales and debris basins would also be constructed to collect, convey and release runoff in a controlled manner.

The primary hydrologic effect of the grading on the two sites is that storm flows would runoff each site at slower rates than under existing conditions.

(3) Utility Corridor

The utility corridor is depicted on **Figure 1.0-30**, **Preliminary Recycled Water Storage System**, found in **Section 1.0, Project Description,** of this EIR. The utility corridor is comprised of several alignments dependent upon the specific type of service. The majority of the alignment is located away from the Santa Clara River and tributaries and would not require bank protection or other measures that may affect river hydraulics, with the exception of approximately 6,600 linear feet of geotextile reinforced bio-engineered erosion protection installed downstream of the project site along the northern edge of the river corridor from Chiquito Canyon to San Martinez Grande Canyon and the approved buried bank stabilization to be constructed directly north of the Valencia WRP. This erosion protection would provide bank stability protection along this portion of the utility corridor.

TRMs are one type of reinforced bio-engineered bank stabilization material. TRMs and geotextile reinforced bio-engineered bank stabilization methods are designed to reinforce vegetation at the root and stem, thereby allowing vegetation to be used as erosion control in areas where flow conditions could exceed the ability of natural vegetation to remain rooted. TRMs and other geotextiles are suitable for locations with high slopes or stream banks where grouted riprap and concrete channels are hydraulically unnecessary and hardened bank protection is aesthetically undesirable. TRMs are secured to the soil surface using a predetermined staple pattern and either wire soil staples or biodegradable stakes. TRM products are constructed of two basic materials that perform different functions: (1) permanent netting designed to provide permanent structure and strength to the vegetation at the root and stem level; and (2) degradable natural and synthetic fiber netting that provides erosion control immediately after installation by holding seed and soil particles in place and trapping moisture on the soil surface. As a result, TRM products provide erosion control, vegetation establishment, and reinforcement at one location.

The bank protection section of the utility corridor is located along the north bank of the river immediately downstream of the existing County Sanitation District Treatment facility/Valencia WRP, and would consist of bank stabilization between the river and the Old Road. This section of bank stabilization would be constructed in conjunction with the utility corridor. This approximately 2,000 linear feet of bank stabilization was analyzed and approved as part of the Natural River Management Plan (NRMP).

One additional section of utility corridor bank protection is required for the approximately 1,000 linear feet of reach downstream of the San Martinez Grande Canyon confluence with the river and is necessary

to protect the utility corridor. The current bank protection material selection for this reach is soil cement; however, with the final design it may be determined that a geotextile-reinforced bio-engineered method could be adequate and, if so, the non-hardened solution would be utilized.

Newhall Land is currently in discussions with several of the utility agencies who will have infrastructure in the corridor. Prior to the project final map recordation, Newhall will finalize a maintenance agreement with an agency or some other entity (public or private – Homeowners Association (HOA), Center for Natural Land Management, Joint Power Authority, Landscape Maintenance District, etc.) for acceptance of the maintenance responsibility for bank protections for the Utility Corridor.

With the TRM (bio-engineered) slope protection along the Utility Corridor it is anticipated that there will be some limited maintenance activities related to vegetation replacement, removal of non-native species, removal of non-healthy plants, grading, replacement and/or repair of the TRM's. All of this work will take place within the limits of the project disturbance limits as analyzed in the project EIR. As part of the maintenance entity agreement Newhall will provide a Utility Corridor maintenance easement for repair activities along the Utility Corridor to the limits of project disturbance.

In the unlikely event that maintenance or repair beyond that described above is necessary and would include impacts outside the project disturbance limits (maintenance easement) analyzed in the project EIR's the appropriate permits and approvals would have to be obtained.

8. PROJECT IMPACTS

a. Significance Threshold Criteria

According to the County of Los Angeles *Environmental Document Reporting Procedures and Guidelines*, the County is concerned with any development that may be subject to flood hazards and debris flows, including (1) flooding due to the development's location within a major drainage course; (2) flooding due to the development's location within a floodplain; and (3) high debris transport and deposition potential.

Under Appendix G of the *State CEQA Guidelines*, a project would result in a significant flood impact if it would result in any of the following:

- 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 which would result in substantial erosion or siltation on or off site;
- Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner which would result in flooding on or off site;

- Create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff;
- Place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map;
- Place within a 100-year flood hazard area structures which would impede or redirect flood flows;
- Expose people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam; and/or
- Create the potential for inundation by seiche,[4] tsunami,[5] or mudflow.

The Landmark Village site and its tributary area are too far inland from the Pacific Ocean to be affected by inundation by either a seiche or tsunami. Furthermore, no large, continuously filled body of water exists within or in proximity to the project site or the tributary area that would be subject to a seiche. The impacts of project implementation, however, are discussed below for the remaining significance threshold criteria. Wherever pertinent, these thresholds are applied to project construction impacts. Wherever a significance threshold criterion is exceeded or there is the potential for a criterion to be exceeded, mitigation is identified that, if feasible, would reduce the potential impact to a less than significant level. This impact analysis focuses only on the potential flood impacts of the project from storm runoff. The potential water quality impacts of the project are addressed in this EIR, **Section 4.3**, **Water Quality**. The project's potential impacts to biological resources within and around drainages are addressed in this EIR, **Section 4.4**, **Biota**, and **Section 4.5**, **Floodplain Modifications**.

b. Construction Impacts

(1) Landmark Village Site (VTTM 53108)

The primary concern during construction of the proposed Landmark Village project is potential erosion and sedimentation impacts during site clearing and grading, the placement of up to 5.8 million cubic yards of fill on the site, and excavation within the river to install the bank stabilization, construct the Long Canyon Road Bridge, and widen and extend of the Castaic Creek Bridge. After construction, the tract map site would largely be covered with impermeable surfaces and non-erodible surfaces, including landscape vegetation. Erosion and sedimentation caused by construction activities are dependent upon

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4 A seiche (pronounced say'sh) is a wave on the surface of a lake or landlocked bay caused by atmospheric or seismic disturbances. The effect of a seiche may also be referred to as "sloshing," which occurred to many swimming pools in the San Fernando Valley during the 1994 Northridge earthquake.

5 A tsunami (pronounced soo-NAH-mee) is a series of waves of extremely long wave length and long period, generated in a body of water by an impulsive disturbance that displaces the water, such as an earthquake, landslide, or sub-marine volcanic eruption.

on climatic and site conditions, as well as the degree of soil disturbance during construction. Erosion within the creek and streambed would depend upon perennial and natural flows. Site clearing and grading operations, in particular, would have the greatest potential for discharging sediment downstream during storm events.

The proposed reinforced concrete and riprap at bridge abutments, in addition to the soil cement proposed as part of this project, would encroach into the existing 100-year floodplain in some areas. This action would trigger FEMA review in the form of the CLOMR/LOMR floodplain map revision process. Additionally, some banks located out of the floodplain need stabilization because of lateral migration of the riverbed, and the need to protect for the capital flood discharge. Construction of the soil cement bank protection represents a short-term construction-related disturbance as areas on the river side of the soil cement will be filled and re-vegetated.

Increases in sedimentation and debris production on the site, and erosion and sedimentation in the river and creek beds during construction, although temporary, would result in a significant impact without mitigation.

(2) Off-Site Grading

A primary concern during the grading of the Landmark Village tract map site is potential erosion and sedimentation impacts during the clearing, excavation, and grading at, and export of cut material from, the Adobe Canyon borrow site and the Chiquito Canyon grading site. These operations would have the greatest potential for the discharge of sediment downstream during storm events. Unless mitigated through erosion control and rapid soil stabilization at the completion of excavation and grading, increases in sedimentation and debris production during construction, although temporary, would result in a significant impact.

(3) Utility Corridor

Construction of the utility corridor would result in significant erosion and sedimentation impacts as the site grading, and borrow site excavation and grading, unless mitigated.

c. Operational Impacts

(1) Landmark Village Site (VTTM 53108)

(a) Substantial Alteration of an Existing Drainage Pattern

Implementation of the Landmark Village Drainage Concept Plan would allow runoff from the 996-acre tributary area (which is inclusive of the Chiquita Canyon Drainage) to collect in a storm drain system. Landmark Village does not propose to direct any flows to this drainage channel. Runoff would then gravity flow toward the river in a drainage pattern similar to existing conditions, where water flows have naturally formed paths of least resistance and concentrate at existing topographic depressions or cut channels through the site. Therefore, while the project would include development of the storm drain system and have predefined outlets to the river, existing drainage patterns would not be significantly altered.

The river would be encroached upon with placement of the buried soil cement, TRMs, bridge abutments and piers, storm drain outlets, and energy dissipaters proposed by the project. Project impacts are expected to include localized erosion and increased localized sedimentation as a result of changes to river velocity and water surface elevation due to project impacts (see this EIR in **Section 4.5**, **Floodplain Modifications**, for a discussion of potential project impacts on location biological resources as a result of these improvements). The project would not affect overall discharges to the river because no discharge would be diverted from or to the river as a result of the proposed project.

Site Erosion

Once the project site is implemented as proposed, erosion is not anticipated to be a concern because it would largely be covered with impermeable and non-erodible surfaces and landscaping. Placement of the soil cement along the northern bank of the river would result in a long-term beneficial impact because the soil cement would stabilize the river's banks.

Riverbed Scouring and Floodplain

In-stream velocities are indicators of potential riverbed scouring. Potential for erosion within the river 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). Therefore, a representative velocity

of 4.0 fps was determined to be the appropriate indicator for potential erosion or scouring. In addition, a detailed capital fluvial analysis has been prepared to evaluate both existing and project conditions.

If a significant amount of the 2- to 100-year floodplain area were in the 0- to 4- fps range, but as a result of the project (including the Long Canyon Road Bridge and downstream bank protection), would be subjected to velocities greater than 4 fps, it would be considered to have a potentially significant erosion impact. Table 4.2 of the PACE August 2006 report indicates that flows in excess of 4 fps would be reduced by approximately -1.7. -4.5, -12.4, 0.1, 58.1, and 27.5 for the 2-, 5-, 10-, 20-, 50-, and 100-year storm events, respectively. The result of this slight decrease in riverbed area where velocities exceed 4 fps is an indication of a slightly more stable and less erosive condition. However, based upon the minor reductions in the area where the velocity exceeds 4 fps, it is more of an indication that there is not much change between the existing and project condition (proposed project floodplain fill and bank protection) from the riverbed scour perspective.

The overall decrease in floodplain area where the velocity is greater than 4 fps is due to the proposed excavation of existing agricultural field and increase in riverbed. The valuation of the total floodplain indicates (PACE August 2006 report) a -0.5, 0.4, 1.2 -33.9, -90.1, and -100.3 change for the 2-, 5-, 10-, 20-, 50-, and 100-year events, respectively. However, the largest reductions in floodplain acreage with flows in excess of 4 fps would be on land presently sued for agricultural purposed and that is proposed for conversion to residential and commercial uses.).

For high frequency floods (2-year, 5-year, and 10-year), the proposed floodplain modifications would not 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 them to meander and spread out further than they would under pre-project conditions.

However, during more infrequent floods (20-year, 50-year and 100-year events), flows would spread out up to 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 prevent flooding of formerly adjacent floodplain areas. These formerly adjacent areas would be developed under the Specific Plan for various land uses, including residential, commercial, industrial, and parks.

Table 4.3 of the PACE August 2006 report (Recirculated Draft EIR **Appendix 4.2**) shows that during the 100-year storm event, project-related improvements would result in 31 increased water surface elevation locations, with 10 exceeding 1 foot, and 21 decreased water surface elevation locations, with one exceeding 1 foot, in the river. No impacts to water surface elevation would be realized upstream or downstream of the project.

Localized increases in velocity in excess of 4 fps would occur downstream of the Landmark Village project site development. Such localized increases have the potential to cause erosion; however, the project-related increases in velocity downstream of the project site would be mitigated by installation of buried soil cement protection on the southern edge of the river corridor south of the Long Canyon Road Bridge.

The Specific Plan acknowledges that natural riverine dynamics could erode fill placed on top of the bank protection (e.g., buried soil cement) during certain flood events. For example, natural riverine migration between the banks may place the lowest points along the length of the riverbed in contact with the bank. Additionally, storms greater than approximately the 25-year discharge are expected to flow from bank to bank.

The Long Canyon Road Bridge construction would include abutments, rip-rap transitions to soil cement, and approaches that would reduce the width of the 100-year floodplain. However, the existing active river channel width would be completely spanned by the bridge and remain unaffected for up to the 5-year flood event. The proposed bridge improvements would cause a localized narrowing at the channel at the bridge; however, flooding up to a capital flood event would still be contained within the channel. The Long Canyon Road Bridge and associated bank protection are consistent with the improvements described in the approved Specific Plan.

Erosion at Drainage Discharge Points

The Los Angeles MS4 Permit notes that increased volume, velocity, and discharge duration of stormwater runoff from developed areas could potentially accelerate downstream erosion and impair stream habitat. As a result, the permit stipulates, "Permittees shall control post-peak stormwater runoff in Natural Drainage Systems to prevent accelerated stream erosion and protect stream habitat." The following discussion supports the conclusion that there would be no significant downstream impacts potentially accelerating stream erosion as a result of the project. (See this EIR, **Section 4.5**, **Floodplain Modifications**, for a discussion of the project's potential impacts on biological resources in the river and other affected drainages.)

Most of the restoration areas associated with the Landmark Village tract map site are located outside of the existing riparian corridor and are presently being utilized for agricultural purposes. These restoration areas will be planted with native vegetation. With the revegetation in restored areas, there would be more vegetated corridor than presently occurs under existing conditions. While it is acknowledged there is a potential for a portion of the buried bank stabilization to become exposed during a major storm event, it is not a likely or probable outcome. To illustrate this point, site visits were conducted of the Bridgeport project and other project sites, which utilize buried soil cement bank protection along the Santa Clara

River upstream of the Landmark Village project site. The site visits were conducted after the 2004/2005 winter rainy season, which proved to be one of the wettest years on record and produced an approximate 50-year flood in the Santa Clara River; however, storm flows did not expose any of the buried soil cement bank protection and no damage occurred to the revegetated areas at these upstream project sites.

In addition, PACE prepared a technical memorandum evaluating buried bank stabilization installed upstream of the Landmark Village project site after the 2004/2005 winter storms.

In terms of erosion, PACE concluded that the majority of the river bank protection construction includes a horizontal location of the bank protection that is located outside of or adjacent to the existing riparian edge. PACE found that the placement of the bank protection outside of the existing river corridor substantially decreases the likelihood that the river scour will remove the buried soil and vegetation placed over the soil cement bank protection. As noted above, the majority of the bank protection is located outside of the existing riparian corridor where areas will typically experience velocities much less than the main channel creek velocities (typically velocities of 2-8 fps along the banks while velocities greater than 15 fps in the main channel occur adjacent to these locations during a 100-year discharge). Lower, non-erosive, velocities in the areas along the buried bank stabilization indicate that it is unlikely that all or part of the buried bank stabilization will become exposed. In light of the above, the County does not foresee a need to refill portions of revegetated fill associated with buried bank stabilization.

In natural riverine systems, such as the Santa Clara River and its tributaries, frequent discharges (on the order of the average annual and 2-year flows) dictate stream geomorphology. Extended and frequent discharges at these critical flow rates would potentially impact stream health. The project proposes to install water quality basins, which would capture runoff from small, frequent storms and release flows at non-erosive rates. This means that water from the basins would be released at a rate substantially less than discharges associated with 2-year storms; therefore, erosive impacts would be reduced to less than significant levels.

To reduce storm flow velocities during smaller, more frequent flows (i.e., 2-year storm events) and to prevent erosion at stormwater discharge points into the river, the Landmark Village Drainage Concept includes energy dissipaters consisting of either rip-rap or larger standard impact type energy dissipaters at affected storm system outlets in the river. These energy dissipaters would slow the rate of flow of discharge into the river in order to prevent erosion of the stream channel.

Energy dissipaters and water quality basins used to reduce erosion risk in smaller events also would reduce erosion risk in larger events.

The project would not affect the rate of flow, currents, or the course and direction of surface water of the side drainages as the project would be required to adhere to Los Angeles County requirements for detention basins and pipe sizing. As a result, project impacts under this criterion would be less than significant.

Fluvial Impacts

Development along the river within the study area has the potential to modify the fluvial mechanics of the river, and the PACE fluvial analysis evaluates impacts from buildout of Newhall Ranch from (1) fluvial modifications of the riverbed from single hypothetical storm events; and (2) changes in the floodplain fluvial operation over the long-term. It is important to note that the HEC-RAS and fluvial study covers an area from I-5 to generally west of the Ventura County/Los Angeles County line and is not limited to the Landmark project site.

The fluvial study examined local, long-term, and episodic components of riverbed adjustment. The study found that localized impacts from proposed bridge piers would occur, however, these impacts would not be significant. The study also found that the Landmark Village project would not change the fluvial mechanics of the Santa Clara River and, therefore, would not create a significant impact.

(b) Post-Development Drainages and Runoff Discharge for Landmark Village Tract Map (VTTM 53108)

Because the proposed upstream debris basins are part of the project's drainage system design, runoff flow rates from the entire 996-acre tributary area are addressed in the following analysis. Runoff from the 349-acre Chiquita Canyon Landfill drainage area would be channelized through the Landmark Village site and no project site runoff would discharge into that separate facility. Runoff from the landfill is addressed in a separate report and improvements associated with that drainage area are determined to have adequate capacity to accommodate runoff from that acreage and facility. This report prepared by Psomas, entitled Off-Site Chiquito Landfill Drainage Concept, dated September 21, 2005, is located in Recirculated Draft EIR **Appendix 4.2**.

The drainage and runoff discharge calculations for the Landmark Village Tract Map (VTTM 53108) under existing conditions are shown in **Table 4.2-3**, above. The development of the proposed Landmark Village project would increase the amount of runoff from those areas of the site that would be covered by roads, buildings, paved parking areas, and other relatively impermeable or impervious features (see **Table 4.2-1** for the assumed percent imperviousness the general land uses proposed for the site). Specifically, impervious surfaces on the site would increase the amount of clear flow runoff from and through the site, while burned and bulked runoff and debris flow rates would be reduced because the developed portions of the site would be overcovered with impervious surfaces and non-erodible vegetation, and because three additional debris basins that would reduce the amount of debris and sediment in the runoff would

be constructed at upstream off-site locations (see **Figure 4.2-6**). Post-development runoff flow rates by drainage-area are presented in **Table 4.2-6, Post-Development Drainages and Runoff Discharge – VTTM 53108**.

Table 4.2-6
Post-Development Drainages and Runoff Discharge – VTTM 53108

Drainage Areas	Acreage	Time of Conc. (min)	Q50u[1] (cfs)	Q50b[2] (cfs)	Q50bb[3] (cfs)	Qdesign (cfs) (MORA)[5]
Off-Site RVE Areas						
RVE-1A	18	24	14	20	25	20
RVE-2A	39	28	28	38	50	39
RVE-3B	15	8	24	32	41	32
RVE-4B	44	19	41	57	72	57
RVE-6A	35	11	47	62	79	62
Subtotal of Off-Site						147
On-Site RVE Areas						
RVE-7A	14	29	21			21
RVE-8A	23	30	26			26
RVE-9A	6	11	11			11
Cumulative (Including Off-Site Subtotal)						198
RVE-11B	16	14	27			27
RVE-12C	1	15	1			1
RVE-13C	17	19	25			25
RVE-16D	2	20	2			2
RVE-17D	18	15	30			30
RVE-20E	18	16	28			28
RVE-21F	1	7	1			1
RVE-24F	2	14	2			2
RVE-25F	14	16	22			22
RVE-27B	7	12	15			15
RVE-28B	5	10	11			11
RVE-29B	1	14	1			1
Subtotal (all RVE, including Off-Site and Cumulative Rows)						**363**
RVC-2A	11	9	18			18
RVC-3A	12	15	20			20
RVC-7A	10	27	13			13
RVC-8A	5	14	8			8
Cumulative (RVC-A)						60
RVC-11B	16	11	30			30
RVC-12C	3	18	3			3
RVC-13C	2	12	3			3
RVC-17C	2	19	2			2
RVC-18C	17	14	29			29
RVC-21D	3	16	3			3
RVC-22D	3	12	7			7
RVC-23E	39	24	53			53
RVC-24E	7	22	12			12

Drainage Areas	Acreage	Time of Conc. (min)	Q50u[1] (cfs)	Q50b[2] (cfs)	Q50bb[3] (cfs)	Qdesign (cfs) (MORA)[5]
Subtotal (all RVC, including Cumulative RVC-A))						**202**
CQT-1/4A	23.9	9	37	41	46	41
CQT-5A	4.4	5	10	12	15	12
CQT-6A	22.6	15	25	31	39	31
CQT-7/8A	6.2	5	14	14	14	14
CQT-9A	31.8	14	37	44	52	52
CQT-10A	14.5	11	20	23	27	27
CQT-11A	7.4	21	11	11	11	11
CQT-12A	4.4	12	9	9	9	9
Subtotal (CQT)						**197**
RVW-1A	11	14	17			17
RVW-2A	15	14	28			28
Subtotal (RVW)						**33**
Totals	**568**					**795[4]**

Source: PSOMAS, Landmark Village Tentative Tract Map 53108 Drainage Concept *(2005) (Recirculated Draft EIR* ***Appendix 4.2****).*

[1] *Q50u - 50-year rainfall, unburned and unbulked (clear flow) runoff intensity.*

[2] *Q50b - 50-year rainfall, burned flow runoff intensity.*

[3] *Q50bb - 50-year rainfall, burned and bulked flow runoff intensity.*

[4] *Total is the sum of all Subtotals. Qdesign and cumulative data is the result of LACDPW Modified Rational Method tabulations, shown in Recirculated Draft EIR* ***Appendix 4.2****., PSOMAS, Landmark Village Tentative Tract Map 53108 Drainage Concept (2005). Burned flow for Subareas RVE 1A through 6A. Developed flow for the remaining Subareas RVE, Subareas RVC and RVW, Burned flow for Subareas CQT-1/4A, CQT-5/6A, Burned and bulked flow for Subareas CQT-9/10, Developed flow for Subareas CQT-7/8A and CQT-11/12A.*

The post-development discharge quantities would total 795 cfs for the tributary area during a 50-year capital storm. A comparison of existing peak discharges from **Table 4.2-3** and post-development peak discharge from **Table 4.2-6**, is provided below in **Table 4.2-7**.

Table 4.2-7
Comparison of Acreage and Discharge - Existing and Proposed Project
VTTM 53108

Acreage			Q_{50} (cfs)		
Existing	**Proposed**	**Difference**	**Existing**	**Proposed**	**Difference**
568	568	0	831	795	-36

Source: PSOMAS, Landmark Village Tentative Tract Map 53108 Drainage Concept (2005) (Recirculated Draft EIR ***Appendix 4.2****).*

As shown, there would be a 36 cfs (4 percent) reduction in discharge from the tributary watershed, specific to the Landmark Village tract map site (VTTM 53108), under post-development conditions. This reduction in discharge would be the result of reduced erosion of the site due to coverage of much of the site with pavement, roofs, vegetation, and other non-erosive surfaces. It also would be largely the result of the proposed debris basins that would capture sediment and debris in upstream runoff and allow debris to settle out from the runoff before it would enter the storm system through the developed portion of the site. With these improvements in place, the project would reduce runoff flow rates through the site and into the Santa Clara River. Furthermore, since storm flows from upstream areas would be channeled through the site in facilities designed for the 50-year capital storm, and since on-site runoff would be accommodated in facilities designed for the 25-year urban design storm, pursuant to LACDPW requirements, no on-site or upstream flooding due to inadequately designed storm drainage facilities would occur.

As a result, the project would not create or contribute runoff flow rates that would exceed the capacity of existing or planned stormwater drainage systems and project impacts under this criterion would be less than significant.

(c) Place Housing or Structures Within a 100-Year Flood Hazard Area

Approximately 169 acres of the Landmark Village tract map site are currently located within the capital floodplain. The project proposes development within the existing FEMA flood hazard area. Therefore, the project applicant proposes to elevate approximately 169 acres of the site above the capital floodplain. As required, future habitable structures on the site would be elevated a minimum of 1 foot above the 100-year flood hazard area. As additional flood protection, buried bank protection is proposed on the project's southern boundary to stabilize the elevated bank and protect the proposed development from flood hazards. The buried bank protection is designed to act as a non-erodible boundary to contain floodwaters during a capital flood discharge. These improvements are consistent with those envisioned by the Newhall Ranch Specific Plan. As a result of these improvements, no housing or structures would be placed within a 100-year flood hazard area, and there would be no impact under this criterion.

(d) Exposure to Significant Risk of Loss, Injury, or Death by Flooding or Mudflow

As previously discussed, overall upstream tributary and project site runoff would decrease under post-development conditions. In addition, the project would channel off-site and on-site runoff through drainage improvements designed and constructed for either the 25-year urban flood or the 50-year capital flood as required by the LACDPW. Furthermore, approximately 169 acres of the site would be elevated above the capital floodplain of the Santa Clara River, thereby, removing the proposed improvements on

the site from flood hazards. Any increases in the river's water levels resulting from the elevation of the site and the soil cement bank protection placement would dissipate prior to the end of the proposed soil cement because encroachments into the floodplain would only minimally impact water surface elevations at the downstream portions of the project. Therefore, increases in flood water elevations due to project-related improvements would be limited to the applicant's property and would not expose people or structures to a significant risk of loss, injury, or death involving flooding. With these improvements in place, there would be no exposure to significant risk of loss, injury, or death as a result of flooding or mudflow and, therefore, no significant impacts would result.

Although the site is presently subject to some debris and mud flows, adequate building setbacks from natural slopes and debris control facilities proposed in upstream areas of the site would protect the proposed project development from debris and mudflow hazards.

(2) Off-Site Grading

(a) Substantial Alteration of an Existing Drainage Pattern

Adobe Canyon Borrow Site

Under existing conditions, runoff from most of the eight sub-basins of the Adobe Canyon borrow site drain northwesterly and then into Long Canyon, while the remaining runoff would drain northerly and northeasterly to Long Canyon. After grading, there would be a total of 10 sub-basins (see **Figure 4.2-8**, **Post-Development Drainage Patterns – Adobe Canyon Borrow Site**). Runoff from the borrow site would continue to flow toward Long Canyon and ultimately to the Santa Clara River such that post-grading drainage patterns within Adobe Canyon and its vicinity would not be substantially altered, resulting in no significant impact.

Chiquito Canyon Grading Site

Under existing conditions, runoff from most of the twelve sub-basins drains southwesterly toward culverts under SR-126 and toward the project site, while runoff from one sub-basin drains toward Chiquito Canyon to the west. Chiquito Canyon flows south and discharges into the Santa Clara River. All of the runoff flows through the project site and into the Santa Clara River. After grading, there would be eight sub-basins and little to no change in the direction of storm flows (see **Figure 4.2-9**, **Post-Development Drainage Patterns – Chiquito Canyon Grading Site**). However, runoff from the sub-basin that currently flows west toward Chiquito Canyon would be redirected to flow south towards SR-126 and the Santa Clara River. This is not considered a substantial alteration to existing drainage patterns, and there would be no significant flood impact.

(b) Post-Development Drainages and Runoff Discharge for Off-Site Grading Areas

Adobe Canyon Borrow Site

Post-grading runoff flow rates for the Adobe Canyon borrow site are presented below in **Table 4.2-8, Post-Grading Drainages and Runoff Discharge – Adobe Canyon Borrow Site**. The post-development runoff quantities would total 352 cfs for the borrow site during a 50-year capital storm.

Table 4.2-8
Post-Grading Drainages and Runoff Discharge – Adobe Canyon Borrow Site

Sub-Basins	Acreage	Time of Conc. (minutes)	Q50u[1] (cfs)	Q50b+d[2] (cfs)	Q50bb+d[3] (cfs)	Qdesign[4] (cfs)
ADB-1A	28.0	12	35	46	67	46
ADB-2A	12.7	7	23	27	36	27
ADB-3A	29.5	12	29	39	39	39
ADB-4A	22.2	13	28	28	28	28
ADB-5A	25.2	11	36	36	36	36
ADB-6B	13.6	13	16	21	27	27
ADB-7B	28.7	26	21	30	38	38
ADB-9C	30.6	14	36	42	48	48
ADB-10C	8.8	6	17	21	27	27
ADB-11C	13.9	8	22	28	36	36
Totals	**213.2**		**273**	**318**	**382**	**352**

Source: PSOMAS, Off-Site Borrow Areas Drainage Concept *(Recirculated Draft EIR* ***Appendix 4.2*****)** (Under Conditional Use Permit)*).*

1 *Q50u - 50-year rainfall, unburned and unbulked (clear flow) runoff intensity*
2 *Q50b+d - 50-year rainfall, burned and developed runoff intensity*
3 *Q50bb+d - 50-year rainfall, burned and bulked and developed runoff intensity*
4 *Qdesign - Runoff intensity includes burned and developed for Sub-basins 1/4A, 5A, 6A, plus burned and bulked and developed flow for Sub-basins 9A, 10A, plus developed for Sub-basins 7/8A, 11A, 12A.*

A comparison of existing and post-grading peak discharge rates for the Adobe Canyon borrow site is provided below.

Table 4.2-9
Comparison of Acreage and Discharge - Existing and Proposed Project
Adobe Canyon Borrow Site

Acreage			Q_{50} (cfs)		
Existing	**Proposed**	**Difference**	**Existing**	**Proposed**	**Difference**
213	213	0	450	352	-98

Source: PSOMAS, Off-Site Borrow Areas Drainage Concept (Recirculated Draft EIR **Appendix 4.2**) *(Under Conditional Use Permit)*

As shown, there would be a 98 cfs (22 percent) reduction in runoff from the borrow site under post-graded conditions. This reduction in runoff would be a result of a reduced rate of runoff from the site allowing for greater infiltration, as well as the proposed debris basin that would capture sediment and debris before the runoff discharges off site. As a result of the grading, runoff from the Adobe Canyon borrow site would not result in downstream flooding and, therefore, impacts would be less than significant.

Chiquito Canyon Grading Site

Post-grading runoff flow rates for Chiquito Canyon are presented below in **Table 4.2-10, Post-Grading Drainages and Runoff Discharge – Chiquito Canyon Borrow Site**. The post-development runoff quantities would total 197 cfs for Chiquito Canyon during a 50-year capital storm.

Table 4.2-10
Post-Grading Drainages and Runoff Discharge – Chiquito Canyon Borrow Site

Sub-Basins	Acreage	Time of Conc. (minutes)	Q50u[1] (cfs)	Q50b+d[2] (cfs)	Q50bb+d[3] (cfs)	Qdesign[4] (cfs)
CQT-1/4A	23.9	9	37	41	46	41
CQT-5A	4.4	5	10	12	15	12
CQT-6A	22.6	15	25	31	39	31
CQT-7/8B	6.2	5	14	14	14	14
CQT-9B	31.8	14	27	44	52	52
CQT-10C	14.5	11	20	23	27	27
CQT-11C	7.4	21	11	11	11	11
CQT-12C	4.4	12	9	9	9	9
Totals	**115.2**		**163**	**185**	**213**	**197**

Source: PSOMAS, Off-Site Borrow Areas Drainage Concept *(Recirculated Draft EIR* ***Appendix 4.2)*** (Under Conditional Use Permit)*).*

[1] *Q50u - 50-year rainfall, unburned and unbulked runoff intensity*
[2] *Q50b+d - 50-year rainfall, burned and developed runoff intensity*
[3] *Q50bb+d - 50-year rainfall, burned and bulked and developed runoff intensity*
[4] *Qdesign - Runoff intensity includes burned and developed for Sub-basins 1/4A, 5A, 6A, plus burned and bulked and developed flow for Sub-basins 9A, 10A, plus developed for Sub-basins 7/8A, 11A, 12A.*

Legend:

ADB-1A / 28.0 ac — SUB-BASIN NUMBER / SUB-BASIN AREA (ac)

- EXISTING PROPERTY LINE
- EXISTING EASEMENT
- EXISTING CONTOUR
- DAYLIGHT LINE
- CUT & FILL
- FLOW LINE
- BENCH
- CONCRETE DEBRIS SWALE
- HAUL ROUTE ACCESS ROAD
- RIVER CORRIDOR-2003 (FORMERLY SEA 33)
- FEMA
- G-CAP
- DEBRIS TRIBUTARY LIMIT
- SUB-BASIN BOUNDARY
- DRAINAGE AREA BOUNDARY
- RIGHT OF WAY
- EASEMENT
- PROPOSED CONTOUR
- DAYLIGHT LINE
- STORM DRAIN
- EXISTING CMP INLET
- FLOWPATH
- DEBRIS FLOWPATH
- DEBRIS BASIN
- SPINE FLOWER
- SPINE FLOWER PROTECTION BOUNDARY
- COAST LIVE OAK (Quercus agrifolia)
- VALLEY OAK (Quercus lobata)
- SCRUB OAK (Quercus berberidifolia)
- SOUTHERN CALIFORNIA BLACK WALNUT (Juglans californica)
- HOLLYLEAF CHERRY (Prunus ilicifolia)
- EXISTING TREE CANOPY
- (8.6 ac) UNDEVELOPED PORTION OF SUBAREA
- Qu(sub)= 9 cfs — PROPOSED SUBAREA Q(unburned)
- Tc(sub)= 15 min — PROPOSED TIME OF CONCENTRATION

Qd	=	DEVELOPED Q
Qb	=	BURNED Q
Qbb	=	BURNED+BULKED Q
Qb+d	=	BURNED & DEVELOPED Q
Qbb+d	=	BURNED & BULKED & DEVELOPED Q
DP	=	DEBRIS PRODUCTION

DRAINAGE CONCEPT NOTES:

1. HYDROLOGY INFORMATION AND STORM DRAIN ALIGNMENTS SHOWN ARE NOT NECESSARILY APPROVED.
2. ALL STREET DRAINAGE REQUIREMENTS WILL COMPLY WITH THE SATISFACTION OF THE DEPARTMENT OF PUBLIC WORKS.
3. DEDICATION OF THE NECESSARY EASEMENTS FOR THE STORM DRAIN SYSTEM SHOWN WILL BE TO THE SATISFACTION OF THE DEPARTMENT OF PUBLIC WORKS.
4. PAVED VEHICULAR ACCESS WILL BE PROVIDED TO ALL INLETS, OUTLETS, AND BASINS TO THE SATISFACTION OF THE DEPARTMENT OF PUBLIC WORKS.
5. APPROVAL OF THE DRAINAGE CONCEPT DOES NOT CONSTITUTE DETERMINATION THAT THE OFFSITE IMPROVEMENTS ARE REQUIRED WITHIN THE MEANING OF GOVERNMENT CODE SECTION 66462.5, (EXCEPT AS NOTED).
6. DELINEATE THE FLOOD HAZARD AREA AND DEDICATE TO THE COUNTY OF LOS ANGELES THE RIGHT TO RESTRICT BUILDING WITHIN THAT AREA ON THE FINAL MAP.
7. THE PROPOSED DEBRIS BASINS AND STORM DRAIN FACILITIES WILL BE PRIVATELY MAINTAINED.

PROPOSED ADOBE PROJECT DRAINAGE

SUB-BASIN NUMBER	TIME OF CONCENTRATION (minutes)	INCREMENTAL SUB-BASINS 50-YEAR STORM EVENT: SUB-BASIN AREA (acres)	Qu (cfs)	Qb+d (cfs)	Qbb+d (cfs)	DEBRIS PRODUCTION (cy)	PROP. DEBRIS BASIN CAP (cy)	Qd^{A} (cfs)
ADB-1A	9	28.0	35	46	67	3584		46
ADB-2A	7	12.7	23	27	36	1101		27
ADB-3A	12	29.5	39	39	39			39
ADB-4A	13	22.2	28	28	28			28
ADB-5A	11	25.2	36	36	36		4685	36
ADB-6B	13	13.6	16	21	27	367		27
ADB-7B	26	28.7	21	30	38	775		38
ADB-9C	14	30.6	36	42	48	419		48
ADB-10C	6	8.8	17	21	27	238		27
ADB-11C	8	13.9	22	28	36	375		36
	Σ	213.2	273	318	382	6858		352

(1) – K = Burn Factor from Appendix G-2, K = 0.677*(I **-0.102)
(2) – Qb = A**(1-K)*K*Qu
Subareas 1A and 2A:
(3) – Qbb = 1.465*Qb
(4) – DP = A*128 cy (Zone 5)
Subareas 3A, 4A, 5A, 6B, 7B, 9C, 10C and 11C:
(3) – Qbb = 1.27*Qb
(4) – DP = A*27 cy (Zone 9)

NOTES:

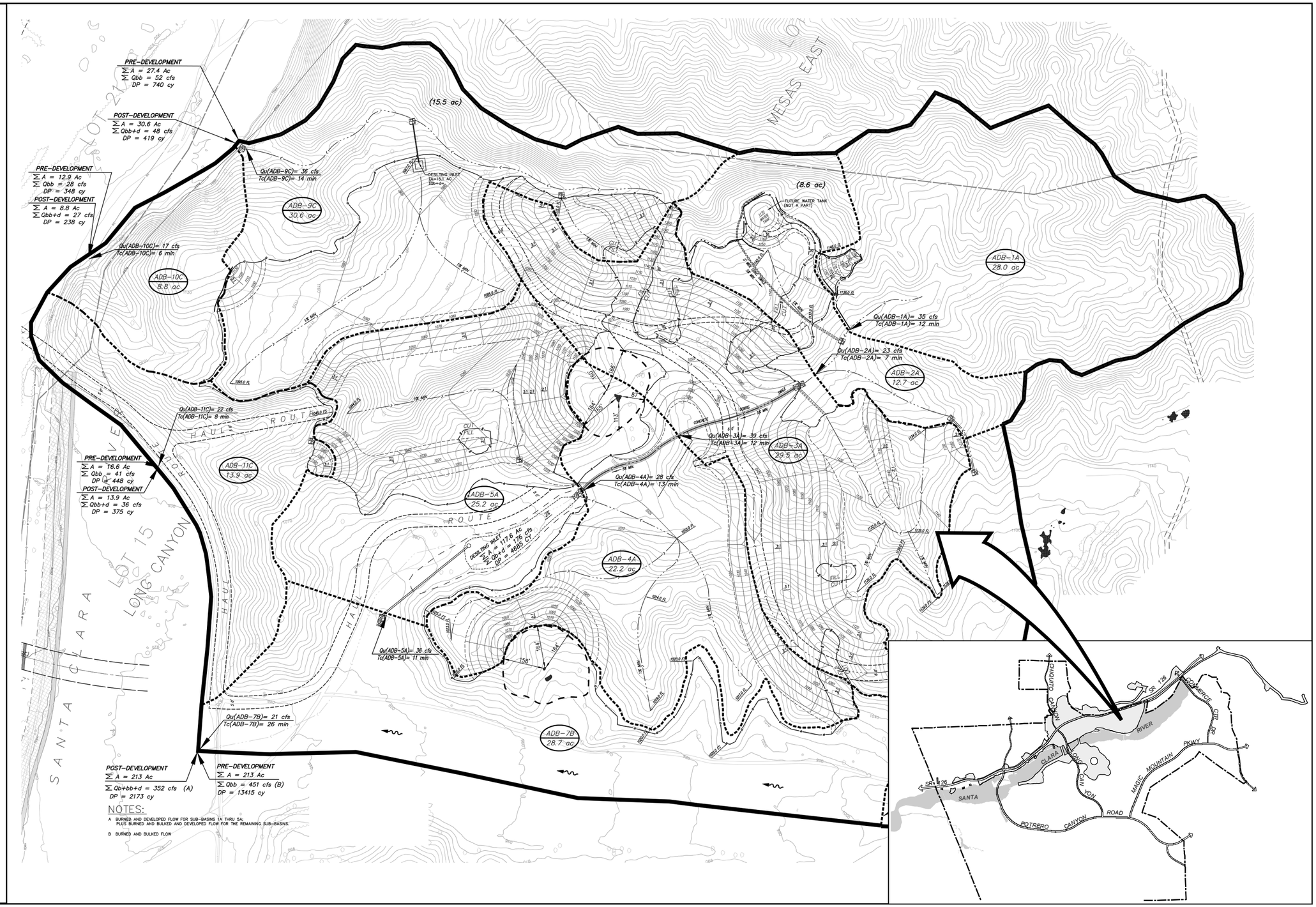
A. BURNED AND DEVELOPED FLOW FOR SUB-BASINS 1A THRU 5A; PLUS BURNED AND BULKED AND DEVELOPED FLOW FOR THE REMAINING SUB-BASINS.

SPECIAL WATER QUALITY NOTES:

1. ENGINEERED SLOPES TO BE HYDROSEEDED AND MAINTAINED.
2. DESILTING INLETS, CONC. SWALES AND OTHER DRAINAGE DEVICE TO BE PRIVATELY MAINTAINED

Note:
For a detailed map, please refer to the corresponding map pocket in Appendix 4.2

400 200 0 400
APPROXIMATE SCALE IN FEET



SOURCE: PSOMAS, Off-Site Borrow Areas (Under Conditional Use Permit) Drainage Concept (March 14, 2005).

FIGURE **4.2-8**

Post-Development Drainage Patterns – Adobe Canyon Borrow Site

Legend:

LEGEND:

CQT–5A — SUB–BASIN NUMBER
4.4 ac — SUB–BASIN AREA (ac)

- EXISTING LOT LINE
- EXISTING EASEMENT
- 1100 EXISTING CONTOUR
- DAYLIGHT LINE
- SUB–BASIN BOUNDARY
- DRAINAGE AREA BOUNDARY
- RIGHT OF WAY
- EASEMENT
- 950 PROPOSED CONTOUR
- PROPOSED STORM DRAIN
- EXISTING STORM DRAIN CULVERT
- DEBRIS CHANNEL (5% MIN)
- EXISTING FLOWPATH
- PROPOSED DEBRIS CHANNEL FLOWPATH
- (8.6 ac) UNDEVELOPED PORTION OF SUBAREA
- Qu(sub)= 9 cfs — PROPOSED SUBAREA Q (unburned)
- Tc(sub)= 15 min — PROPOSED TIME OF CONCENTRATION

Qd	=	DEVELOPED Q
Qb	=	BURNED Q
Qbb	=	BURNED+BULKED Q
Qb+d	=	BURNED & DEVELOPED Q
Qbb+d	=	BURNED & BULKED & DEVELOPED Q
DP	=	DEBRIS PRODUCTION
Qcap	=	FULL FLOW CAPACITY

DRAINAGE CONCEPT NOTES:

1. HYDROLOGY INFORMATION AND STORM DRAIN ALIGNMENTS SHOWN ARE NOT NECESSARILY APPROVED.
2. ALL STREET DRAINAGE REQUIREMENTS WILL COMPLY WITH THE SATISFACTION OF THE DEPARTMENT OF PUBLIC WORKS.
3. DEDICATION OF THE NECESSARY EASEMENTS FOR THE STORM DRAIN SYSTEM SHOWN WILL BE TO THE SATISFACTION OF THE DEPARTMENT OF PUBLIC WORKS.
4. PAVED VEHICULAR ACCESS WILL BE PROVIDED TO ALL INLETS, OUTLETS AND BASINS TO THE SATISFACTION OF THE DEPARTMENT OF PUBLIC WORKS.
5. APPROVAL OF THE DRAINAGE CONCEPT DOES NOT CONSTITUTE DETERMINATION THAT THE OFFSITE IMPROVEMENTS ARE REQUIRED WITHIN THE MEANING OF GOVERNMENT CODE SECTION 66462.5, (EXCEPT AS NOTED).
6. DELINEATE THE FLOOD HAZARD AREA AND DEDICATE TO THE COUNTY OF LOS ANGELES THE RIGHT TO RESTRICT BUILDING WITHIN THAT AREA ON THE FINAL MAP.
7. THE PROPOSED DEBRIS BASINS AND STORM DRAIN FACILITIES WILL BE MAINTAINED BY LOS ANGELES COUNTY.

PROPOSED CHIQUITO PROJECT DRAINAGE

SUB–BASIN NUMBER	TIME OF CONCENTRATION (minutes)	INCREMENTAL SUB–BASINS 50–YEAR STORM EVENT: SUB–BASIN AREA (acres)	Qu (cfs)	Qb+d (cfs)	Qbb+d (cfs)	DEBRIS PRODUCTION (cy)	PROP. DEBRIS BASIN CAP (cy)	Qd[A] (cfs)
CQT–1/4A	9	23.9	37	41	46	270	300	41
CQT–5A	5	4.4	10	12	15	119		12
CQT–6A	15	22.6	25	31	39	491	650	31
CQT–7/8A	5	6.2	14	14	14	0		14
CQT–9A	14	31.8	37	44	52	521[C]		52
CQT–10A	11	14.5	20	23	27	205[C]		27
CQT–11A	21	7.4	11	11	11	0		11
CQT–12A	12	4.4	9	9	9	0		9
	Σ	115.2[B]	163	183	213	1607		197

K = Burn Factor from Appendix G–2, K=0.677*(1^–0.102)
Qb = A**(1–K)+K*Qu
Qbb = 1.27*Qb
DP = A*27 cy (DPA Zone 9)

NOTES:

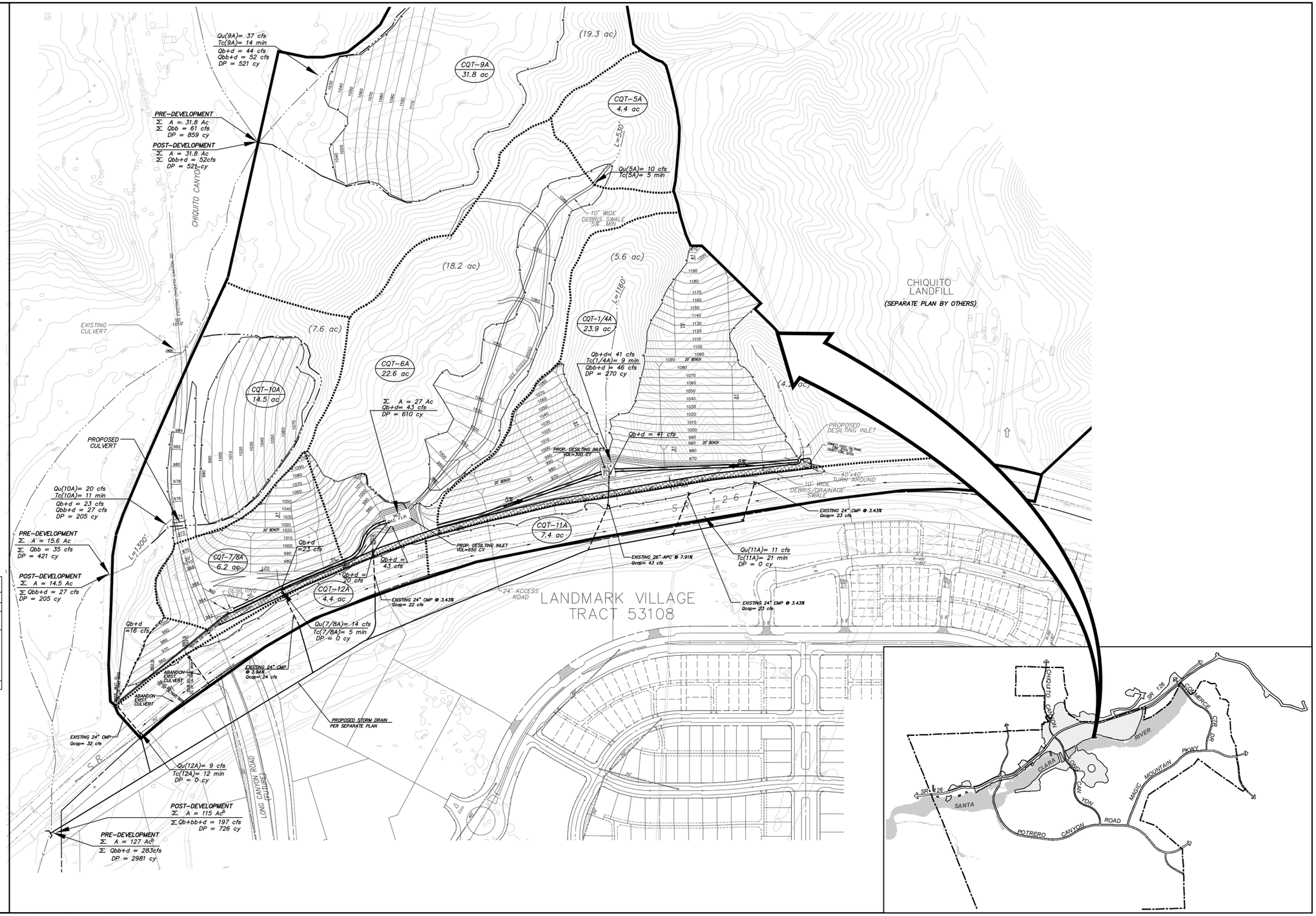
A BURNED AND DEVELOPED FLOW FOR SUB–BASINS 1/4A, 5/8A, PLUS BURNED AND BULKED AND DEVELOPED FLOW FOR SUB–BASINS 9A, 10A, PLUS DEVELOPED FLOW FOR SUB–BASINS 7/8A, 11A, AND 12A

B DRAINAGE TRIBUTARY AREA IS LESS THAN IN EXISTING CONDITION BECAUSE THE AREA SOUTH OF SR–126 IS PART OF LANDMARK VILLAGE DEVELOPMENT TRACT 53108 IN THE PROPOSED CONDITION.

C AREAS CQT–9A AND CQT–10A DRAIN DIRECTLY TO CHIQUITO CANYON. EXISTING CONDITION IS MAINTAINED.

Note:
For a detailed map, please refer to the corresponding map pocket in Appendix 4.2

400 200 0 400
APPROXIMATE SCALE IN FEET



SOURCE: PSOMAS, Off-Site Borrow Areas (Under Conditional Use Permit) Drainage Concept (March 14, 2005).

FIGURE **4.2-9**

Post-Development Drainage Patterns – Chiquito Canyon Grading Site

32-92•05/06

A comparison of existing and post-grading peak discharge for the Chiquito Canyon grading site is provided below.

Table 4.2-11
Comparison of Acreage and Discharge - Existing and Proposed Project
Chiquito Canyon Grading Site

Acreage			Q_{50} (cfs)		
Existing	Proposed	Difference	Existing	Proposed	Difference
127	115	-12	283	197	-86

Source: PSOMAS, Off-Site Borrow Areas *Drainage Concept (Recirculated Draft EIR* ***Appendix 4.2****)* (Under Conditional Use Permit).

As shown, there would be an 86 cfs (30 percent) reduction in runoff from the Chiquito Canyon grading site under post-graded conditions. This reduction would be a result of a reduced rate of runoff from the site allowing for greater infiltration, as well as the proposed debris basin that would capture sediment and debris before the runoff discharges off site. As a result of the grading, runoff from the Chiquito Canyon grading site would not result in downstream flooding and, therefore, impacts would be less than significant.

(c) Place Housing or Structures within a 100-Year Flood Hazard Area

Neither the borrow site nor Chiquito Canyon grading site would include housing or habitable structures, which are located within a 100-year flood hazard area; therefore, there would be no significant impacts due to the placement of housing or structures within a 100-year flood hazard area.

(d) Exposure to Significant Risk of Loss, Injury, or Death by Flooding or Mudflow

Grading in Adobe Canyon and Chiquito Canyon would be to standards established by the LACDPW (see **Section 4.1**, **Geotechnical and Soil Resources**) and all manufactured slopes would be stabilized through standard engineering practice and revegetation. Furthermore, the amount of runoff and debris flow from these sites would be less under post-graded conditions than under existing conditions, thereby reducing the potential for flood impact and mudflow to less than significant levels. As a result of these improvements, impacts resulting from exposure to significant risk of loss, injury, or death by flooding or mudflow would be less than significant.

(3) Utility Corridors

(a) Substantial Alteration of an Existing Drainage Pattern

The proposed utility corridor contains three segments: a westerly segment of approximately 1,200 linear feet extending eastward from the proposed Newhall Ranch WRP (to be protected with soil cement or non-hardened bank protection to be determined with final design); a middle segment of 6,600 linear feet extending between the Chiquito and Grande tributaries (protected with TRMs or similar non-hardened bank protection methods); and the easterly segment that extends 2,000 linear feet to Round Mountain along The Old Road. The bank stabilization improvements associated with the eastern segment (protection with soil cement) were approved under the previously adopted Natural River Management Plan Section 404 Permit and Section 1603 Streambed Alteration Agreement for portions of the Santa Clara River and its tributaries (1998).

The analysis for the middle segment evaluated river flow velocities in the reach between Chiquito and Grande on the northern edge of the river corridor, STA 22010 to STA 17785. A uniform distance from the SR-126 road and the rail right-of-way area to the southern edge of the utility corridor was established for the entire reach. The horizontal location of the corridor was determined to be 67 feet from the rail right-of-way area to the edge of the utility corridor. At this location, a vertical levee was created in HEC-RAS to represent the boundary between the river and the utility corridor. The modeled levee affected the hydraulic geometry of 22 cross-sections in the reach from Chiquito west to Grande. One primary simulation was run in HEC-RAS, the Q_{cap} flood event (140,793 cfs), under a mixed flow regime and a mixed Manning's *n* conditions based on aerial photography analysis. Under these conditions, when the water surface elevation was high enough to reach the banks, the water velocities at the levee were very low, ranging from 0.8 to 4.1 fps. These modeled velocities are not to the level that would require hardened bank protection and so would not substantially alter the existing drainage patterns that could result in substantial erosion or siltation. In this case, approximately 6,600 linear feet of geotextile reinforced bio-engineered erosion protection (possibly TRMs) would be permanently placed on the bank to ensure protection from erosion.

(b) Result in Runoff Flow Rates in Excess of Existing or Planned Drainage Systems

The scope of the utility corridor and adjunct facilities is not such that it would result in runoff flow rates in excess of existing or planned drainage systems. Wherever a water tank is proposed on a graded pad, burned and bulked runoff from the pad would be reduced as a result of overcovering the pad with impervious materials and non-erosive vegetation. Furthermore, the water tank pad would be graded and

flattened, which would decrease the coefficient of runoff from the pads. As a result, there would be a net decrease in runoff and the impact of the utility corridor would be less than significant.

(c) Place Housing or Structures Within a 100-Year Flood Hazard Area

Most of the utility corridor would not be located within the existing 100-year flood hazard area and those improvements proposed within the Landmark Village site would be elevated above the 100-year and the 50-year capital floodplains. No portion of the utility corridor includes residential or habitable structures within a flood hazard area. As a result, there would be no impact relative to the utility corridor.

(d) Exposure to Significant Risk of Loss, Injury, or Death by Flooding or Mudflow

Construction of the utility corridor would be to standards set forth by the LACDPW. The utility corridor south of the SR-126 and within proposed "A" Street would be constructed within a trench that would be approximately 10 feet in width with some slope stabilization and remedial grading as necessary. Once the utilities are placed within the trench, the trench would be overcovered with soil, graded and compacted to blend in with existing grades, and revegetated or paved over. Upon completion, runoff from this portion the utility corridor would be channeled through catch basins and storm drains and discharged to the Santa Clara River. Runoff and debris flow would be equal to or less than existing conditions, and there would be no risk of loss, injury, or death. As a result, there would be a less than significant impact for the utility corridor south of the SR-126 and within proposed "A" Street.

The proposed project's water tank would be placed in a geologically stable location (see **Section 4.1**, **Geotechnical and Soil Resources**). All manufactured slopes in the immediate vicinity of the tank would be stabilized through standard engineering practice and revegetation. Furthermore, the amount of runoff and debris flow from the two off-site grading sites would be less under post-graded conditions than under existing conditions, thereby reducing the potential for flood impact to less than significant. As a result of these improvements, impacts associated with this criterion would be less than significant.

d. Conclusion

As shown in **Tables 4.2-7, 4.2-9,** and **4.2-11**, there would be a total 220 cfs reduction in discharge from the tributary watershed under post-development conditions, which includes: (1) a 36 cfs reduction in discharge from the Landmark Village tract map site (VTTM 53108); (2) a 98 cfs reduction in discharge from the Adobe Canyon borrow site; and (3) an 86 cfs reduction in discharge from the Chiquito Canyon grading site. This reduction in discharge would be the result of reduced erosion of the site due to coverage of much of the site with pavement, roofs, vegetation, and other non-erosive surfaces. It also would be largely the result of the proposed debris basins that would capture sediment and debris in

upstream runoff and allow debris to settle out from the runoff before it would enter the storm system through the developed portion of the site. With these improvements in place, the project would reduce runoff flow rates through the site and into the Santa Clara River. Consequently, development of the proposed Landmark Village project, off-site grading, and construction of the utility corridor would result in less than significant impacts on drainage patterns because development would not substantially alter existing drainage patterns, significantly modify a drainage channel, or change the rate of flow, currents, or the course and direction of surface waters such that they would cause substantial erosion or siltation, or cause on-site or off-site flooding or mudflow.

Project impacts relative to excess runoff would be less than significant because post-construction and post-grading runoff flow rates would be less than existing conditions. Furthermore, all grading and drainage improvements would be consistent with LACDPW requirements and drainage improvements would be sized for either the 25-year urban or the capital storm events, depending on the source of runoff. As a result, the project would not create or contribute runoff in quantities that would exceed the capacity of existing or planned stormwater drainage systems.

Much of the western portion of the Landmark Village tract map site is within the FEMA 100-year floodplain and within the capital floodplain of the Santa Clara River. This portion of the site would be elevated above the capital floodplain and bank stabilization is proposed along the northern riverbank to protect the proposed improvements from risk of flood, loss, and injury or death. No housing or structures are proposed within the borrow site as part of this project. The water tank site would not be located within a flood hazard area. Grading and slope stabilization within the two off-site grading sites would be to standards set forth by the LACDPW, and neither site would be subject to flooding or mudflow. The project would not expose people or structures to a significant risk of loss, injury, or death as a result of inundation by a seiche or tsunami. Therefore, project impacts under would be less than significant.

9. MITIGATION MEASURES

Although the proposed Landmark Village project may result in potential flood control impacts absent mitigation, the County already has imposed mitigation required to be implemented as part of the Newhall Ranch Specific Plan. These mitigation measures, as they relate to flood control, are found in the previously certified Newhall Ranch Specific Plan Program EIR (March 8, 1999) and the adopted Mitigation Monitoring Plan for the Specific Plan (May 2003). In addition, this EIR identifies recommended mitigation measures specific to the Landmark Village project site. The project applicant has committed to implementing the applicable mitigation measures from the Newhall Ranch Specific Plan and the mitigation measures recommended for the proposed Landmark Village project to ensure

that future development of the project site would not result in flood control impacts, and would not adversely affect adjacent properties.

a. Mitigation Measures Required by the Adopted Newhall Ranch Specific Plan, as They Relate to the Landmark Village Project

The following seven mitigation measures (**Mitigation Measure Nos. 4.2-1** through **4.1-7**, below) were adopted by the County in connection with its approval of the Newhall Ranch Specific Plan (May 2003). The applicable mitigation measures will be implemented to mitigate the potentially significant flood control impacts associated with the proposed Landmark Village project. These measures are 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 are to be constructed to the satisfaction of the LACDPW, 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 RWQCB 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) (of the Newhall Ranch Specific Plan Program EIR).

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) (of the Newhall Ranch Specific Plan Program EIR).

SP 4.2-4 Conditional Letters of Map Revision (CLOMR) relative to adjustments to the 100-year FIA floodplain 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 LACDPW.

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 LACDPW.

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 LACDPW. These requirements currently include preparation of an 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 LACDPW shall monitor compliance with those NPDES requirements.

b. Mitigation Already Incorporated into the Project

The following mitigation measures are already incorporated into the design of the proposed Landmark Village project. To reflect that the measures relate specifically to Landmark Village, each measure is preceded by "LV," which stands for Landmark Village.

LV 4.2-1 The on-site storm drains (pipes and reinforced concrete boxes) and open channels shall be designed and constructed for either the 25-year or 50-year capital storm.

LV 4.2-2 Debris basins shall be constructed pursuant to LACDPW requirements to intercept flows from undeveloped areas entering into the developed portions of the site.

LV4.2-3 Energy dissipaters consisting of either rip-rap or larger standard impact type energy dissipaters shall be installed as required by LACDPW at outlet locations to reduce velocities of runoff into the channel where necessary to prevent erosion.

LV4.2-4 The project is required to comply with the RWQCB Municipal Permit (General MS4 Permit) Order No. R4-2006-0074, NPDES No. CAS004001 (amended September 14, 2006), and with the state's General Construction Activity Storm Water Permit, California State Water Resources Control Board Order No. 99-08-DWQ, National Pollutant Discharge Elimination

System (NPDES) No. CAS000002, reissued on August 19, 1999, as amended and further modified by Resolution No. 2001-046 on April 26, 2001.

c. Additional Mitigation Measures Proposed by this EIR

The following project-specific mitigation measures are recommended to mitigate the potentially significant flood control impacts that may occur with implementation of the proposed Landmark Village project. These mitigation measures are in addition to those adopted in the previously certified Newhall Ranch Specific Plan Program EIR.

(1) Construction Mitigation Measures

LV 4.2-5 During all construction phases, temporary erosion control shall be implemented to retain soil and sediment on the tract map site, within the Adobe Canyon borrow site, the Chiquito Canyon grading site, the utility corridor right-of-way, and the bank stabilization areas, as follows:

- Re-vegetate exposed areas as quickly as possible;
- Minimize disturbed areas;
- Divert runoff from downstream drainages with earth dikes, temporary drains, slope drains, etc.;
- Reduce velocity through outlet protection, check dams, and slope roughening/terracing;
- Implement dust control measures, such as sand fences, watering, etc.;
- Stabilize all disturbed areas with blankets, reinforced channel liners, soil cement, fiber matrices, geotextiles, and/or other erosion resistant soil coverings or treatments;
- Stabilize construction entrances/exits with aggregate underdrain with filter cloth or other comparable method;
- Place sediment control BMPs at appropriate locations along the site perimeter and at all operational internal inlets to the storm drain system at all times during the rainy season (sediment control BMPs may include filtration devices and barriers, such as fiber rolls, silt fence, straw bale barriers, and gravel inlet filters, and/or with settling devices, such as sediment traps or basins); and/or
- Eliminate or reduce, to the extent feasible, non-stormwater discharges (e.g., pipe flushing, and fire hydrant flushing, over-watering during dust control, vehicle and equipment wash down) from the construction site through the use of appropriate sediment control BMPs.

LV 4.2-6 All necessary permits, agreements, letters of exemption from the ACOE and/or the CDFG for project-related development within their respective jurisdictions must be obtained prior to the issuance of grading permits.

LV 4.2-7 By October 1st of each year, a separate erosion control plan for construction activities shall be submitted to the local municipality describing the erosion control measures that will be implemented during the rainy season (October 1 through April 15).

(2) Operational Mitigation Measures

LV 4.2-8 A final developed condition hydrology analysis (LACDPW Drainage Concept Report (DCR) and Final Design Report (FDR)) shall be prepared in conjunction with final project design when precise engineering occurs. This final analysis shall confirm that the final project design is consistent with this analysis. This final developed condition hydrology analysis shall confirm that the sizing and design of the water quality and hydrologic control BMPs control hydromodification impacts in accordance with the NSRP Sub-Regional Stormwater Mitigation Plan. All elements of the storm drain system shall conform to the policies and standards of the LACDPW, Flood Control Division, as applicable.

LV 4.2-9 Ultimate project hydrology and debris production calculations shall be prepared by a project engineer to verify the requirements for debris basins and/or desilting inlets.

LV 4.2-10 To reduce debris being discharged from the site, debris basins shall be designed and constructed pursuant to LACDPW Flood Control to intercept flows from undeveloped areas entering into the developed portions of the site.

10. CUMULATIVE IMPACTS

As discussed in **Section 3.0, Cumulative Impact Analysis Methodology**, two development scenarios were selected for the cumulative impact analysis that is required by CEQA for this EIR. These scenarios include the County's DMS Build-Out Scenario and the SCV Cumulative Build-Out Scenario (see **Section 3.0** for a detailed description of each of these scenarios). Individual or detailed discussion of these scenarios with respect to cumulative flood impacts is not relevant in this section because: (1) the County's DMS does not monitor projects for the County's Flood Control Division of the LACDPW; and (2) the boundary of the approximate 996-acre tributary watershed in which the Landmark Village site is located is the appropriate geographic area for such an analysis at the project level. Therefore, attention is focused in this cumulative impact analysis on the potential flood impacts of the buildout of the tributary

watershed in which the Landmark Village site is situated (please refer to **Section 4.5**, **Floodplain Modifications**, for a discussion of cumulative flood impacts on the Santa Clara River and floodplain).

a. Flood Impacts

The adopted Newhall Ranch Specific Plan and the County of Los Angeles General Plan provide for additional development within the tributary watershed.

Pursuant to LACDPW requirements, all future drainage facilities in the 996-acre tributary watershed must be designed for either the capital storm or the 25-year urban design storm (storm drains under major and secondary highways, open channels (main channels), debris carrying systems, and sumps must be designed for the capital storm). LACDPW also prohibits increases in off-site post-development storm flows and increases in storm flow velocities. As a result of compliance, overall storm runoff discharge quantities from the watershed under post-development runoff conditions would be less than or equal to existing conditions largely because the runoff would include less debris than is typical of undeveloped watersheds and flow velocities would not increase. Because on-site facilities already would have been built for burned and bulked flows from undeveloped areas, they would have more than adequate capacity to accommodate off-site flows as the off-site portions of the drainage areas develop.

Because on-site drainage facilities would have adequate capacity to capture and convey off-site flows from developed upstream areas, and because the storm drainage improvements in the remainder of the watershed would be required to comply with LACDPW design criteria, no significant cumulative project flooding impacts are expected to occur as buildout within the watershed occurs.

Development of the Newhall Ranch Specific Plan would increase runoff from upland areas due to increased impervious surface areas (e.g., pavement, roads, and buildings). The increase in discharges for different return events (2-year, 5-year, 10-year, 20-year, 50-year, and 100-year) would be measurable to a point about 4 miles downstream of Newhall Ranch in Ventura County. Beyond this point, development would have no impact on flows. The increase in runoff would range from 3 percent for high flows to 7 percent for the 2-year event. These data indicate that the proposed project would slightly increase the average flows in the river downstream of Newhall Ranch, consistent with the analysis conducted for the Specific Plan. No significant increases in velocity and related scouring, and no potentially significant cumulative project flooding impacts are expected to occur either in the vicinity of the project or downstream of the site as buildout occurs in the watershed.

Additionally, all development within the portion of the watershed of the Santa Clara River located in Los Angeles County is required to comply with the LACFWD Qcap requirements to ensure that upstream or downstream flooding does not occur. Compliance with these requirements ensures consistency with the County's Qcap model. Pursuant to LACDPW requirements, all drainage systems in developments that

carry runoff from developed areas must be designed for the 25-Year Urban Design storm, while storm drains under major and secondary highways, open channels (main channels), debris carrying systems, and sumps must be designed for the capital storm. LACDPW also prohibits significant increases in off-site post-development storm flows and significant increases in storm flow velocities. Development in the Los Angeles County portion of the watershed also must comply with LACDPW design criteria. As a result of this compliance, overall storm runoff discharge quantities from the watershed under post-development runoff conditions would be less than or equal to existing conditions largely because the runoff would be free of the debris that is typical of undeveloped watersheds and flow velocities would not increase significantly. Because on-site facilities would be constructed to accommodate for burned and bulked flows from undeveloped areas, they would have more than adequate capacity to accommodate off-site flows as the off-site portions of the drainage areas develop.

Other projects within Los Angeles County would be subject not only to the same general requirements as the proposed Landmark project, but also to such other requirements as LACDPW would specifically identify for them based on their unique topographic and geologic characteristics.

The analysis of project conditions, above, demonstrates that project development, which must comply with all County requirements and previously approved Newhall Ranch Specific Plan EIR mitigation measures, would not create any significant impacts. Compliance with the applicable regulations results in less discharge from the project post-development as compared to pre-development levels, and thus runoff from the project causes no incremental increase in the cumulative impact of watershed-wide development.

Because the cumulative project drainage improvements in Los Angeles County would be required to conform to the requirements of LACDPW in order to accommodate the capital flood from the effected watershed, no potentially significant cumulative project flooding impacts are expected to occur. The development criteria imposed on each project by LACDPW would ensure no potentially significant cumulative impacts.

As to the influence of increased urban area with respect to associated cumulative geomorphic impacts to the Santa Clara River, a study was prepared addressing these issues, which is located in Recirculated Draft EIR **Appendix 4.2**. Assessment of potential impacts resulting from cumulative hydromodifcation effects in selected reaches of the Santa Clara River is addressed in that study, which was prepared by Balance Hydrologics, Inc., October 2005 (Recirculated Draft EIR **Appendix 4.2**). In summary, the study concluded that:

> *Major perturbations within the Santa Clara River watershed (dam construction, levee construction, changes in flows in response to decadal-scale climatic patterns, and increase in woody vegetation) do not appear to have had a significant impact on the geomorphic expression of*

the Santa Clara River, as quantified from measurements made from a series of historical aerial photographs flown during the years 1927 through 2005.

The study has further concluded that while there is no expected increase in summer flows due to additional treated effluent discharge to the Santa Clara River, and even if summer baseflows do increase, it is not expected that there would be a significant change within the channel. Generally, large storm events, such as those that occurred in February 1998 and January 2005 can significantly modify the channel form. However, the study has concluded that the channel morphology of the Santa Clara River mainstem has not adjusted significantly to much larger disturbances in flow, sediment yield, and riparian vegetation growth factors, within the Newhall reach. Consequently, a significant impact is not expected to the geomorphic impact of the Santa Clara River mainstem due to the anticipated increase in urban development.

b. Conclusion

Other projects within the tributary watershed would not only be subject to the same general requirements as the proposed Landmark Village project, but to other requirements that LACDPW Flood Control Division may specifically identify for such projects based on their unique topographic and geologic characteristics. All development within the watershed of the Santa Clara River and within unincorporated Los Angeles County is required to comply with the LACDPW Flood Control Division requirements, which are designed to ensure that upstream or downstream flooding does not occur, and to ensure that downstream erosion and sedimentation do not occur. Therefore, no significant unavoidable cumulative flooding, erosion, and sedimentation impacts would occur. Compliance with these requirements ensures consistency with the County's Qcap model.

11. CUMULATIVE MITIGATION MEASURES

Other projects within Los Angeles County would not only be subject to the same general requirements as the proposed Landmark Village project, but to other requirements that the LACDPW Flood Control Division would specifically identify for such projects based on their unique topographic and geologic characteristics. Therefore, no further mitigation is specified in this section for cumulative development projects relative to downstream flooding, erosion, and sedimentation impacts. Buildout of the tributary watershed in which the Landmark Village site is located would not have an adverse impact on beach sand replenishment at the mouth of the Santa Clara River.

12. SIGNIFICANT UNAVOIDABLE IMPACTS

a. Project Impacts

Implementation of the above mitigation measures to the satisfaction of the LACDPW would reduce storm-related flooding, erosion, and sedimentation impacts to less than significant levels. Therefore, no significant unavoidable impacts are anticipated.

b. Cumulative Impacts

Because all development within the tributary watershed must comply with LACDPW Flood Control Division requirements to ensure that upstream or downstream flooding does not occur, there would be no significant cumulative impacts; and therefore, no significant unavoidable cumulative flooding, erosion, or sedimentation impacts would be created.