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*****Impacts determined not to be significant are addressed in this EIR under **Section VII, Impacts Determined to be Insignificant**, and have been omitted from the Impact Section of this report.

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INTRODUCTION

This section provides an overview of the existing conditions for earth resources within the proposed project area. It also discusses the potential impacts to these resources as a result of the development of the proposed project. The analysis contained in this section is based on a Geotechnical Report prepared for the proposed project site in March 2003 by Leighton and Associates. A copy of the Geotechnical Report is included in this Draft EIR as **Appendix A**.

GRADING

Environmental Setting

Geology and Topography

The 25.4-acre development area of the 449-acre project site consists of two predominantly north-south trending ridge tops with an intervening, steep-sided canyon that drains in a southerly direction to Bundy Drive, approximately one mile south of the project site. This canyon is referred to as Bundy Canyon in this Draft EIR and ranges approximately 200-400 feet in depth. The westernmost ridge is a continuation of Canyonback Ridge and the eastern ridge is Stoney Hill Ridge. Both of these ridges are partially built on with other existing Mountaingate Community developments that include the Crown, Crest and Promotory neighborhoods. In addition to Bundy Canyon, there are two other minor drainages found on the project site. One area drains to Mandeville Canyon and the other to Kenter Canyon.

Elevations at the project site range from 1,090 feet to 1,695 feet above mean sea level (msl). Gradients on the site range from nearly level to steeper than 1:1 (horizontal: vertical). Site vegetation consists of dense native chaparral, walnut woodland, riparian woodland non-native grasslands and coastal sage scrub. Please refer to **Section IV.D, Plant Life**, for greater description and discussion of on-site vegetation. As described in **Section III, General Description of Environmental Setting**, the property is predominantly vacant with the exception of the Los Angeles Department of Water and Power (DWP) access road along Canyonback Ridge, which terminates at the LADWP's on-site water tank. Other modifications to the ridge top area include Edison Company roads and tower pads along the western perimeter of the project site. In addition, Stoney Hill Ridge has been modified with a dirt access road that leads south from a dead-end street of the existing Crest and Promotory developments.

Site Geology

The bedrock formations at the site include the Jurassic-age Santa Monica Slate Formation and the Miocene-age Modelo Formation. The surficial earth units at the site consist of artificial fill (certified and uncertified), colluvium, alluvium, and slump and landslide deposits. The surface extent of the bedrock units, the artificial fill, and the slump and landslide deposits are shown in **Figure IV.A-1**. Brief descriptions of each of the earth units that were encountered at the site are as follows:

Artificial Fill (AfL)

Uncertified artificial fill including landfill materials exists to the east of proposed Lots 1 through 10 and is associated with the now closed Mission Canyon Landfills.

Certified Artificial Fill (AfC)

Certified artificial fill was placed adjacent to, and near, the existing water tank on the western ridge. A 20-foot high landscape fill was constructed on the southwestern side of the tank pad, and a 17-foot deep shear key was constructed across the access road, approximately 200 feet north of the tank, to stabilize the upper portion of slump deposit (Qs). Another area of certified artificial is located in the northern perimeter of the project site, south of the existing Mountain Crest Lane. In this area, a side-hill shear key and fill were constructed to mitigate stability concerns related to Landslide Qls-7 on the existing off-site residential development to the north.

Colluvium (Qcol)

Although not delineated on the Geotechnical Map, colluvial deposits are present on the site. They consist of thin, loose soil accumulations on slope flanks. This material is comprised of loose mixtures of silty clay, clayey silt, and silty sand with gravel and cobbles.

Alluvium (Qal)

Alluvial deposits at the site were not explored during our investigation due to the very steep terrain to get to the canyon bottoms. The existing canyons are narrowed with steep canyon walls. During our site reconnaissance, localized areas with bedrock outcrops were observed at the canyon bottoms, suggesting a predominant erosional environment rather than a depositional environment. Based on our surface field observations, it is anticipated that thickness of the alluvium could range between 5 to 15 feet, with the thickest alluvium being at the intersection of the two existing drainages (in the general area of the proposed desilting basin).

Figure IV.A-1

On-site Geotechnical and Soil Information

Landslide and Slump Deposits

Landslide deposits exist at the project site as a result of weathering, slope steepness, and well developed dip slope, or out-of-slope foliation in the Santa Monica Slate. Nine landslides (Qls-1 through Qls-9) have been mapped and characterized at the site. The majority of these landslides occur on the west-facing slopes and appear to have been facilitated by the pervasive, westerly-dipping foliation and/or along clay seams within shear zones in the Santa Monica Slate Formation bedrock. The thickness of the landslide materials are anticipated to range between approximately 15 to 90 feet. In addition to the mapped landslides, areas of relatively shallow slumping and accelerated erosion occur along the west sides of Canyonback and Stoney Hill Ridges. A questionable slump/landslide (Qs(?)/Qls(?)) deposit is mapped on the west-facing natural slope at the existing eastern terminus of Stoney Hill Road.

The approximate locations of the mapped landslides and slump areas throughout the project site are shown in **Figure IV.A-1**. These landslides and slumps have been identified based on photo analyses, surface mapping and subsurface exploration.

Modelo Formation

The Modelo Formation bedrock caps much of the western ridge. The bedrock units of the Modelo Formation, as observed on the outcrops and in the exploratory excavations, consist of weakly to well cemented, hard to very hard, massively bedded, fine- to medium-grained sandstones and silty sandstones, with thinly bedded siltstones and clayey siltstones, with localized claystone interbeds.

Santa Monica Slate Formation

The Santa Monica Slate Formation bedrock is stratigraphically the lowest and oldest unit that is exposed, and predominantly underlies the majority of the project site. This bedrock formation generally consists of medium to dark gray slate and phyllite. The unit varies from strongly foliated (due to remnant bedding and a preferred orientation of platy micaceous minerals) to weakly foliated and massive in appearance. The foliations within this bedrock unit are characteristically pervasive throughout the formation, but are not generally continuous planes. The Santa Monica Slate Formation was logged as hard to very hard with localized shearing and irregular quartzite veins sub-parallel to, and/or crosscutting, primary foliation structure. The formation was observed jointed and fractured, and weathers to dark orange-brown silt and clay along fractures and faults.

Geologic Structure

In general, bedding of the Modelo Formation strikes northeast, and dips to the southeast at angles typically ranging from 6 degrees to 27 degrees. Foliation within the Santa Monica Slate Formation is generally irregular in orientation and extent, although predominantly tends to strike north-south and dip to the west at angles varying from 8 degrees to 45 degrees, with localized steeper dip angles. Jointing/fracturing in both the Modelo Formation and the Santa Monica Slate Formation tends to be very steeply dipping, or near vertical.

Certain narrow irregular zones of severe fracturing and shearing, possibly related to regional seismic activity, exist on the project site.

Several northeast-southwest trending faults that offset the bedrock formations have been mapped at the site. These faults are predominantly steep-angle with a normal sense of movement. The faults are presumably secondary features associated with regional folding of the Santa Monica Mountains and lack evidence of being active. One of these faults was encountered during field explorations at the site; the fault plane did not displace the younger overlying colluvial deposits.

Groundwater

Regional ground water was not encountered during the field investigations conducted at the site. However, minor water seeps were encountered in several of the geotechnical borings excavated at the site. A heavy seepage was observed at the bottom of one of the most recent borings drilled at the site. The water surface in this boring rose to 66 feet below the ground surface.

No surface water was observed at the bottom of the deeply incised canyons during the field mapping at the site. However, relatively dense hydrophilic vegetation was observed along the canyon bottoms and it is expected that perched ground water of limited extent will be encountered during grading in these canyons.

Environmental Impact Analysis

Significance Threshold Criteria

The L.A. CEQA *Thresholds Guide* has been adopted by the City council and it indicates that a project would normally have a significant impact on landform alteration if one or more distinct and prominent geologic or topographic features would be destroyed, permanently covered or materially and adversely modified.[1] Such features may include, but are not limited to hilltops, ridges, hillslopes, canyons, ravines, rock outcrops, water bodies, streambeds and wetlands.

Project Impacts

Grading

The proposed development would consist of 29 single-family homes and two private roadways on 25.4 acres of land. The project also includes a dedication of approximately 424-acres of land for permanent open space. The proposed project would incorporate all the grading and fill techniques as required by the City of Los Angeles Department of Building and Safety, Grading Division. Approximately 56 acres, or twelve percent, of the project site would require grading in order to create the planned residential pads and road elevations. Grading will generally consist of excavation of the two existing ridge areas.

Figure IV.A-2, Soil Placement Locations, shows the areas where grading will occur. Development of the street extension and lots along the Stoney Hill ridge would require grading of a 13.3-acre area. A total of 575,000 cubic yards of earth would be cut in this area. As shown in **Figure IV.A-2**, 525,000 cubic yards would be deposited as a remedial grading solution in a nearby 11.3-acre fill area located in the adjacent canyon. In addition, up to 50,000 cubic yards of cut earth material may be deposited on the northern edge of the Mission Canyon 8 landfill. This material would be used to fill fissures in the landfill cover material and for other maintenance activities associated with the landfill as required by the existing landfill closure plan.

Development of the street extension of Canyonback Road and the associated lots would require grading of 11.0 acres. A total of 485,000 cubic yards of earth would be cut in the Canyonback development area. This material would be placed over 7.8 acres in a small canyon located immediately southeast of the Canyonback development area as shown in **Figure IV.A-2**.

The proposed remedial grading will include grading required to overexcavate and recompact the earth in the proposed building pads, partial or complete removal and recompaction of landslide debris, which impact the proposed development and construction of a shear and buttress keys and fills to stabilize landslide and slope areas. Approximately 91,000 cubic yards of earth would be

1 L.A. CEQA *Thresholds Guide: Your Resource for Preparing CEQA Analyses in Los Angeles*, City of Los Angeles, Environmental Affairs Department, May 14, 1998, p. C.3-3.

overexcavated, 850,000 cubic yards of landslide area would be stabilized while 24,000 cubic yards would be graded for shear key development.

In total, 1,055,000 cubic yards of earth would be cut in the Stoney Hill and Canyonback development areas and placed as fill on the site and 965,000 cubic yards of earth material would be graded to remediate existing landslide and soils conditions.

The maximum height of cut slopes would be approximately 100 feet. The maximum height of fill slopes would be approximately 300 feet. The proposed slope gradient of manufactured slopes (cut and fill) would be 2:1 (horizontal to vertical) or flatter. Maximum depth of cut would be approximately 80 feet and the maximum depth of fill would be approximately 80 feet for remedial earthwork.

Currently, the significant geologic-hazards at the project site are characterized by the presence of existing landslide areas, and the potential instability of the natural slopes due to adverse geologic structure within the bedrock formations as identified in the **Section III, General Description of Environmental Setting**, this Draft EIR. There are nine landslides (Qls-1 through Qls-9) and one potential slump/landslide within the proposed 25.4-acre development area. These landslides are shown in **Figure IV.A-1**. Recommendations of the Geotechnical Report prepared for the project site suggest that development of the project would require both, complete and partial removals of some of the identified landslides to reduce the potential risk for reactivation or slippage, in accordance with City guidelines.[2] The Geotechnical Report also provided additional recommendations in regards to other geologic hazards. The study recommends that the project would need to remove and/or rework/replace unsuitable or potentially compressible subsurface material such as colluvium, alluvium and landslide materials. Project earthwork-construction would be required to utilize shear and buttress keys. With implementation of the recommended grading and construction measures presented in the Geotechnical Report along with City grading requirements, the potential for landslide slippage and other geologic hazards would be less than significant. Geologic conditions common in the Santa Monica Mountains include such conditions as landslide areas, earth fracturing and generation of oversize rock materials during grading. The Geotechnical Report identified these typical conditions for the development area of the project site.[3] These common geologic conditions can be mitigated by implementing corrective grading concepts, such as the removal of landslide materials and the construction of buttresses and shear keys. The Geotechnical Report recommended these measures to correct these common conditions.[4] With implementation of the recommended mitigation measures, impacts to geologic site conditions and unique geologic structures would be less than significant as a result of the proposed project.

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2 Leighton and Associates, Inc., Geotechnical Report, March 2003.
3 Ibid., p. 3.
4 Ibid., pp. 13-14.

Figure IV.A-2

Soil Placement Locations

Cumulative Impacts

Located immediately north and directly adjacent to the north of the proposed project site is the existing Mountaingate Community. On the immediate south, west, and east of the project site is a large expanse of open land. In addition, the related project in the general area of the project site has been presented in **Section III** of this EIR.

Development of the open lands and the construction of the related projects would all involve grading and landform alterations due to comparable topographic conditions on the Santa Monica Mountains. However, there are natural limitations in making assumptions about soil conditions and grading impacts. This is because soils and bedrock over the same area show variations in geologic structure, type, and physical and chemical properties. As a result, individual development projects would be required to comply with the requirements of the City's Department of Building and Safety, Grading Division. Compliance with the City's requirements would ensure that cumulative project impacts associated with geologic structure and grading would not exceed the identified threshold of significance. Therefore, cumulative impacts would not be cumulatively considerable, and so are considered to be less than significant.

Mitigation Measures

1. The geotechnical and geologic consultants should provide observation and testing services continuously for all geotechnical-related activities, including the following:

    - All excavations, including excavations for buttresses, cut slopes, backcuts, and overexcavations;
    - Subdrain installation; and
    - Placement of fills.

2. During grading, the following tests shall be performed:

    - Sulfate content tests (to verify the recommendations for the sulfate content of soils within building pads).
    - Expansivity tests (to verify the recommendations for expansion potential values to be used for design, or to provide select, lower expansion potential materials).

3. As foundation, improvement, and 40-scale grading plans are finalized and loads are known, they shall be forwarded to the Geotechnical Consultant for review and verification of conformance with the intent of these recommendations.

4. Prior to grading and construction, any vegetation should be stripped, and trees should be removed. Surface obstructions, stockpiled and/or uncertified fills, miscellaneous debris, and any other deleterious material, should also be removed. Vegetal matter may be processed into mulch and stockpiled on site for use in landscaping areas. Otherwise, all such material should be hauled off site.

5. Holes and depressions, resulting from the removal of any buried obstructions, and/or oversize rocks that extend below finished site grades or in zones of overexcavation, should be backfilled with compacted fill.

6. Any existing underground utilities or wells should be identified and abandoned per the current requirements of the City of Los Angeles, and any other regulatory agencies.

Removals

7. The proposed grading plan indicates that fill is proposed in portions of the canyon area located between the two ridges. Soil deposits at the bottom of canyons are expected to be unsuitable for supporting the proposed fills, and therefore, should be removed to competent native materials. Field exploration in these specific areas was not performed due to difficult accessibility. However, based on field geologic mapping, alluvial deposits are expected at the bottom of these canyons. The thickness of these deposits is estimated to be on the order of 10-15 feet or less. This is an approximation, and if more definite information about the anticipated removals at the bottom of the canyons is desired, additional exploration should be performed. In this case, grading will be required to provide access. These relatively thin deposits of alluvium or colluvium are unsuitable for support of fill and shall be removed to expose competent native material prior to the placement of fill.

8. Landslide debris (Qls-6, Qls-8, and Qls-9) within the proposed grading areas including both cut and fill areas, should be removed to expose competent bedrock materials. The surface material (upper few feet of loose material) within the areas of Landslide Qls-5 and northern portion of the questionable slumps/landslide deposit Qs(?)/Qls(?) within the grading limits in the canyon bottoms should be removed, and replaced by engineered compacted fill.

9. The recommended depth of removals shall be determined by the project geotechnical consultant. Deeper removals than what is anticipated may be required in local areas, depending on actually encountered geotechnical conditions.

Overexcavation

10. The proposed building pads are designed as cut areas. The cut pads shall be overexcavated at least 5 feet below the planned grade. These planned grades would be achieved through the placement of engineered compacted fill. Building footings shall be underlain by a minimum of 3 feet of compacted fill that is keyed into the underlying bedrock.

11. Overexcavation deeper than 5 feet may be warranted in certain areas of the graded transition pads, particularly if highly expansive or unsuitable materials are encountered at the bottom of the cut portion of the pad. Therefore, the bottom of overexcavations should be observed by the project geotechnical consultant.

12. The need for deeper excavation (if warranted) would be determined in the field by the project geotechnical consultant, based upon observation and evaluation, if necessary, of conditions exposed at the bottom of overexcavations. The adequacy of the proposed overexcavation depth in certain areas of the site shall be further evaluated when foundation plans become available.

13. If pools are planned in the future, deeper overexcavation of at least 10 feet below the pad grade could be warranted due to the hard bedrock material and difficulties of overexcavation with smaller grading equipment.

Subdrainage System Beneath Fill

14. Subdrains should be placed on a clean bedrock surface in canyon bottoms prior to fill placement, and constructed in accordance with the recommended guidelines provided in the geotechnical investigation report prepared for the proposed project. Subdrain pipes ranging from 6 to 8 inches in diameter (8 inch for longer runs) and should extend to within 15 feet vertically of finished grade. Proposed subdrain locations have been provided within the report, but are subject to amendment based upon conditions encountered during grading.

Fill Placement and Compaction

15. Prior to fill placement, the bottom of the fill areas shall be scarified to a depth of between 8 to 12 inches, moisture conditioned to slightly above the optimum moisture content, and compacted to at least 90% relative compaction.

16. Fill materials should be moisture conditioned to approximately 2% above the optimum moisture content, placed in layers not exceeding 8 inches of uncompacted thickness, and compacted to at least 90% relative compaction.

Fill Material

17. Most of earth materials generated from cuts or overexcavations at the site may be used as fill materials. However, fill materials should be free from trash, debris, rocks larger in size than 8 inches, as well as any other deleterious materials.

18. Import fill (if any) should be similar to on-site materials, and shall be subject to approval by the project geotechnical consultant prior to hauling to the site or incorporated into windrows.

Sulfate Content/Cement Type

19. For planning purposes, concrete in contact with on-site soils should be designed in accordance with the moderate soluble sulfate category of Table 19-A-4 of the 1997 Uniform Building Code (UBC). Additional testing should be performed at the completion of rough grading to verify this conclusion.

Fill Slopes

20. A keyway associated with the removal of Landslides Qls-8 and Qls-9 shall be variable in width, ranging from approximately 70 to 100 feet, and should be excavated at least 5 feet into competent bedrock.

21. Fill slopes constructed on a sloping ground steeper than 5:1 (h:1) shall have a keyway that extends into competent in-place materials, and should be benched into competent materials.

Construction Considerations

22. The caisson-supported design system for this project is being developed for four separate areas within the proposed development. The caissons will be used to support Lots 28, 29, 22, and the last three existing residential structures adjacent to the subject tract at the existing terminus of Stoney Hill Drive. The depth to the failure surface, which is the retained height of material, is 30 to 40 feet for Lot 28, and 20 feet for Lots 29, 22, and the three existing structural residential units at the current terminus of Stoney Hill Road. The caissons should be a minimum of 2 feet in diameter and installed at a minimum center-to-center spacing of 3 times the diameter of the caissons, maximum spacing should range between 6 to 10 feet; on-site soils will arch between piles of this maximum spacing. The installation of the caissons is critical to ensure successful resistance.

23. Pile hole drilling shall be observed by the geotechnical consultant during construction, to verify that the piles are embedded in suitable materials, and to the expected embedment lengths in those materials. An uncased pile excavation shall not be performed adjacent to a recently cast pile until the concrete in the recently cast pile has set.

24. Excavations shall be filled with concrete as soon as practical after cleanout and observation. If an excavation is left open overnight, an additional observation by the geotechnical consultant shall be made prior to concrete placement, in case slaking (desiccation and loss of strength) of the excavation walls has occurred. If slaking has occurred, the excavation shall be freshened by reboring of the excavation prior to concrete placement.

25. A nominal allowable axial downward bearing pressure of 5,000 lb/ft^2 may be used in the pile design, if needed, for the cantilever pile design.

Other Considerations

26. Final design and spacing of the caisson system shall be performed and optimized by the structural engineer based on design specific input and review by the geotechnical consultant. Additional analyses corresponding to the structural design can be provided as required by the structural engineer.

Temporary Excavations

27. Removal of the landslide and slump material would be required within the pad areas to expose competent material. Depending on the amount and lateral extent of the removals, permanent lagging, may be required if the landslide material is removed up to, or close to, the caisson locations. Lagging would be needed to support the newly placed compacted fill material between caissons. The minimum height, or vertical extent, and lateral extent of lagging will be determined during grading operations. Permanent lagging should be reinforced concrete sheets.

28. All excavations for the proposed development shall be performed per the current OSHA (Occupational Safety and Health Agency) guidelines, and other regulatory agencies.

29. Backcut excavations shall maintain a minimum factor of safety for temporary slope stability equal to or greater than 1.25.

Probes Associated with Mission Canyon Landfill

30. The probes are currently located in the center of the eastern ridge and would be impacted by grading activities. Prior to grading, the probes shall be removed and properly abandoned (or incorporated into the project design) in accordance with applicable regulatory requirements.

Foundations and Slabs on Grade

31. Based on the geotechnical investigation prepared for the proposed project and existing site conditions, the proposed development can be supported with conventional foundations (shallow spread footings and conventional slab on grade). Recommendations for conventional foundations and post-tensioned foundations or post-tensioned slabs shall be provided at the grading plan stage.

Foundation Settlement

32. Building pads shall be overexcavated a minimum of 5 feet, and foundations will be founded into a newly placed compacted fill blanket that rests on bedrock. Foundations should be designed for a maximum anticipated settlement of 1/2 inch and a maximum differential settlement of 1/4 inch over a span of approximately 30 feet. Lots 15 through 20 will have up to approximately 30 feet of compacted fill due to the removal of Landslides Qls-8 and 9 and the rebuilding of a

2H:1V slope. Foundations for Lots 15 through 20 should be designed for a maximum anticipated settlement of 1 inch, and a maximum differential settlement of 1/2 inch over a span of approximately 30 feet.

Foundation Setback

33. All foundations located close to slopes shall have a minimum setback per UBC design guidelines, or in accordance with the structural setback zone as defined by the City of Los Angeles grading division whichever is greater. The setback distances shall be measured from competent materials on the outer slope face, excluding any weathered and loose materials. An alternative setback request, as indicated in Section 1806.5.6 of the 1997 UBC, can be recommended based on proper geotechnical evaluation and analysis, during the 40-scale plan review. Preliminary building setback recommendations on lots designed with the caisson supported system maybe considered as being H/3 but not exceeding 25 feet. The lots with this caisson-supported system will be evaluated and included in an alternative setback request during the future 40-scale grading plan review stage.

Foundation Venting

34. At the grading plan stage, special provision for foundation venting systems in each slab shall be considered for Lots 1 – 22 due to the proximity of the landfill to the east.

Seismic Design Parameters

35. The site lies within Seismic Zone 4, as defined in the UBC. Seismic Design parameters will be generated at the grading plan review stage of the project.

Subsurface Drainage

36. Special attention must be paid to subsurface drainage in subsequent phases of this project. Artificial sources of water, such as that from swimming pools and homeowner irrigation, must not be allowed to impact adjacent slopes. Special design requirements and homeowner notification is recommended. Artificial sources of water, such as that from swimming pools and homeowner irrigation, must not be allowed to impact adjacent slopes. If pools are planned and permitted in the future, on the above Lots special design requirements and/or subsurface drainage systems will be required and homeowner notification is recommended. Pool plans

should be reviewed by the geotechnical consultant to verify conformance to the geotechnical recommendations.

Surface Drainage

37. Pad drainage should be designed to collect and direct surface water away from structures to approved drainage facilities. A minimum downward gradient of approximately 2 percent shall be maintained, and drainage shall be directed toward approved swales or drainage facilities.

38. An earthen berm shall be constructed at the top of the descending slopes adjacent pads to direct surface water away from slope faces.

39. Existing drains at the site which outlet onto the natural slopes (Lot 22, and in the vicinity of Lot 15) shall be redirected away from the slopes to outlets at approved locations.

Asphalt Paving

40. The aggregate base material shall conform to the specifications for Class 2 Aggregate Base (Caltrans) or Crushed Aggregate Base (Standard Specifications for Public Works Construction). The base material shall be compacted to achieve a minimum relative compaction of 95 percent.

Adverse Impacts

The proposed project, as designed, incorporates all of the City required grading and fill techniques for hillside development projects. With implementation of mitigation measures recommended in this EIR, there would be no significant adverse impacts as a result of the development of the proposed Mountaingate residential project.

SEISMICITY AND SEISMIC HAZARDS

Environmental Setting

The two principal seismic considerations for most properties in Southern California are surface rupturing of earth materials along fault traces and damage to structures due to seismically-induced ground shaking. In addition, large earthquakes may be accompanied by secondary seismic hazards including liquefaction and seismic settlement, seismically induced landsliding, lateral spreading, earthquake-induced flooding, seiches, and tsunamis, depending on the site location, underlying soils, geologic structure, and ground water conditions. Each of these seismic hazards is discussed in the following sections.

Earthquake Fault Zones

In 1972, the Alquist-Priolo Special Studies Zones Act was passed into law. This Act was later renamed as "Alquist-Priolo Earthquake Fault Zoning Act" in 1994. The primary purpose of this act is to mitigate the hazard of fault rupture by prohibiting the location of structures for human occupancy across the trace of an active fault (Hart and Bryant, 1999). This State law was a direct result of the 1971 San Fernando earthquake, which extensive structural damage was associated with the surface fault ruptures from this earthquake.

The Act requires the State Geologist to delineate "Earthquake Fault Zones" along faults that are considered to be "sufficiently active" and "well-defined" and require additional studies prior to construction within the Earthquake Fault Zone. The boundary of an "Earthquake Fault Zone" is generally about 500 feet from major active faults and 200 to 300 feet from minor faults.

The fault classification system adopted by the California Geological Survey (CGS), formerly the California Division of Mines and Geology (CDMG), delineating Earthquake Fault Zones in proximity to active or potentially active faults, is used to regulate construction intended for human occupancy. An active fault is one that is known to have moved in the last 11,000 years. Faults showing evidence of movement within the last 1.6 million years, but has not been proven by direct geologic evidence to have moved within the last 11,000 years is considered to be potentially active.

The project site is not located within any Earthquake Fault Zone, and no zoned faults cross or project to the project site.

Regional Faulting

Geologic and seismic studies have found that the Los Angeles Basin is a geologically complex area with over 100 active and potentially active faults. Many of the faults traversing the Southern California area have the potential of generating strong ground motions at the project site.

A search was made for all of the known active and potentially active faults within a 62-mile (100-km) radius of the site using the computer program EQFAULT (Blake 2000a), which contains a database of faults compiled jointly by the California Division of Mines and Geology, and the United States Geological Survey. The closest faults that can contribute intense seismic ground shaking, based on the deterministic analyses, are listed in **Table IV.A-1**. The remaining faults located within the 62-mile radius are provided in the Geotechnical Report in **Appendix A** of this Draft EIR. The locations of these faults with respect to the site are shown in **Figure IV.A-3**.

Table IV.A-1
Local Fault Distance and Maximum Earthquake Magnitude

Fault Name	Distance (miles)	Maximum Earthquake Magnitude (Mw)
Santa Monica	2.1	6.6
Northridge (E. Oak Ridge)	3.2	6.9
Malibu Coast	3.3	6.7
Hollywood	4.4	6.4
Newport-Inglewood	9.1	6.9
Palos Verdes	9.6	7.1
Verdugo	11.4	6.7

Local Faulting and Probabilistic Ground Shaking

Several northeast-southwest trending faults that offset the bedrock formations have been mapped at the site. These faults are predominantly steep-angle with a normal sense of movement. The faults are presumably secondary features associated with regional folding of the Santa Monica Mountains and lack evidence of being active. One of these faults was encountered during field explorations at the site; the fault plane did not displace the younger overlying colluvial deposits.

An earthquake occurs when the elastic strain energy that has accumulated in the bedrock adjacent to a fault is suddenly released. The energy released propagates in the form of seismic waves that radiate great distances in all directions from the earthquake epicenter. The strong ground motion or shaking produced by these seismic waves is the primary cause of earthquake damage. How much the ground shakes at any one point depends primarily on the earthquake magnitude, distance from the earthquake source, and the local geologic conditions, which can either amplify or attenuate the earthquake waves.

Figure IV.A-3

Regional Fault Locations

The current edition of the Uniform Building Code (UBC 1997) states that the minimum standard for design of structures is a ground motion that has a 10% chance of exceedance in a 50-year time period, i.e., a ground motion that has a 475-year average return period. In order to estimate this ground motion, a probabilistic seismic hazard analysis (PSHA) was performed for the site using the computer program FRISKSP (Blake, 2000b).

The PSHA considered various magnitudes of earthquakes that major active or potentially active faults within a 100-km radius of the site could produce along their respective fault lengths. The fault parameters that were used were derived jointly by the California Division of Mines and Geology and the United States Geological Survey (Petersen, et al., 1996), and are recommended for use by UBC 1997.

In order to assess the ground motion that could be induced at the site, the attenuation relationships of Boore, et al. (1997), Campbell and Bozorgnia (1997), Sadigh, et al. (1997), and Abrahamson and Silva (1997) were used. An attenuation relationship assesses how the amplitudes of ground motions decrease with distance from the source that generates the motions (i.e., an earthquake produced by a fault). Attenuation relationships are commonly derived from data from similar earthquake types and in similar geographic locales.

The results that were derived from the use of the attenuation relationships were summed and averaged in order to estimate appropriate ground motions for use in design. Based on the results of the PSHA, the PHGAs at the project site range between 0.49g and 0.54g. The results of the PSHA are presented graphically in the Geotechnical Report in **Appendix A** of this EIR.

Secondary Seismic Hazards

In addition to seismic shaking, other effects of seismic activity include liquefaction and seismic settlement, landslides, lateral spreading, earthquake-induced flooding, seiches, and tsunamis. Results of a review of the potential of these effects impacting the project site are presented below:

Liquefaction

Liquefaction is a seismic phenomenon in which loose, saturated, fine-grained granular soils behave similarly to a fluid when subjected to high-intensity ground shaking. Liquefaction occurs when three general conditions exist: (1) shallow groundwater; (2) low density, fine, clean sandy soils; and (3) high-intensity ground motion. Studies indicate that saturated, loose and medium dense, near-surface cohesionless soils exhibit the highest liquefaction potential, while dry, dense, cohesionless soils and cohesive soils exhibit low to negligible liquefaction potential. Effects of liquefaction on level ground can include sand boils, settlement, and bearing capacity failures below structural foundations. Lateral spreading can also occur in areas of sloping ground.

Based on the review of the State of California Seismic Hazard Zones Map for the Beverly Hills Quadrangle, (CDMG, 1999), the project site is not located within an area considered susceptible to liquefaction.

Seismic Settlement

Seismic densification of dry soils is a phenomenon in which loose, dry soils, primarily sands and silty sands, densify and settle when subjected to earthquake shaking. In Southern California, evidence of seismically-induced densification and resultant settlement of dry soils have been observed in the 1971 San Fernando and the 1994 Northridge Earthquakes.

The project site is predominantly underlain by bedrock materials. As a result, the potential for seismic densification and related settlement within the project area is considered to be low.

Landslides

Seismically-induced landslides and other slope failures are common occurrences during or soon after earthquakes. The existing natural slopes within, and adjacent to the project site are located within an area susceptible to seismically-induced landslides (CDMG, 1999). The stability of these slopes has been evaluated and are provided in the Geotechnical Report in **Appendix A** of this EIR. Based on the results of slope stability analyses, the potential for seismically induced landslides in the project area is considered minimal.

Lateral Spreading

Seismically-induced lateral spreading primarily involves lateral movement of earth materials due to ground shaking. It differs from slope failure in that complete ground failure involving large down-slope movement does not occur due to the relatively shallow gradient of the initial ground surface. Lateral spreading is demonstrated by near-vertical cracks with predominantly horizontal movement of the soil mass involved.

As previously mentioned, the liquefaction potential at the site is considered negligible. Therefore, the potential for lateral spreading and its effects at the site is also considered negligible.

Earthquake-Induced Flooding

Earthquake-induced flooding is caused by dam, or other water retaining structure failures as a result of seismic shaking. Strong seismic ground motion can cause dams and levees to fail, resulting in damage to structures and properties located downstream of the damaged reservoirs. Flood control and water-storage facilities can also fail as a result of geotechnical flaws not recognized in the feasibility studies, design or construction phases of the project.

No current dams or levees exist at the site or vicinity. It should be noted that an existing water tank is located approximately 900 feet to the south of Lot 27 and the proposed terminus of the Canyonback Road. Based on the location and distance of this tank with respect to the proposed development, the potential for flooding in the project area is considered to be low.

Seiches

Seiches are large waves generated in enclosed bodies of water (such as reservoirs, lakes, or ponds) in response to ground shaking. As discussed, an existing water tank is located approximately 900 feet to the south of Lot 27 and the proposed terminus of the Canyonback Road. This water tank is surrounded by steep slopes that generally descent to canyon bottoms outside the proposed development. The design strength of this water tank is unknown at this time. However, because of the location and distance of this tank with respect to the proposed development, the potential for seiches in the project area is considered low.

Tsunamis

Tsunamis are large tidal waves generated in large bodies of water by fault displacement or major ground movement caused by underwater landsliding. The project site is located in the higher portions of the Santa Monica Mountains and it is well outside any potential tsunami inundation areas. The potential for tsunamis affecting the project area is considered implausible.

Environmental Impact Analysis

Significance Threshold Criteria

The L.A. CEQA *Thresholds Guide* indicates that: "a project would normally have a significant geologic hazard impact if it would cause or accelerate geologic hazards which would result in substantial damage to structures or infrastructure, or expose people to substantial risk of injury."[5] In addition, a significant sedimentation or erosion impact would occur if the project would constitute a geologic hazard to other properties by causing or accelerating instability from erosion, or if the project would accelerate natural processes of wind and water erosion and sedimentation, resulting in sediment runoff or deposition which would not be contained or controlled on site.[6]

Project Impact

Seismic Ground Shaking

Slight to moderate ground shaking is possible at the site if an earthquake occurs on a segment of the major local active faults. Some areas of the project site are underlain by unconsolidated colluvial soils and loose landslide and slump materials, which tend to amplify earthquake-produced ground motion. The anticipated peak horizontal ground accelerations (PGA's) expected at the site, for a 10% probability of exceedance in 50 years range between approximately 0.49 and 0.54g. This is considered a significant impact.

Ground Surface Rupture

Several northeast-southwest trending faults have been mapped at the site. However these faults have poor geomorphic expression and lack evidence of being active. In addition the site is not located within an Earthquake Fault Zone, and no zoned faults cross or project to the site. Therefore, impacts associated with ground rupture are considered less than significant.

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5 L.A. CEQA *Thresholds Guide: Your Resource for Preparing CEQA Analyses in Los Angeles*, City of Los Angeles, Environmental Affairs Department, May 14, 1998, p. C.1-4.

6 Ibid., p. C.2-3.

Secondary Seismic Hazards

Several secondary phenomena are generally associated with strong seismic shaking, especially in areas characterized by a relatively shallow ground water table, and underlain by loose, cohesionless deposits. These phenomena are discussed below:

Liquefaction

As discussed previously the potential for liquefaction at the site is considered to be negligible. Additionally, any loose landslide debris and colluvial soils would be removed during grading. Since the proposed fills will be adequately compacted in accordance with the recommendations of the attached Geotechnical Report in **Appendix A**, liquefaction impacts at the site are considered less than significant.

Seismic Settlement

Since the loose landslide debris and colluvial soils would be removed during grading, and since the proposed fills will be adequately compacted, the potential for seismically induced settlement is considered low. As a result, impacts associated with seismically induced settlement are considered less than significant.

Landslides

As discussed previously the potential for seismically induced landslides at the site is considered to be low, provided that the remedial activities recommended in the attached Geotechnical Report, in **Appendix A**, are implemented during the design and construction phases of the proposed project. The corrective grading, in the form of buttresses and shear keys, will increase the pseudostatic factor of safety of the larger landslides to an acceptable level of 1.1 or greater. With the implementation of site grading and corrective grading, the potential for seismically induced landslides will be reduced to a less than significant level.

Since all alluvial and colluvial soils and compressible landslide materials will be removed during grading at the site, settlement due to compressibility of these soils will not be a consideration. As part of the proposed project, fill soils would be placed slightly above optimum moisture content during grading to reduce the potential for the occurrence of hydroconsolidation of the proposed fills. As a result, impacts associated with compressible soils or hydroconsolidation would be less than significant.

As part of project construction, the project site would be modified through excavation, clearing of vegetation and the placement of fill. During this time, the site would be subject to increased potential for erosion and sedimentation, which could impact uses at lower elevations. It is assumed in this analysis that during project operation, all graded slopes and building pad areas not occupied by structures would be landscaped with ornamental and/or native vegetation or treated in a manner that would reduce the potential for erosion to the greatest extent feasible. This would significantly reduce erosion and subsequent sedimentation on the site. As a result, no significant impacts would occur.

Lateral Spreading

The potential for lateral spreading and its effects at the site is considered to be low. Therefore, this hazard is considered less than significant.

Seismically-Induced Flooding

An exiting water tank is located to the south of the proposed development at the western portion of the site. As mentioned previously, because of the location and distance of this tank with respect to the proposed project, the potential for flooding due to the failure of this tank is considered low. However, a desilting basin is proposed at the intersection of the canyon fill and buttress fill in the southerly portion of the site. As the design and construction of this basin will need to comply with current local guidelines and requirements, seismically induced flooding hazards at the site would be less than significant.

Seiche

Although the design strength of the existing water tank is unknown at this time, because of the location of this tank with respect to the proposed development, the potential for seiches impacting the project site is considered to be low. Therefore, this hazard is considered less than significant.

Tsunami

As motioned previously, the potential for tsunamis at the site is considered to be absent. Therefore, this hazard is considered less than significant.

Cumulative Impacts

Geologic hazards are typically a site-specific condition that does not represent a cumulative concern. In certain circumstances, such as hillside development or construction in areas prone to landslides, individual projects can interact with one another to cause unstable conditions if not properly designed and constructed. In the case of the project site, an existing development is located north and directly adjacent to the project site. On the immediate south, west and east of the project site is a large expanse of open land. In addition, a related project in the general area of the project site has been presented in **Section III** of this EIR. As these projects are not located near each other, no cumulative impacts would result.

Implementation of the proposed project and other projects in the Southern California region would cumulatively increase the number of structures and people exposed to geologic and seismic related hazards. So long as project design and construction occurs consistent with proper engineering practices and to the requirements of applicable portions of the Municipal Code as they apply to each project, seismic and regional geologic hazards would not be considered cumulatively considerable.

On a site-specific basis, the project site is within a larger master plan development approved for 870 units. Existing residential development adjacent to the project is part of a master tract that was subject to review by the City during the approval process. This allowed a comprehensive review of local geologic conditions to ensure site design and engineering practices applied during construction of individual subdivisions within the master tract form an effective program to mitigate local geologic conditions. Given the above, with implementation of the measures identified in the geotechnical report prepared for the project, geologic hazards would not be considered cumulatively considerable, and so no significant cumulative impact would occur with respect to earth resources.

Mitigation Measures

It should be noted that the mitigation measures identified earlier in this section also are applicable to impacts identified as a result of seismic activities.

1. Refer to the mitigation measures listed earlier in this section (Page IV. A-9 – Page IV. A-6).

Adverse Impacts

Because site development and construction must comply with the City of Los Angeles requirements pertaining to seismic safety, as outlined in the mitigation measures, no unavoidable adverse significant impacts associated with seismic hazards would occur.