4.5 SAFETY AND GEOLOGIC HAZARDS

The following analysis is based, in part, on the analysis in the "Technical Memorandum Discussing Preliminary Geotechnical Engineering Considerations for the Chandler Ranch Development in Paso Robles, California" (October, 1995) and the "Phase I Environmental Site Assessment Report for the Chandler Ranch Property" (December, 1995), both of which were prepared by Fugro West, Inc. These analyses are included in their entirety within Appendix F of this EIR. Based on studies of the subject site, the project is anticipated to result in several potentially significant but mitigable impacts. All or portions of the site are subject to potential erosion, expansive soil, ground shaking and landsliding. In addition, the site could also be subject to the migration of hazardous materials from off-site locations and from soils that could contain residual quantities of presently-banned agricultural chemicals. Potential hazards identified herein can be mitigated by proper engineering design and construction.

4.5.1 Setting

a. Geologic Conditions and Topography. The geology of northern San Luis Obispo County is in one of the most complex formations in the state. Jurassic rocks, approximately 180 million years old, form the Franciscan complex, which is a mixture of igneous, metamorphic and sedimentary rocks. Alluvial soils occur along creeks and the Salinas River where intensive land uses have typically been located. Deeper rock formations contain groundwater, which provides the water supply for development. The Specific Plan area is located within the Salinian domain, which is part of a northwest-trending tectonic terrain within the California Coast Ranges, characterized by granitic and crystalline metamorphic basement rocks (Compton, 1966). Historical seismicity in the Salinian domain is concentrated mainly along its right-lateral strike-slip boundary faults (Nacimiento and San Andreas), and is relatively sparse within the central portion of the domain. The main geologic hazards associated with this domain are groundshaking, liquefaction or seismic related settlement of alluvium in the low lying areas and landslide potential in hillsides of moderate to steep slopes that have experienced large to moderate size landslides in some formations.

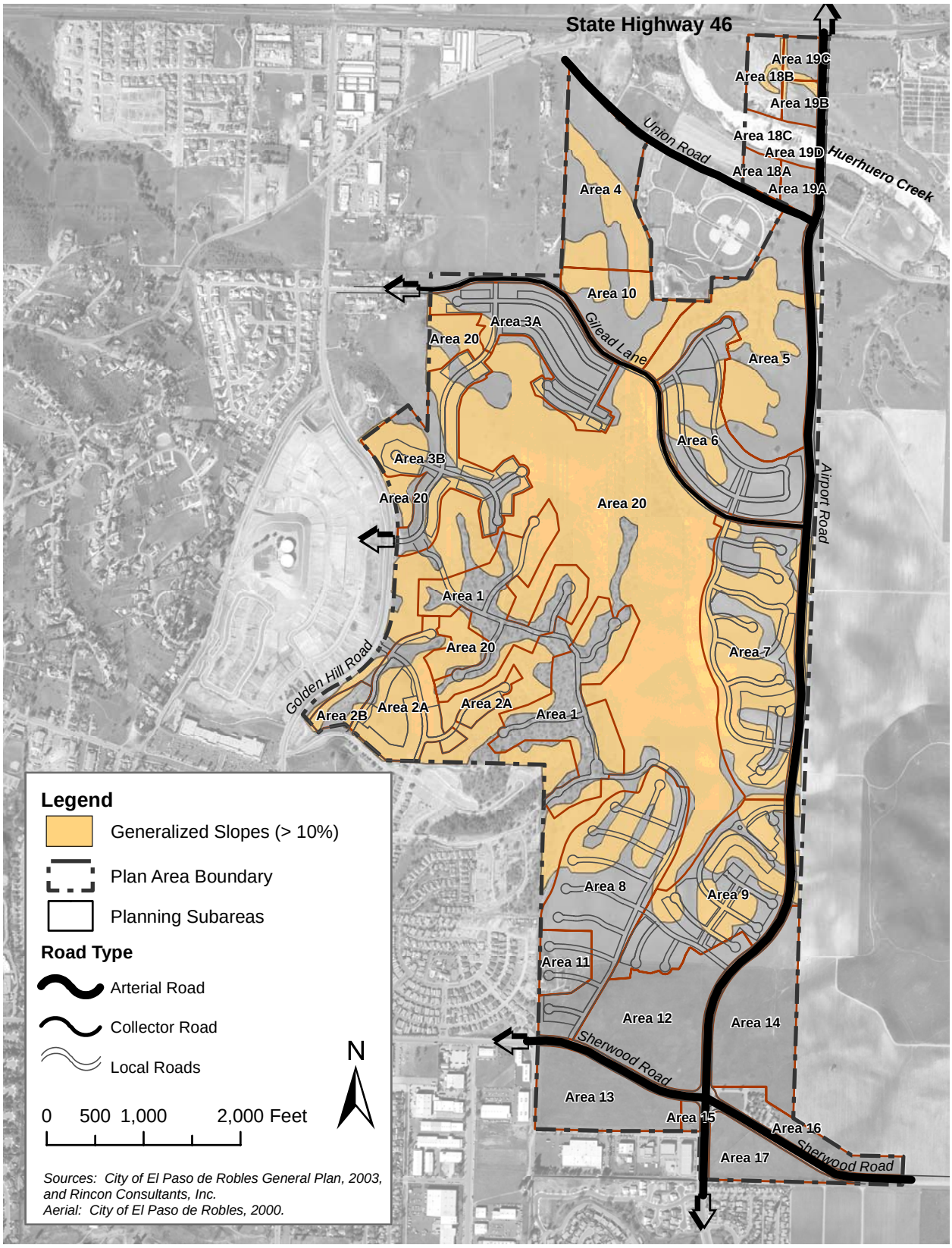
The Chandler Ranch site generally consists of relatively gently rolling hill terrain with a major north-south trending ridgeline in the central portion of the site (refer to Figure 4.5-1). Steeper slopes are present along the flanks of this ridgeline with canyons and drainages emanating away from these higher elevations. Elevations across the site range from a high of approximately 985 feet along the main ridgeline to 760 feet at the northeast corner of the site. At that location, the primary northeast trending on-site tributary drains to Huerhuero Creek, located immediately northeast of the subject property.

b. Site Geology and Soils. Specific Plan area soils generally consist of colluvium and older alluvium overlying Pleistocene-age deposits of the Paso Robles Formation. Colluvium and/or residual soils are encountered at the ground surface (up to depths ranging from three to fifteen feet) with an average depth of five feet. The thickest colluvium is found at the bottom of canyons and drainages. Colluvium soils consist of clays mixed with sand and gravel. Older alluvium, consisting of silts and clayey sands, are located along the northern and southern ends of the site in relatively flat lower lying areas. Older alluvium was encountered at a maximum depth of six feet below the surface. Soils within the underlying Paso Robles Formation are typically composed of hardened silt and clay interspersed with sand and gravel (refer to Table 4.5-1). The Paso Robles Formation was encountered at depths exceeding 70 feet.

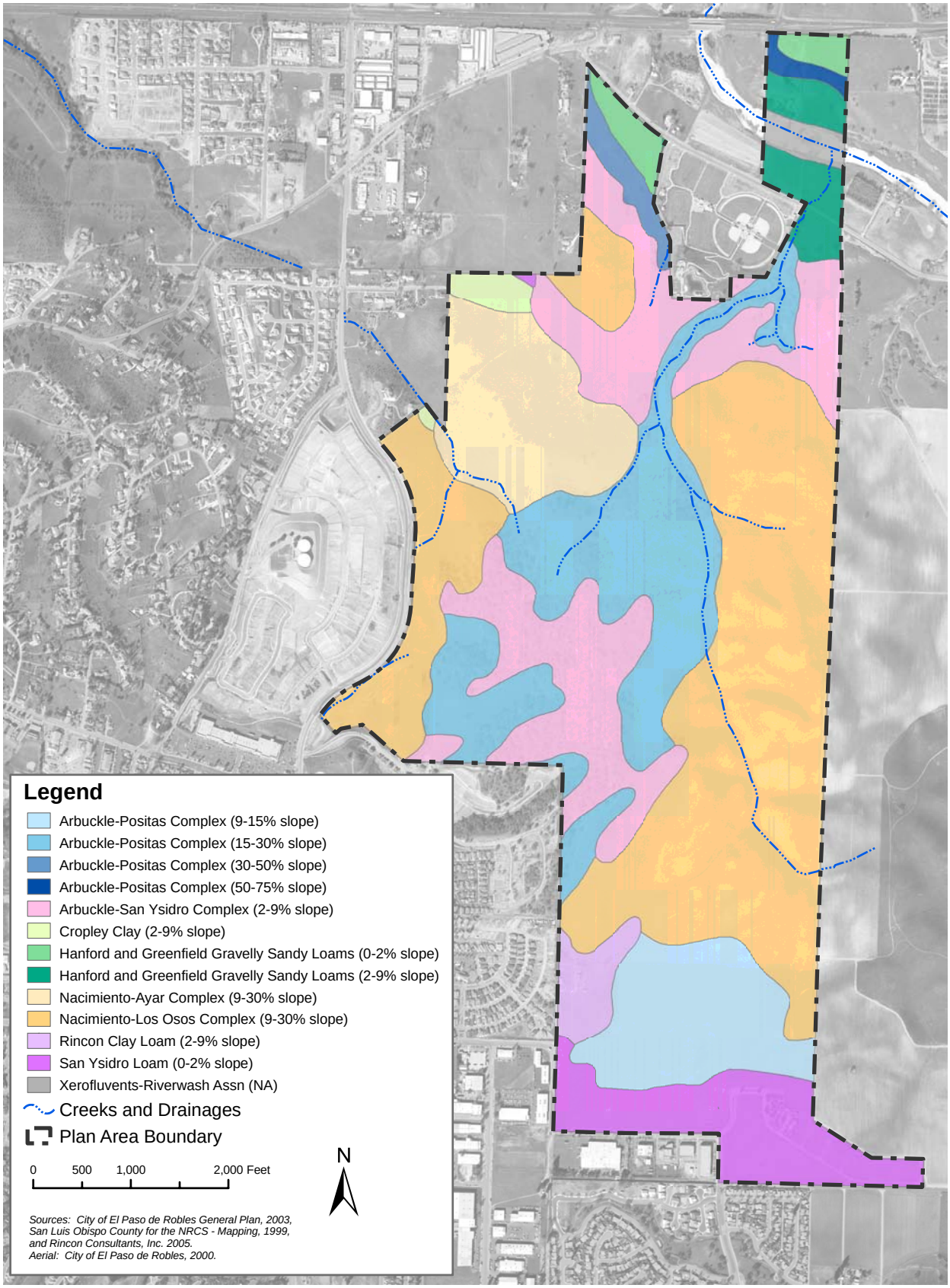
Table 4.5-1. Selected General Soil Parameters

Name	Permeability	Water Holding Capacity	Expansion Potential	Rate of Surface Runoff	Erosion Hazard
Arbuckle-Positas complex (50-75% slopes)	Moderately Slow to Very Slow	Moderate to High	Low	Very Rapid	Very High
Arbuckle-Positas complex (9-15% slopes)	Moderately Slow to Very Slow	Moderate to High	Low	Medium	Moderate
Arbuckle-Positas complex (15-30% slopes)	Moderate to Very Slow	Moderate to High	High	Rapid	High
Arbuckle-Positas complex (30-50% slopes)	Moderate to Very Slow	Moderate to High	High	Rapid	High
Arbuckle-San Ysidro complex (2-9% slopes)	Moderately Slow to Very Slow	Moderate to High	Moderate	Medium	Moderate
Nacimiento-Los Osos complex (9-30% slopes)	Moderately Slow to Slow	Low to Moderate	Moderate	Rapid	High
Cropley Clay (2-9% slopes)	Slow	High to Very High	High	Medium	Moderate
Rincon clay loam (2-9% slopes)	Slow	High to Very High	Moderate to High	Medium	Moderate
San Ysidro loam (0-2% slopes)	Very Slow	Moderate to High	Low to High	Slow	Slight
Hanford and Greenfield Gravelly Sandy Loams (0-2% slopes)	Moderately Rapid	Low to Moderate	Low	Slow	Slight
Hanford and Greenfield Gravelly Sandy Loams (2-9% slopes)	Moderately Rapid	Low to Moderate	Low	Medium	Moderate
Nacimiento-Ayar complex (9-30% slopes)	Moderately Slow to Slow	Moderate to High	High	Rapid	High
Xerofluvents	ND	ND	ND	ND	ND

ND: No Data
Source: U.S. Natural Resources Conservation Service (NRCS) Soil Survey of San Luis Obispo County, California, Paso Robles Area, Revised May 1983.



Generalized Slopes in Excess of 10% Figure 4.5-1



Soils Map Figure 4.5-2

c. Geologic and Seismic Hazards. Similar to much of California, the Chandler Ranch Area is located within a seismically active region. Several potentially active on-shore faults are mapped in the project vicinity (refer to Figure 4.5-3). No active or potentially active faults are known or are suspected within the Chandler Ranch site boundaries. The closest mapped fault is the Huerhuero Fault, which follows the general location of Huerhuero Creek, approximately two miles to the east of the site. Although this fault is not considered to be active or potentially active, this fault is classified as an "undivided Quaternary fault," a fault that has evidence of displacement within the last 1.6 million years. The geologic and seismic hazards relevant to the project site are described in the impact assessment below.

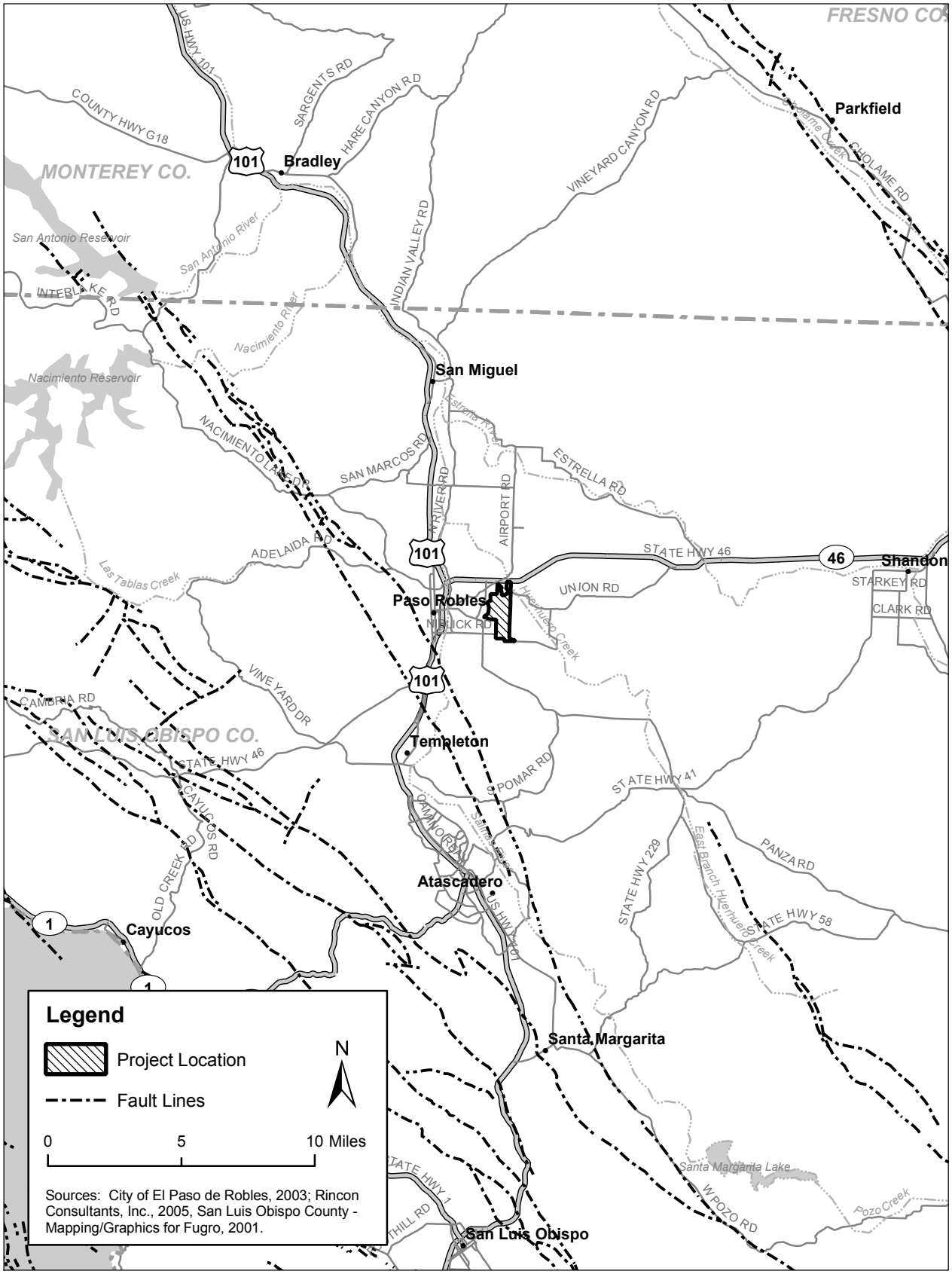
Faulting. The U.S. Geological Survey defines active faults as those that have had surface displacement within Holocene time (about the last 11,000 years). Surface displacement can be recognized by the existence of cliffs in alluvium, terraces, offset stream courses, fault troughs and saddles, the alignment of depressions, sag ponds, and the existence of steep mountain fronts. Potentially active faults are ones that have had surface displacement during the last 1.6 million years. Inactive faults have not had surface displacement within the last 1.6 million years. Several faults are located in the vicinity of the project site (refer to Figure 4.5-3), and are described in the paragraphs below:

Oceanic Fault Zone. The Oceanic Fault Zone, located in coastal Central California, lies offshore and in the Santa Lucia mountains, north of the town of Cambria and near Hearst Castle. Seismologists have agreed that fault zone was the source of the earthquake that shook Paso Robles on December 22, 2003. The Oceanic Fault Zone stretches from Vandenberg Air Force Base in the south to the Golden Gate Bridge in the north.

The December 2003 earthquake, commonly known as the San Simeon earthquake, measured 6.5 on the Richter scale. The event was located 11 kilometers NE of San Simeon, and 39 kilometers WNW of Paso Robles, where the brunt of the damage occurred. The strong shaking during the main-shock reached 47% of the force of gravity at the Templeton Hospital grounds. The shallow but powerful earthquake uplifted the Santa Lucia Mountains and triggered a vigorous aftershock sequence.

Approximately 800 aftershocks above magnitude (M) 1.8 and 97 above M3 have been recorded in the first 48 hours since the initial temblor, and they are expected to continue for several years. The rate of aftershocks is about 50% higher than the average California earthquake sequence bit. Numerous active faults are mapped in the epicentral region, but it is not yet clear which, if any, of these mapped faults may have ruptured during the quake. Many landslides and liquefaction features have been found as is typical for an earthquake of this size.

San Andreas Fault. The San Andreas Fault, which is the most likely source of a major earthquake in California, is located 20 miles east of the site, along the eastern border of San Luis Obispo County. It is the primary surface boundary between the Pacific and the North American plate. There have been numerous historic earthquakes along the San Andreas fault, and it is generally considered to pose the greatest earthquake risk to California. The San Andreas Fault is likely capable of producing a Maximum Credible Earthquake (MCE) of magnitude Mw 8.25.



Regional Earthquake Fault Zones Figure 4.5-3

Rinconada Fault. The closest substantial fault to the site is the potentially active Rinconada Fault, which is located approximately 2 miles west of the site. Large scale strike-slip movement along the fault zone is indicated by a predominance of right-lateral displaced drainages along various segments of this fault. Hart (1985) indicates that the lack of geomorphic features in young alluvium, normally associated with strikeslip faults, suggests the fault has been inactive during the Holocene time. Nevertheless, the California Division of Mines and Geology (CDMG) considered the fault to be potentially active. It is estimated that the Rinconada Fault is capable of generating a MCE of approximately 7.5. A seismic event is considered likely on this fault segment between Cholame and San Bernardino, with expected peak ground accelerations of approximately 0.25 to 0.30g[1] with a during of strong groundshaking of 40 to 50 seconds,

Nacimiento Fault. The Nacimiento Fault, which has recorded several recent moderate seismic events, is located approximately 21 miles west of the site, in the Santa Lucia Range. The Nacimiento fault zone separates the soft rocks of the Coastal Franciscan domain on the west from the primary granitic rocks of the Salinian domain on the east. Based on mapping by several investigators, the Nacimiento fault zone is not a single fault line of specific age, but rather a complex zone of branching and discontinuous faults of diverse orientations, movement, and ages.

Huerhuero Fault. One known inactive fault, the Huerhuero Fault, is located approximately two miles east of the site, along the west side of Huerhuero Creek. This fault is not considered to be active or potentially active, and is classified as an "undivided Quaternary fault," a fault that has evidence of displacement in the last 1.6 million years.

Faults generally produce damage in two ways: ground shaking and surface rupture. Seismically induced ground shaking covers a wide area and is greatly influenced by the distance of the site to the seismic source, soil conditions, and depth to groundwater. Surface rupture is limited to very near the fault. Other hazards associated with seismically induced ground shaking include earthquake-triggered landslides and tsunamis. Tsunamis and seiches are associated with ocean surges and inland water bodies, respectively. Neither of these hazards would affect the project area.

<u>Liquefaction</u>. Liquefaction is defined as the sudden loss of soil strength due to a rapid increase in soil pore water pressures resulting from seismic ground shaking. Liquefaction potential is dependent on such factors as soil type, depth to ground water, degree of seismic shaking, and the relative density of the soil. When liquefaction of the soil occurs, buildings and other objects on the ground surface may tilt or sink, and lightweight buried structures (such as pipelines) may float toward the ground surface. Liquefied soil may be unable to support its own weight or that of structures, which could result in loss of foundation bearing or differential settlement. Liquefaction may also result in cracks in the ground surface followed by the emergence of a sand-water mixture.

[1] The force on a building during an earthquake is proportional to ground acceleration. Such forces are prescribed by the UBC. During an earthquake the ground acceleration varies with time. "g" is a common value of acceleration equal to 9.8 m/sec/sec (the acceleration due to gravity at the surface of the earth). 30% of g is the acceleration one would experience in a car that takes 9 seconds to brake from 60 miles per hour to a complete stop.

Because of the relatively fine-grained nature of soils encountered on the Chandler Ranch site coupled with relatively deep groundwater conditions, on-site soil materials possess a relatively low potential for liquefaction. The only area in the vicinity of the site with high liquefaction potential is the alluvial soils located along Huerhuero Creek, outside the site boundaries, where shallow groundwater may be present (refer to Figure 4.5-4). However, due to the presence of unconsolidated alluvial material underlying portions of the proposed Specific Plan area (including areas adjacent to Huerhuero Creek), liquefaction is considered to be a geologic hazard within the Chandler Ranch area.

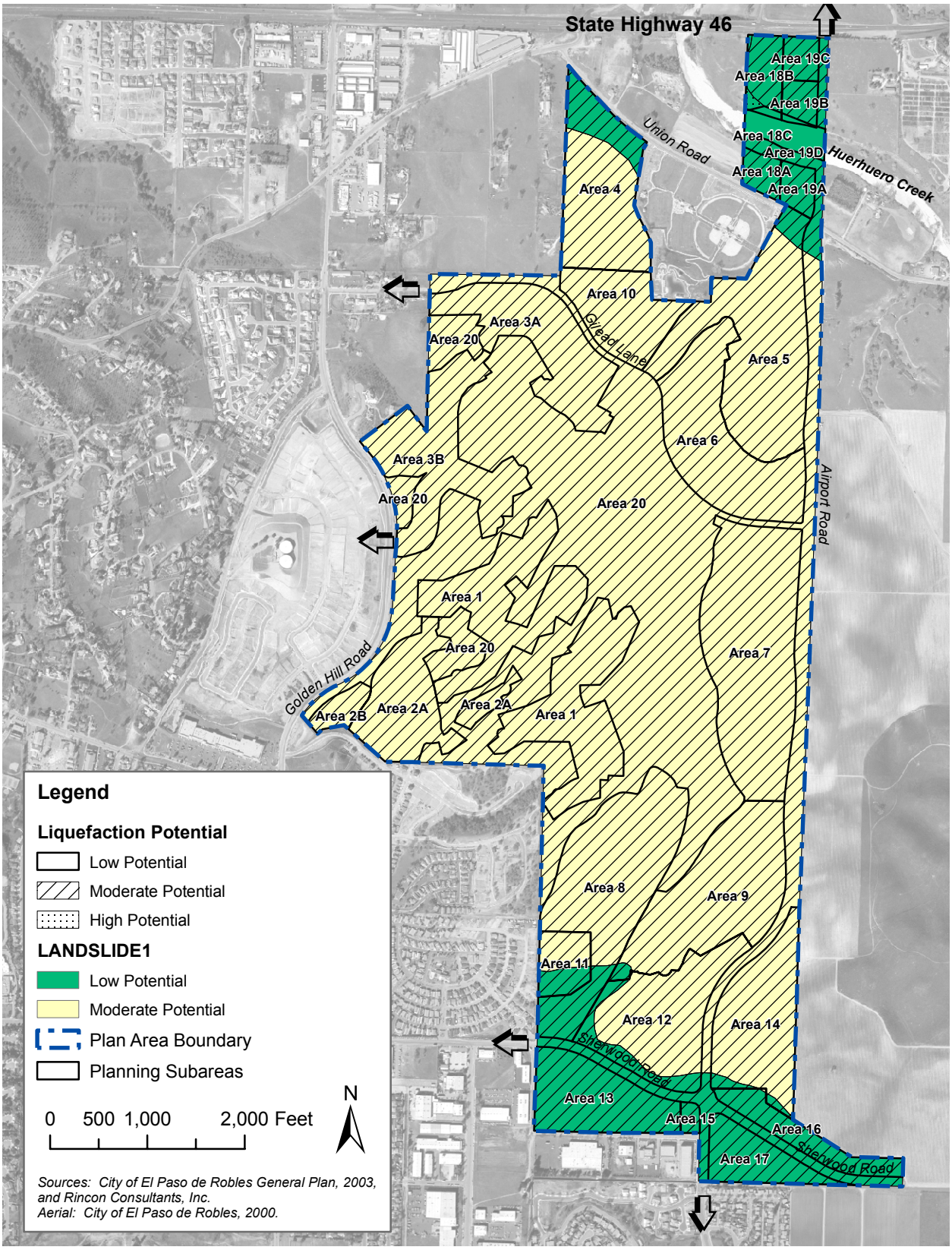
Slope Stability and Landslides. Landslides result when the driving forces that act on a slope (i.e., the weight of the slope material, and the weight of objects placed on it) are greater than the slope's natural resisting forces (i.e., the shear strength of the slope material). Slope instability may result from natural processes, such as the erosion of the toe of a slope by a stream, or by ground shaking caused by an earthquake. Slopes can also be modified artificially by grading, or by the addition of water or structures to a slope. Development that occurs on a slope can substantially increase the frequency and extent of potential slope stability hazards. Areas susceptible to landslides are typically characterized by steep, unstable slopes in weak soil/bedrock units which have a record of previous slope failure. There are numerous factors that effect the stability of the slope, including: slope height and steepness, type of materials, material strength, structural geologic relationships, ground water level, and level of seismic shaking.

Landslide deposits were encountered during on-site surveys (Fugro West, Inc. October, 1995). Recent landslides appear to be relatively shallow involving surficial failures that have occurred within the colluvium and near-surface Paso Robles Formation materials. Older landslides, originating within the deeper Paso Robles Formation, have been overlain by more recent soil movement due to erosion. Due to the presence of historic landslide action and on-site topography, landslides are considered to be a potential hazard on the site.

The Chandler Ranch site generally consists of relatively gently rolling hill terrain with a major north-south trending ridgeline in the central portion of the site (refer to Figure 4.5-4). Steeper slopes are present along the flanks of this ridgeline with canyons and drainages emanating away from these higher elevations. Due to the occurrence of proposed residential development in areas of relatively steep slopes, the proposed project would employ mass grading to create areas for future tract development.

Expansive Soils. On-site soils generally have high clay content (refer to Table 4.5-1). During periods of water saturation, these soils tend to expand. During dry periods, the soils tend to shrink. These volume changes with moisture content can cause cracking of structures built on expansive soils. As described in the Soil Survey, the expansion potential of on-site soils ranges from low to high. Therefore, areas characterized by high expansive soils potential would be considered a geologic hazard on the project site.

Erosive Soils. Soil erosion is the removal of soil by water and wind. The rate of erosion is estimated from four soil properties: texture, organic matter content, soil structure, and permeability data. Other factors that influence erosion potential include the amount of rainfall and wind, the length and steepness of the slope, and the amount and type of vegetative cover.



Geologic Hazards Figure 4.5-4

As described in the NRCS Soil Survey, the erosional hazard for soils at this site varies considerably between soil types. Erosion potential on the project site ranges from slight to very high (refer to Table 4.5-1). Therefore, areas characterized by high erosion potential would be considered a geologic hazard on the project site.

d. Potential Sources of Soil and Groundwater Contamination. A "Phase I Environmental Site Assessment Report" was prepared for the Chandler Ranch Area (Fugro West, Inc., December, 1995). The Phase I ESA Report indicated that several exploratory oil wells were drilled in the vicinity of the Chandler Ranch site by the California Department of Oil and Gas between 1949 and 1957. However, no oil or gas wells have been drilled within the planning area boundaries. Several exploratory oil wells were drilled within a three-mile radius of the planning area but these wells are listed as plugged and abandoned dry holes. The closest of these wells is located approximately ½ mile south of the planning area.

Four locations possessing conditions which indicate the potential for toxic substances impacts were identified within the Chandler Ranch site during on-site surveys by Fugro West. These areas are described as follows:

1. *Trash dump located at the head of a north-south trending stream canyon*. A dump containing household trash and ranch materials was observed at the head of the drainage where it intersected one of the ranch roads. Among the items observed were multiple 55-gallon, 30-gallon, 10-gallon and 5-gallon containers and drums. The containers appeared to be typical of containers used for storing paints, chemicals and petroleum products. Observations indicated that more materials may be buried under the trash pile and in the sediments deposited in and along the nearby stream channel. This site is located in proposed planning subarea 20, which would remain in open space. No impact is expected in this area.

2. *Trash and debris along the north-south trending stream canyon*. Scattered trash consisting of old gas cans, 30-gallon drums and automotive parts was observed. Observations indicated that additional trash and debris may be buried under sediments accumulated in and adjacent to the stream channel. This site is located in proposed planning subarea 20, which would remain in open space. No impact is expected in this area.

3. *Small trash dump in the north-south trending stream canyon west of an existing house and barn complex located in the northeast corner of the project site*. The trash observed in this area consisted primarily of old bottles, an old washing machine, bed springs and paint containers. Observations indicated that additional trash may be buried in the vicinity of the dump as well as in sediments accumulated in and along the adjacent stream channel. This site is located in proposed planning subarea 5, which would remain in open space at this location. No impact is expected in this area.

4. *An apparent open well located in the house and barn complex in the northeast corner of the project site*. Adjacent to a functional, sealed well, a 5 to 6-inch diameter pipe was observed that appeared to extend well below ground. The pipe was not dissimilar to the piping observed on the nearby functional well. This pipe was

not capped and creates an open well which provides a direct pathway to subsurface materials with an increased potential for their contamination. This well is readily accessible to the general public from Union Road. This site is located in proposed planning subarea 5, which would remain in open space at this location. No impact is expected in this area.

In addition to the four on-site areas listed above, six separate properties were identified within an approximate one-mile radius of the planning area as using, storing or generating hazardous materials. Five of these sites were found to have not released any of these hazardous materials. One site, CTS Keene, Inc., located at 500 Linne Road, was identified as having the potential for hazardous materials release. This site is located just south of the Chandler Ranch property at the southwest corner of Fontana and Linne Roads, and is topographically down gradient of the Chandler Ranch property. This site contained up to ten underground tanks used for storage of product and waste materials. Waste materials listed for the Keen, Inc. site indicate the presence of spent solvents, metals plating sludges and residues, cyanides and acids. Keene, Inc. ceased its operations in 1990**.** Based on several site audits conducted between 1990 and 1993, significant soil contamination was not identified. Based upon these investigations, the California Department of Toxic Substances Control accepted the request by Keen, Inc. for closure of the site.

Although the historic and continued use of the Chandler Ranch property for agricultural production does not include row crops, the planning area was historically used for dryland farming, livestock grazing and a small almond orchard. As such, it can be assumed that the past agricultural use of the site could have involved the use of agricultural chemicals (pesticides, herbicides, fertilizers). The possible use and storage of these chemicals on the project site could have resulted in undocumented releases of contaminants. Residual quantities of these chemicals, including presently banned agricultural chemicals, could occur in on-site soils.

e. Regulatory Setting. The City of Paso Robles regulates safety and geologic hazards through the implementation of adopted policies and programs within the General Plan. The General Plan prescribes goals, policies and action items to protect the community from risks associated with safety and geologic hazards. The Safety Element contains policy statements that serve as a framework for evaluating proposed projects in regard to their potential to effect proposed development within the City. Building plans for development in the City would be reviewed for consistency with these policies, which include the following:

- **POLICY S-1A:** Hazard Education. Continue to inform the public about hazards, hazard avoidance, and disaster response.

- **POLICY S-1B:** Disaster Response. Develop a community-wide Disaster Response Plan to:

  - Address heavy search and rescue, major medical response, hazardous material response, interim morgue, emergency shelter, traffic and utility impacts, and debris removal and disposal; and
  - Identify procedures for access, traffic control, emergency evacuations, and security of damaged areas.

- **POLICY S-1C:** Hazardous Exposure Minimization. Minimize hazards to people and property caused by fire, crime, and related services.

- **POLICY S-1D:** Structural Safety. Rely on the City's planning and building permit review process to ensure that existing and proposed structures are adequately designed, and to reduce susceptibility to damage from fire, flooding, and geologic hazards.

- **POLICY S-1E:** Hazardous Materials. The City shall comply with Government code requirements regarding the use, storage, and transportation of hazardous materials.

4.5.2 Impact Analysis

a. Methodology and Significance Thresholds. Assessment of impacts is based on: 1) review of site information and conditions; 2) review of environmental information for adjacent projects; 3) review of the geotechnical study and Phase I ESA prepared by Fugro West, Inc. and review of the City of Paso Robles Safety Element and other City information regarding grading and geologic issues.

For the purposes of the analysis, impacts are considered to be potentially significant with regard to geology if the proposed development activity, including all proposed mitigation measures, could result in substantially increased erosion, landslides, soil creep, mudslides, and unstable slopes. In addition, impacts are considered significant when people or structures would be exposed to geologic hazards upon implementation of the project.

b. Project Impacts and Mitigation Measures.

Impact G-1 **Due to the presence of active faults in the vicinity, the planning area is subject to strong ground shaking. Ground shaking has the potential to cause fill material to settle, de-stabilize slopes, and cause physical damage to structures, property, utilities and road access. Ground shaking has the potential to cause injury and death to humans. This is considered a Class II, *significant but mitigable impact*.**

The planning area is located approximately 20 miles west of the San Andreas Fault, 21 miles west of the Nacimiento Fault, and approximately two miles east of the Rinconada Fault. The Rinconada Fault is capable of generating a Maximum Credible Earthquake (MCE) of 7.5. The San Andreas Fault is capable of producing an MCE of 7.5 to 8.0. As seismic event of this magnitude is considered likely during the useful life of any structures planned under the proposed project.

In addition to the possibility of future seismic events from active faults in the region, the Chandler Ranch area (along with much of the County) experienced recent seismic activity from the Oceanic Fault Zone, located offshore and in the Santa Lucia mountains, north of the town of Cambria and near Hearst Castle. This fault zone was the source of the earthquake that shook the town of Paso Robles on December 22, 2003. The Oceanic Fault Zone stretches from Vandenberg Air Force Base in the south to the Golden Gate Bridge in the north. The San Simeon earthquake, along the Oceanic Fault Zone, was a magnitude 6.5 earthquake, located 11

kilometers NE of San Simeon, and 39 kilometers WNW of Paso Robles, where the brunt of the damage occurred. Many landslides and liquefaction features have been found as is typical for an earthquake of this size.

This is evidence that the site, as well as all of southern California, can experience strong ground motion from future local and regional earthquake events. There is nothing unique about the planning area that would make it subject to higher ground motions than adjacent or nearby sites. A portion of the Huerhuero Fault is located approximately two miles east of the site. However, this fault is considered inactive and would not produce seismic groundshaking or fault rupture that would be experienced at the site.

Besides the direct physical damage to structures caused by the ground shaking, marginally stable landslides, slopes, and inadequately compacted fill material could move and cause additional damage. Gas, water, and electrical lines can be ruptured during the ground shaking, or broken during movement of earth caused by the earthquake, which can jeopardize public safety. Impacts are potentially significant.

Mitigation Measures. The philosophy in the Uniform Building Code is to prevent structural collapse and thereby mitigating life safety issues. By definition, significant structural damage is acceptable in Code-conforming structures; although it has been found by experience that single-family, wood-frame structures properly built to the latest building codes generally perform well in response to strong ground shaking where ground failure is not involved. The following measures would help to ensure that any structures planned as a result of the proposed Chandler Ranch Area Specific Plan would be mitigated, to the extent possible, against possible ground shaking.

G-1(a) **UBC Compliance**. Above-ground structures shall be designed and constructed according to the latest Uniform Building Code Seismic Zone 4 standards.

Plan Requirements and Timing: Any proposed development plans submitted to P&B for land use clearance within the planning area shall have a note printed on the plans which specify UBC Seismic Zone 4 standards for all above-ground structures. Building plans submitted in an application for a Building Permit shall include documentation that these standards are met. Final project plans shall be submitted which include the required design specifications prior to approval of the Land Use Permit. Building plans which meet UBC Zone 4 standards shall be provided to the Building Division prior to issuance of Building Permits. **Monitoring:** Prior to approval of any Land Use Permits, P&B staff shall review project plans and verify that the UBC Seismic Zone 4 requirements are printed on the plans. Building Division staff shall verify that UBC standards are met prior to issuance of Building Permits. Building inspectors shall conduct site inspections to assure that construction occurs consistent with approved plans.

Residual Impacts. Through Code-conformance and proper engineering design and construction, hazards of strong ground shaking would be less than significant.

Impact G-2 **Seismic activity could produce sufficient ground shaking which may result in liquefaction. On-site soils proposed for future development of residential uses and commercial facilities are subject to a generally moderate potential for liquefaction. This is considered a Class II, *significant but mitigable* impact.**

Unconsolidated alluvial material underlies portions of the Specific Plan area. The County has defined nearly the entire area as having moderate liquefaction potential (refer to Figure 4.5-4). In such areas, it is typically required to conduct geotechnical studies prior to development to assess the site-specific liquefaction condition. Therefore, the risk to structures and people at within the area is considered a significant but mitigable impact.

Mitigation Measures. The following mitigation measure is required:

G-2(a) **Geotechnical Study.** In conjunction with any development within the Plan Area, a geotechnical study shall be prepared by a registered civil or geotechnical engineer. This report shall include a soils report and an analysis of the liquefaction potential of the underlying materials. If a particular development site is confirmed to be in an area prone to seismically-induced liquefaction, appropriate techniques to minimize liquefaction potential shall be prescribed and implemented. Any structures proposed under the Specific Plan shall comply with applicable methods of the Uniform Building Code.

Suitable measures to reduce liquefaction impacts could include: specialized design of foundations by a structural engineer; removal or treatment of liquefiable soils to reduce the potential for liquefaction; drainage to lower the groundwater table to below the level of liquefiable soils, in-situ compaction of soils; or other alterations to the ground characteristics. In areas prone to liquefaction, current structural engineering methods for foundation design may not be sufficient to prevent a building's foundation from failing in a larger earthquake which would result in stronger and longer ground shaking.

Plan Requirements and Timing: The required geotechnical report shall be provided with any building plans proposed for the planning area and shall evaluate soil engineering properties. The applicant shall notify the Community Development Department prior to commencement of grading. The geotechnical report shall be provided to the Engineering Department for review and approval prior to issuance of building permits. Measures to reduce liquefaction shall be implemented prior to issuance of any building permits. **Monitoring:** Engineering staff shall review and approve the required report prior to issuance of the building permit. Building inspectors shall make site inspections to assure implementation of approved plans. Grading inspectors shall monitor technical aspects of any grading activities.

Residual Impacts. Implementation of the above mitigation measure would reduce impacts from potential liquefaction to a less than significant level.

Impact G-3 Soils within the planning area have the potential to present soil-related hazards (expansive soils, erosive soils) to potential structures and roadways in the planning area and are considered Class II, *significant but mitigable,* impacts.

Expansive Soils. Expansive soils have a clay content and mineralogy that renders them susceptible to volume increase upon absorption of water and volume decrease upon desiccation. Repeated cycles of wetting and drying of expansive soils can cause severe distress to roadways, foundations, and concrete flatwork.

Of the 15 soil types mapped within the planning area, five have high expansion potential: Rincon clay loam (2 to 9% slopes), San Ysidro loam (0 to 2% slopes), Cropley Clay loam (2 to 9% slopes) and Arbuckle-Positas complex (15 to 30 and 30 to 50% slopes) (see Table 4.5-1). These soil types can be found throughout the planning area (refer to Figure 4.5-2) and include areas proposed for residential development and open space. Structures and facilities constructed on these soils, as well as occupants of the proposed facilities, could be exposed to hazards related to expansive soils. Impacts are potentially significant.

Erosive Soils. According to the Natural Resource Conservation Service (NRCS) soils mapping for the planning area, some areas proposed for residential and commercial development are underlain by soils which are characterized by high erosion potential (refer to Figure 4.5-2). These soils include the Arbuckle-Positas complex (15 to 30, 30 to 50 and 50 to 75% slopes), Nacimiento-Los Osos complex (9 to 30% slopes) and Nacimiento-Ayar complex (9 to 30% slopes). Structures and facilities constructed on these soils, as well as occupants of the proposed facilities, could be exposed to hazards related to erosion. Impacts are potentially significant.

Mitigation Measures. The proposed Chandler Ranch Area Specific Plan includes grading requirements for the purpose of reducing impacts associated with the grading activities likely to occur upon future development. Implementation of the following grading requirements (as listed in the proposed Specific Plan) would mitigate, to the extent possible, impacts resulting from soil-related hazards. However, Mitigation Measures G-3(a) and G-3(b), in addition to the proposed Specific Plan Policies, will ensure that impacts would be reduced to less than significant.

- ***Policy LU-13. Grading.*** *Grading shall preserve hillsides and natural topography to the maximum extent feasible. Grading shall not occur outside of the boundaries of designated development subareas, and shall conform to the requirements described in Table 4.5-2, unless otherwise refined by standards included in Section 3.5 [of the Specific Plan] for specific subareas.*

Table 4.5-2. Grading Requirements

Grading Category	Description	Where Applicable
A	**Custom Lot Grading** - The following general standards would apply, as refined in greater detail for subareas 1 in Section 3.5 of the Specific Plan: • Grading for each lot will be considered and designed separately from contiguous lots to preserve the topography and aesthetics of the hillside; • Grading schemes that would grade contiguous lots together, disrupt natural grades at the property lines, or create flat building pads on slopes greater than 10% shall be prohibited.	• Subareas 1 • Local roadways within these subareas • See additional refinement of these standards for subareas 1 in Section 3.5 of the Specific Plan
B	**Custom Lot Grading** – The following general standards would apply, as refined in greater detail for subarea 2 in Section 3.5 of the Specific Plan: • Where grading for the public street allows for and results in a naturally sloping lot, grading requirements will conform to Grading Category A. • Where grading for the public street unavoidably results in placing significant fill into a private lot or a series of private lots, and a pad is created, additional grading may be allowed to create a suitable pad for conventional slab-on-grade home construction. • Standard maximum cut-slopes for street construction is 3:1. Maximum grade of 2:1 allowed for preservation of oak trees.	• Subarea 2 • Local roadways within subarea 2 • See additional refinement of these standards for subarea 2 in Section 3.5 of the Specific Plan
C	**Mass Grading** - Mass grading consists of large scale cut and fill operations that extend across multiple lots with the goal of providing large, gently sloped areas for building homes. Areas that are mass graded shall blend in with the natural environment by avoiding terraced or stepped contours where adjacent to open space. Graded slopes will be gradual and undulating to match the natural topography of the site and surrounding area and soften the visual impact of development. The following standards would apply: • Graded changes to the existing topography shall not result in severe angular and obvious benches on the existing hillsides, where adjacent to open space; • Graded slopes adjacent to existing ground (at daylight lines) shall be rounded to blend the graded slope to natural terrain; • Graded slopes adjacent to open space shall vary in graded to provide a natural transition to existing hillsides; • Unless otherwise noted in standards for specific sub-areas, maximum slopes shall not exceed 3:1; • Drainage within a subdivision shall be designed in a comprehensive master plan. In most cases, lots will drain to the street or to an acceptable drainage facility.	• Subareas 3, 6, 7, 8, 9, 10, 11, 12, 13, 14, 16, 17 (residential portions only) • All Specific Plan arterials and collectors • Local roadways within each of the above subareas • See additional refinement of these standards for subareas 3, 6, 7, 8 and 9 in Section 3.5 of the Specific Plan
D	**Pad Grading (for large buildings –non-residential uses)** – Grading activities to construct a level pad for a building shall be limited to the area required for the building, parking lot and access. The pad elevation should be established to blend the surrounding grading into the existing terrain and avoid excessively tall cut slopes.	• Sub-areas 4, 5 (for emergency services area only), 10, 15,18a,b, 19a,b,c. • See additional refinement of these standards for sub-areas 4, 5 and 10 in Section 3.5 of the Specific Plan

Table 4.5-2. Grading Requirements

Grading Category	Description	Where Applicable
E	**Open Space** - No grading allowed in designated Open Space areas, except as needed to construct trails; water, sewer or drainage infrastructure; and roadway crossings. The area identified for emergency services in subarea 5 is an exception to the requirement and shall conform to Grading Category D.	• Subareas 18c, 19d, and 20; subarea 5 (except for the emergency services portion)
Other Grading Requirements Applicable to All Development Areas		
a. **Contour Grading.** Grading in the specific plan area, to the extent feasible, shall be "contour graded". Areas approved for mass grading shall be "contour graded" where they conform to ungraded areas. The term "contour grading" shall, for the purposes of this specific plan, mean the design and performance of grading in accordance with the following requirements: i. Grading for development shall conform to the existing contours of the ground as much as feasible. ii. Conformance contours at the edge of developed areas shall blend into and preserve the existing contours of the ground to preserve a natural appearance. iii. In applying these guidelines, principles of good drainage practice should be maintained.		
b. **Grading Plans**. Prior to any development within any sub-area where mass grading techniques would be applied, an overall preliminary grading plan, accompanied by a physical model or photo-simulations illustrating the grading plan, shall be submitted for Community Development Department approval. The preliminary grading plan and physical model or photo-simulations for each subarea shall be used as the basis for subsequent detailed grading plans for individual development within that area. Plans shall include a program with: techniques to prevent soil erosion and sedimentation during and after the grading process; approximate time frames for grading; and preliminary pad and roadway elevations. Photo-simulations or physical models shall accurately depict the post grading topography of the subarea. Depending on conditions additional inspections may be required to ensure compliance with water quality regulations.		
c. **Revegetation.** Areas where grading is allowed but development will not occur must be revegetated, for the purpose of providing a transition between neighboring development and undisturbed open space. This applies to areas of mass grading that result in disturbed slopes without roads or structures. Prior to initial grading in any area, a revegetation plan shall be prepared by a licensed landscape design professional. The plan shall be reviewed and approved by the City Community Development Director in consultation with the Public Works Director.		

G-3(a) **Soils/Foundation Report.** Upon implementation of the Specific Plan, individual property developers proposing development within the areas identified as having a moderate potential for ~~landsliding~~expansive soils (refer to Table 4.5-1 and Figure 4.5-2~~Figure 4.5-4~~) shall submit a soils/foundation report as part of the application for any proposed Building Permit(s). To reduce the potential for foundation cracking, one or more of the following shall be implemented and/or as recommended by a qualified engineer, based on the conclusions of the soils report:

1. Use continuous deep footings (i.e., embedment depth of 3 feet or more) and concrete slabs on grade with increased steel reinforcement together with a pre-wetting and long-term moisture control program within the active zone.
2. Removal of the highly expansive material and replacement with non-expansive import fill material, provided this is consistent with other grading provisions of the Specific Plan.

3. The use of specifically designed drilled pier and grade beam system incorporating a structural concrete slab on grade supported approximately 6 inches above the expansive soils.
4. Chemical treatment with hydrated lime to reduce the expansion characteristics of the soils.

Plan Requirements and Timing: The required report shall be provided along with any future building plans and shall evaluate soil engineering properties and provide foundation design recommendations. Any future project applicant shall notify the Building Department prior to commencement of grading. The soils/foundation report shall be provided to the Engineering Department for review and approval prior to issuance of Building Permits. **Monitoring:** Engineering staff shall review and approve the required report (and the foundation design) prior to issuance of a Building Permit. Building inspectors shall make site inspections to assure implementation of approved plans. Grading inspectors shall monitor technical aspects of any grading activities.

G-3(b) **Grading and Erosion Control Plan**. A grading and erosion control plan that minimizes erosion, sedimentation, and unstable slopes shall be submitted and approved for development proposed on slopes, prior to issuance of Grading Permits. It must include the following*:*

a. Methods such as retention basins, drainage diversion structures, grading reduction, silt fencing/coordinated sediment trapping, straw bales, and sand bags. These methods shall be used to minimize erosion on slopes and siltation into Huerhuero Creek and its tributaries during grading and construction activities.

b. Graded areas shall be revegetated within 2 weeks of grading activities with deep-rooted, native, drought-tolerant species to minimize slope failure and erosion potential. Geotextile binding fabrics shall be used if necessary to hold slope soils until vegetation is established.

c. After construction of tract improvements and until construction of individual homes, exposed areas shall be stabilized to prevent wind and water erosion, using methods approved by APCD. These methods may include importing topsoil and/or the mixing of the highly erosive sand with finer-grained materials (silt or clay) in sufficient quantities to prevent its ability to be transported by wind. The topsoil or silt/clay mixture is to be used to stabilize the existing soil. At a minimum, six inches of topsoil or silt/clay/sand mixture is to be used to stabilize the wind-erodable soils.

d. Where necessary, site preparation shall include the removal of all or a portion of the expansive soils at the building sites and replacement with compacted fill.

e. Where necessary, construction on transitional lots shall include overexcavation to expose firm subgrade, use of post tension slabs in future structures, or other geologically acceptable method.

f. Landscaped areas adjacent to structures shall be graded so that drainage is away from structures.

g. Irrigation shall be controlled so that overwatering does not occur.

Plan Requirements and Timing: The grading and erosion control plan shall be submitted for review and approval prior to approval of building entitlements for grading of tract improvements. This condition shall be noted on grading plans. The applicant shall notify the Building Department prior to commencement of grading. Components of the grading and erosion control plan shall be implemented throughout all future grading activities. Components of the grading and erosion plans shall be implemented prior to land use clearance for the first structure. **Monitoring:** Building inspectors shall make site inspections to assure implementation of approved plans. Grading inspectors shall monitor technical aspects of the grading activities.

Residual Impacts. Implementation of the proposed Specific Plan Policy LU-13, along with recommended measures to ensure properly designed and constructed foundations and grading and erosion control should adequately mitigate the potential for structural problems caused by soil-related hazards, thereby reducing impacts to less than significant levels.

Impact G-4 **The Specific Plan area contains several steep slopes and is underlain by the Paso Robles Formation, which presents a moderate slope stability hazard. Landsliding has the potential to damage and destroy structures, roadways and other improvements as well as to deflect and block drainage channels, causing further damage and erosion. Soil slumping can damage or destroy structures and lead to erosion problems. These are considered Class II, *significant, but mitigable* impact.**

The Chandler Ranch Area generally consists of relatively gently rolling hill terrain with a major north-south trending ridgeline in the central portion of the site (refer to Figure 4.5-4). Steeper slopes are present along the flanks of this ridgeline. As seen in Figure 4.5-4, most of the areas determined to have a moderate landslide potential consist of proposed residential development. This represents the majority of the Specific Plan area. The exceptions being relatively small areas near the northern and southern portion of the Specific Plan area.

According to the geotechnical report prepared for the Specific Plan area by Fugro West, Inc. (October, 1995), landslide deposits were encountered during on-site surveys. Recent landslides appear to be relatively shallow involving surficial failures that have occurred within the colluvium and near-surface Paso Robles Formation materials. Older landslides, originating within the deeper Paso Robles Formation, have been overlain by more recent soil movement due to erosion. Due to the presence of historic landslide action and on-site topography, landsliding is considered to be a potential (but mitigable) hazard to the proposed project.

Landslide impacts are considered potentially significant for the proposed project. Debris flows typically form in response to local intense rainfall in steep swale areas that are filled with saturated, fine-grained soils. The project area, because of its relatively steep topography, is considered to have a moderate debris flow potential. Landslide impacts would be potentially significant.

Mitigation Measures. In addition to the implementation of proposed Specific Plan Policy LU-13 (as described under Impact G-3), project specific mitigation measures are required to minimize the risks associated with potential landslides and debris flows.

G-4(a) **Site-Specific Investigations.** Each area to be graded will need to be further inspected to ensure that the slope is not subject to soil slumping. Geotechnical engineering measures, such as shoring soils of any landslide areas shall be required to ensure that the slope will not be destabilized during the grading activity. Remedial measures during grading may include the removal of the slump or debris slide from the top to the toe of slope.

In accordance with the applicable building codes, site specific investigations shall be performed upon implementation of the proposed Specific Plan in areas determined to have a moderate landslide hazard (as seen in Figure 4.5-4). Investigations and practices to be prepared and implemented include the following:

a) Prior to issuance of any building permits, a qualified geotechnical engineer and/or engineering geologist shall prepare thorough site-specific geologic/geotechnical studies, and a slope stability analysis which shall incorporate site specific recommendations. The slope stability analysis is to meet the requirements of CDMG 1997 (Guidelines for Evaluating and Mitigating Seismic Hazards in California, Special Publication 117). In addition, the stability analysis is to meet the requirements of the City Building Division.

b) During construction, engineering geologists and geotechnical engineers shall confirm preliminary findings reported in the preliminary studies.

c) All applicable recommendations of final geologic and geotechnical investigations prepared for the project shall be implemented. These recommendations may include: avoidance of or setbacks

from historic landslide deposits or areas susceptible to a high potential for landslides; grading restriction areas; drainage improvements to ensure potential landslide areas do not become saturated; excavating standard keyways and benches in a stair-step configuration; water addition or drying-out as needed to bring soils close to their optimum moisture content; limitations on cut and fill slope gradients; and/or removal and backfilling or potential landslide areas.

d) During construction grading, close coordination shall occur between the civil engineer and the project engineering geologist and geotechnical engineer to ensure that the recommendations of the geologic and geotechnical investigations are properly implemented.

Plan Requirements and Timing: Preliminary geologic and geotechnical reports shall be submitted for review and approved by Engineering prior to approval of building permits. During construction, a City geologist shall review and field-verify preliminary geologic and geotechnical reports. Final geologic and geotechnical reports shall be submitted for review and approved by Engineering prior to approval of Land Use permits. Grading and building plans shall be submitted for review and approved by Building and Safety prior to approval of Land Use permits. Prior to approval of Land Use Permits, Engineering shall review and approve development plans. **Monitoring:** Building inspectors shall site inspect during grading and prior to occupancy clearance to ensure compliance with approved plans.

Residual Impacts. Implementation of the above mitigation measures would reduce impacts from potential landsliding and debris flows to less than significant levels.

Impact G-5 **Specific Plan implementation would occur in an area historically used for agricultural production with soils that could contain residual quantities of presently-banned agricultural chemicals. Past industrial uses nearby may have also contributed to potential onsite groundwater contamination. The exposure of future site construction workers and residents to these contaminants is considered a Class II, *significant but mitigable* impact.**

The historical use of portions of the Chandler Ranch properties for agricultural production may have resulted in undocumented residual quantities of presently-banned agricultural chemicals on-site. The use and storage of agricultural chemicals within the planning area could result in releases of contaminants that could cause adverse health effects. Impacts are potentially significant unless mitigated.

The planning area could also potentially contain contaminants associated with undocumented on- or off-site hazardous materials releases. Improper handling and disposal of contaminated

soils would result in a health risk to people which would be considered a potentially significant impact unless mitigation is incorporated.

Four locations possessing conditions which indicate the potential for toxic substances impacts were identified within the Chandler Ranch site during on-site surveys by Fugro West (see Appendix F). Each of these four areas is associated with past site activities or trash dumping. None of these areas is located within a proposed development subarea, but would instead remain within designated open space. No direct impacts associated with these findings are expected to result.

In addition to the four on-site areas listed above, six separate properties were identified within an approximate one-mile radius of the planning area as using, storing or generating hazardous materials. Five of these sites were found to have not released any of these hazardous materials. One site, CTS Keene, Inc., located at 500 Linne Road, was identified as having the potential for hazardous materials release. This site is located just south of the Chandler Ranch property at the southwest corner of Fontana and Linne Roads, and is topographically down gradient of the Chandler Ranch property. This site contained up to ten underground tanks used for storage of product and waste materials. Waste materials listed for the Keen, Inc. site indicate the presence of spent solvents, metals plating sludges and residues, cyanides and acids. Keene, Inc. ceased its operations in 1990**.** Based on several site audits conducted between 1990 and 1993, significant soil contamination was not identified. Based upon these investigations, the California Department of Toxic Substances Control accepted the request by Keene, Inc. for closure of the site.

Groundwater depths on site typically are relatively far from the surface (at least 71 feet, and more typically below 150 feet from the surface; Wilcox, 1995), so the potential of encountering groundwater through grading and development activities is relatively low. Nevertheless, if groundwater is encountered, and if it is contaminated with industrial pollution, there is the potential release of contaminants onto the site. This is a potentially significant impact would occur unless mitigated.

Mitigation Measures. The following measures would reduce hazardous materials impacts to a less than significant level:

G-5(a) **Soil and Groundwater Assessment.** Prior to construction of development, a soil and groundwater assessment shall be completed by a registered soils engineer or soils remediation specialist to determine the presence or absence of regulated contaminants within the planning area. This assessment shall target agricultural chemicals that may have been used in the historically farmed portions of the site and contamination associated with historic exploratory off-site oil wells. If soil or groundwater sampling indicates the presence of any contaminant in quantities not in compliance with applicable laws, the Regional Water Quality Control Board (RWQCB) and Department of Toxic Substances Control (DTSC) shall be contacted by the project applicant to determine any necessary remediation efforts. Soils and/or groundwater shall be remediated in compliance with applicable laws. Site assessments that result in the need for soil excavation are required

to include: an assessment of air resource impacts and health impacts associated with excavation activities; identification of any applicable local standards that may be exceeded by the excavation activities, including dust and noise levels; transportation impacts from the removal or remediation activities; and risk of upset management practices should employed if an accident occurs on or off the site. A copy of applicable remediation certification from RWQCB and/or DTSC, or written confirmation that a certification is not required shall be submitted to the Community Development Department prior to issuance of a building permit.

G-5(b) **Potential Discovery of Groundwater.** In the event that groundwater is encountered during grading or construction, all grading or construction work in the vicinity of the groundwater will be halted. The groundwater shall be tested for TPH and VOC, and be screened for common industrial groundwater pollutants using EPA testing method 8260b. If one or more pollutant is found in unsafe concentrations, the water shall be treated to a concentration below RWQCB standards, by a City approved registered environmental assessor or environmental engineer in consultation with RWQCB before the water can be released into the watershed. Such testing can occur in advance of grading activities to preclude the possibility of watershed contamination.

G-5(c) **Screening of Imported Fill Material.** Prior to issuance of building permits, a soils engineering study and hazardous materials report of all imported fill materials shall be prepared by a qualified professional and submitted to the City Engineer for review. The soils engineer study and hazardous materials report shall demonstrate that all imported fill materials maintain engineering properties that are suitable for site development, and are free from contaminants that exceed threshold health and public safety levels.

Plan Requirements and Timing: The results of preliminary soil and groundwater tests shall be submitted for review and approved by Building and Safety prior to approval of any future building permits. During construction, a qualified specialist shall review and field-verify the results of the required screening of all imported fill material and any groundwater should it be encountered during construction activities. **Monitoring:** Building inspectors shall site inspect during grading and prior to occupancy clearance to ensure compliance with the required measures.

Residual Impacts. If the mitigation measures are implemented, the impacts related to hazardous materials would be reduced to a less than significant level.

c. Cumulative Impacts. Buildout of pending and approved projects in the greater Paso Robles area would increase development in the region. Buildout under the General Plan would result in additional residents and structures that could be placed at risk. Such development

would alter landforms in the City and would expose new residents and property to seismic hazards that exist in the area. The proposed project would incrementally contribute to these cumulative impacts. However, grading and seismic issues would be addressed on a case-by-case basis to mitigate impacts resulting from individual projects. In addition, mitigation measures including soil and groundwater assessment, measures required in the event that hazardous materials are discovered, and the screening of imported fill material will further reduce impacts related to hazardous materials. Given that all projects would be required to adhere to seismic standards contained in the Uniform Building Code, City requirements pertaining to grading and mitigation measures related to hazardous materials, *less than significant* cumulative safety and geological impacts are anticipated to result from the proposed Specific Plan in conjunction with other projects in the area.