

This section describes the geology of the project site and surrounding vicinity and analyzes issues such as potential exposure of people and future improvements to geologic hazards, alterations to terrain, and erosion. It also discusses the types of soil that have been identified on the site and their properties as they relate to the proposed project. In addition, potential geologic and seismic hazards such as earthquakes and landslides are discussed.

4.8.1 ENVIRONMENTAL SETTING

GEOLOGIC SETTING

The topography of California is generally made up of eleven geomorphic provinces. The project area is located within the northernmost portion of the Great Valley Geomorphic Province. The Great Valley is an alluvial plain about 50 miles wide and 400 miles long in the central part of California. Its northern part is the Sacramento Valley, which is drained by the Sacramento River. Its southern part is the San Joaquin Valley drained by the San Joaquin River.

The project area itself is located in the foothills that rise up from the Sacramento Valley approximately ten miles south of the City of Redding and immediately south and west of the City of Anderson. Slopes within the project area are variable, ranging from nearly level topography to approximately 50 percent slope.

Surface waters in the project area include tributary streams to the Sacramento River such as Olinda and Anderson Creeks as well as numerous unnamed intermittent and ephemeral streams located in seasonal drainages. For a thorough discussion of waterways within the project area, please see Section 4.7, Hydrology and Water Quality, of this Draft EIR.

SOILS

According to the *Soil Survey of Shasta County Area, California*, prepared by the USDA Soil Conservation Service and U.S. Forest Service in 1974, the project area contains Pleistocene nonmarine sedimentary deposits, associated mainly with the Red Bluff Formation and Newtown series soils. The Red Bluff Formation contains well-rounded boulders and gravel within a tan to brick-red iron-stained matrix of sand and some clay. Newtown series soils are found on high terraces and slopes ranging from 8 to 50 percent. In some areas near natural drainages, the soil type is Anderson gravelly sandy loam. This somewhat excessively drained soil type was formed in recent alluvium from mixed sources. Permeability is rapid, runoff is slow, and the erosion hazard is none to slight. Shrink-swell potential is low. The soil may contain from 0 to 20 percent cobbles or stones. Along Anderson Creek and parts of Olinda Creek, the soil type is classified as riverwash, nearly level or gently sloping soils subject to continuous or frequent flooding.

The primary examples of these soils and their physical characteristics are summarized in **Table 4.8-1** below.

4.8 GEOLOGY AND SOILS

**TABLE 4.8-1
SOIL PHYSICAL CHARACTERISTICS**

Soil Type	Drainage	Permeability	Runoff	Water Erosion Hazard	Shrink Swell
Anderson gravelly sandy loam (Ad)	Somewhat excessive	Rapid	Slow	None to slight	Low
Churn gravelly loam, 0 to 3 percent slopes (CeA)	Well-drained	Moderately slow	Slow	None to slight	Low to moderate
Churn gravelly loam, deep, 0 to 3 percent slopes (CfA)	Moderately well-drained	Slow	Slow	None to slight	Low to moderate
Clough gravelly loam, 3 to 8 percent slopes (CgB)	Moderately well-drained	Very slow	Slow to medium	Slight to moderate	Low
Cobbly alluvial land, frequently flooded (Ck)	Excessively drained	Very rapid	Very slow	Very severe	—
Honcut gravelly loam (He)	Well-drained	Moderate	Very slow	None to slight	Low
Newtown gravelly loam, 8 to 15 percent slopes (NeC)	Well-drained	Slow	Medium	Moderate	Low
Newtown gravelly loam, 15 to 30 percent slopes (NeD)	Well-drained	Slow	Medium to rapid	Moderate to high	Low
Newtown gravelly loam, 30 to 50 percent slopes, eroded (NeE2)	Well-drained	Slow	Rapid	High	Low
Perkins gravelly loam, 3 to 8 percent slopes (PmB)	Well-drained	Slow	Medium	Slight to moderate	Low to moderate
Perkins gravelly loam, 8 to 15 percent slopes (PmC)	Well-drained	Slow	Medium	Moderate	Low to moderate
Perkins gravelly loam, 15 to 30 percent slopes (PmD)	Well-drained	Slow	Medium to rapid	Moderate to high	Low to moderate
Red Bluff gravelly loam, moderately deep, 0 to 3 percent slopes (RcA)	Moderately well-drained	Very slow	Very slow	None to slight	Low
Red Bluff gravelly loam, moderately deep, 3 to 8 percent slopes (RcB)	Moderately well-drained	Very slow	Slow to medium	Slight to moderate	Low
Redding gravelly loam, 0 to 3 percent slopes (RdA)	Well-drained	Very slow	Very slow	None to slight	Low to moderate
Redding gravelly loam, 3 to 8 percent slopes (RdB)	Well-drained	Very slow	Slow	Slight to moderate	Low to moderate
Redding-Red Bluff gravelly loams, 0 to 3 percent slopes (ReA)	Well-drained	Very slow	Very slow	None to slight	Low to moderate
Riverwash (Rw)	Excessive	Rapid	Very slow	Very high	—

Source: Natural Resources Conservation Service, United States Department of Agriculture, August 1974. Soil Survey of Shasta County Area, California.

MINERAL RESOURCES

The only noteworthy mineral resource in the vicinity of the project area is aggregate located within and adjacent to streambeds. At this time, however, there are no active quarries located within or adjacent to the project area, or within the City of Anderson, nor are there any locations within the project area identified for mineral resource extraction, including aggregate. Further, there are no publicly known, economically viable deposits of precious metals in the project area or City of Anderson, nor does the State identify the project area or City of Anderson as containing mineral deposits of statewide significance.

GEOLOGIC CONDITIONS

Seismicity

There are no known faults in the immediate vicinity of the project area. The nearest identified faults are the Bear Creek Fault, approximately 4.5 miles northeast, and the Battle Creek Fault, approximately 5 miles south. The Bear Creek Fault has shown no sign of activity in the last 1.6 million years. Portions of the Battle Creek Fault have shown signs of movement within the past 700,000 years, but there is no evidence of more recent movements.

Although the Redding-Anderson area does not have a reputation for being as seismically active as other parts of California, earthquakes have occurred within the area in historic times. Most earthquakes have tended to be small and resulted in little damage. However, on November 26, 1998, an earthquake of magnitude 5.2 occurred on an unnamed fault three to five miles northwest of Redding. An earthquake of magnitude 4.5 had occurred in the same area on July 21, 1998 (*Redding Record Searchlight*, 1999). Earthquakes have been recorded in Shasta County as far back as 1904, but none have been strong enough to severely damage homes, bridges and buildings. The Earthquake Epicenter Map of California indicates that there have been no recorded earthquakes in Shasta County with a magnitude greater than 5.9.

Ground shaking is a common hazard associated with seismic activity. Other hazards include ground rupture, landslides and liquefaction. Liquefaction occurs when loose, saturated granular soils lose their strength due to a sudden buildup of water pressure, which is induced by a seismic event. Soils near streams may be especially prone to liquefaction.

The severity of an earthquake's impact is generally expressed in terms of *intensity* and *magnitude*. Intensity is based on the observed effects of ground shaking on people, buildings, and natural features. By comparison, *magnitude* is based on the amplitude of the earthquake waves recorded on instruments, which have a common calibration. The Richter scale, a logarithmic scale ranging from 0.1 to 9.0, with 9.0 being the strongest, measures the magnitude of an earthquake relative to ground shaking. **Table 4.8-2** provides a description and a comparison of seismic *intensity* and *magnitude*.

**TABLE 4.8-2
MODIFIED MERCALLI INTENSITY SCALE FOR EARTHQUAKES**

Richter Magnitude	Modified Mercalli Scale	Effects of Intensity
0.1 – 0.9	I	Earthquake shaking not felt
1.0 – 2.9	II	Shaking felt by those at rest.
3.0 – 3.9	III	Felt by most people indoors, some can estimate duration of shaking.
4.0 – 4.5	IV	Felt by most people indoors. Hanging objects rattle, wooden walls and frames creak.
4.6 – 4.9	V	Felt by everyone indoors, many can estimate duration of shaking. Standing autos rock. Crockery clashes, dishes rattle and glasses clink. Doors open, close and swing.
5.0 – 5.5	VI	Felt by all who estimate duration of shaking. Sleepers awoken, liquids spill, objects are displaced, and weak materials crack.
5.6 – 6.4	VII	People frightened and walls unsteady. Pictures and books thrown, dishes and glass are broken. Weak chimneys break. Plaster, loose bricks and parapets fall.
6.5 – 6.9	VIII	Difficult to stand. Waves on ponds, cohesionless soils slump. Stucco and masonry walls fall. Chimneys, stacks, towers, and elevated tanks twist and fall.
7.0 – 7.4	IX	General fright as people are thrown down, hard to drive. Trees broken, damage to foundations and frames. Reservoirs damaged, underground pipes broken.
7.5 – 7.9	X	General panic. Ground cracks, masonry and frame buildings destroyed. Bridges destroyed, railroads bent slightly. Dams, dikes and embankments damaged.
8.0 – 8.4	XI	Large landslides, water thrown, general destruction of buildings. Pipelines destroyed, railroads bent.
8.5 +	XII	Total nearby damage, rock masses displaced. Lines of sight/level distorted. Objects thrown into air.

Source: Division of Mines and Geology

Slope Instability and Subsidence

The stability, or instability, of a slope is greatly dependent upon factors such as gradient, available water content, existing vegetation, and stresses (natural and anthropomorphic) affecting the slope. For example, a denuded, saturated slope could be further destabilized and fail if it was to be stressed by an earthquake, considerable earth moving activities, or blasting activities associated with a mining operation.

The terrain of the project area varies from relatively level ridgetops to steep ravines with slopes in excess of thirty percent. (See **Figure 4.8-1, The Vineyards at Anderson, Slope.**) The vast majority of the slopes within the project area, however, are sufficiently vegetated to anchor the site’s well-drained soils. In fact, tree cover within the Specific Plan area is heaviest in those areas of greatest slope because past firewood harvesting in these areas was limited by obvious topographic constraints.

Land subsidence is the loss of surface elevation due to removal of subsurface support. Subsidence has many causes, including seismically induced stresses and the extraction of

4.8 GEOLOGY AND SOILS

mineral, liquid and/or gas deposits. Although mineral and gas extraction can and do result in subsidence, it is more common for subsidence to occur as a result of groundwater extraction in excess of groundwater recharge. For example, in areas of the San Joaquin Valley of California, the extensive pumping of groundwater for use in crop production has resulted in much of the valley floor subsiding over several generations.

There is no known history of subsidence in the project area or surrounding region, and subsidence in the Sacramento Valley as a whole has been rather limited. Further, the various geologic and hydrologic conditions associated with subsidence are not known to occur in the Specific Plan area.

Volcanic Hazards

Volcanoes in the western conterminous United States are concentrated mainly along the Cascade Range, the southern part of which extends to eastern Shasta County. Hazards associated with these volcanoes include lava flows, pyroclastic flows (flows of rock fragments and ash mixed with gas), ash and mudflows.

The nearest volcano to the project area is Lassen Peak, approximately 42 miles to the east. Lassen Peak, with an elevation of 10,457 feet, last erupted during the years 1914-1917. The most powerful eruptions took place during May of 1915. On May 19th, lava flowed down the southwestern and northeastern flanks of Lassen Peak. Snow melted by the lava on the northeast side caused mudflows that traveled along Hat Creek and Lost Creek. On May 22nd, a more powerful eruption sent a mushroom cloud of ash four miles into the sky and a pyroclastic flow destroyed much of the area northeast of the peak. Ash fell as far away as Reno, approximately one hundred miles away. Because the City of Anderson was located west of the volcano, it was not significantly affected by the eruptions. Since 1917, activity at Lassen Park has been limited to occasional emissions of steam from vents in the sides of the mountain.

Mount Shasta, a 14,162-foot volcano also located in the Cascade Range, is located approximately 67 miles north of the project area. The last known eruption of Mount Shasta occurred in 1786, although mudflows have occurred on its slopes since then. Because of its distance, Mount Shasta is not expected to cause significant damage to the project area in the event of an eruption. The most likely effect of an eruption on the project area would be the deposition of ash, the amount of which would depend on the direction of the eruption and meteorological conditions. Ash deposition from Mount Shasta is not likely to seriously affect the City of Anderson or the Specific Plan area.

Other Potential Geologic Hazards

No other potential geologic hazards have been identified.

4.8.2 REGULATORY FRAMEWORK

STATE

Alquist-Priolo Earthquake Faulting Zone Act

The Alquist-Priolo Earthquake Fault Zoning Act of 1972 (prior to January 1, 1994 called the Alquist-Priolo Special Studies Zones Act – CCR, Title 14, Section 3600) sets forth the policies and criteria of the State Mining and Geology Board that governs the exercise of governments' responsibilities

to prohibit the location of developments and structures for human occupancy across the trace of active faults. The policies and criteria are limited to potential hazards resulting from surface faulting or fault creep within Earthquake Fault Zones delineated on maps officially issued by the State Geologist. Working definitions include:

Fault – a fracture or zone of closely associated fractures along which rocks on one side have been displaced with respect to those on the other side;

Fault Zone – a zone of related faults, which commonly are braided and sub parallel, but may be branching and divergent. A fault zone has a significant width (with respect to the scale at which the fault is being considered, portrayed, or investigated), ranging from a few feet to several miles;

Sufficiently Active Fault – a fault that has evidence of Holocene surface displacement along one or more of its segments or branches (last 11,000 years); and

Well-Defined Fault – a fault whose trace is clearly detectable by a trained geologist as a physical feature at or just below the ground surface. The geologist should be able to locate the fault in the field with sufficient precision and confidence to indicate that the required site-specific investigations would meet with some success.

“Sufficiently Active” and “Well Defined” are the two criteria used by the State to determine if a fault should be zoned under the Alquist-Priolo Act.

LOCAL

City of Anderson General Plan

Issues pertaining to geology and soils are addressed in the Health and Safety Element of the City of Anderson General Plan. **Table 4.8-3** identifies those General Plan policies that are directly applicable to the proposed project, and presents an evaluation of the consistency of the Specific Plan with these statements as required by CEQA. While this EIR analyzes the Specific Plan’s consistency with the City of Anderson General Plan pursuant to State CEQA Guidelines Section 15125(d), the determination of the project’s consistency with this General Plan ultimately rests with the City of Anderson City Council.

**TABLE 4.8-3
SPECIFIC PLAN CONSISTENCY WITH CITY OF ANDERSON GENERAL PLAN POLICIES – GEOLOGY AND SOILS**

City Of Anderson General Plan Policies	Consistency with General Plan	Analysis
Minimize risk to life and property from seismic activity. (SSP-1)	Yes	The UBC requires buildings to be built to seismic standards (Earthquake Zone 3).
Continue implementation of Uniform Building Code in construction. (SSP-3)	Yes	Refer to analysis of Specific Plan consistency with General Plan Policy SSP-1 above.
Plan for appropriate densities and types of land use on sloped lands that minimize exposure to soil erosion and landslides. (SSP-4)	Yes	Policies 2.2.13, 2.2.16, 2.2.22, 8.8.1, 8.8.5, and 8.8.10 of the Vineyards at Anderson Specific Plan relate to grading and ensure that there is a minimum exposure to soil erosion and landslides.

4.8 GEOLOGY AND SOILS

The Vineyards at Anderson Specific Plan

The proposed Vineyards at Anderson Specific Plan contains various goals and policies regarding geological hazards. Specific Plan policies relevant to geology and soils within Phase 2 of the proposed project area in the context of CEQA are summarized in **Table 4.8-4**. This table also provides an evaluation of Phase 2 relative to its consistency with the pertinent Specific Plan policies as required by State CEQA Guidelines Section 15125(d). The final authority for interpretation of these policy statements, and determination of the project's consistency rests with the City of Anderson City Council.

**TABLE 4.8-4
PROJECT LEVEL (PHASE 2) CONSISTENCY WITH VINEYARDS AT ANDERSON SPECIFIC PLAN POLICIES
GEOLOGY AND SOILS**

Specific Plan Policies	Consistency with Specific Plan	Analysis
Design with sensitivity to existing landforms and vegetation. (Policy 2.2.13)	Yes	Development of Phase 2 will occur predominantly on relatively flat portions of the ridge-tops on the project site. Areas with slopes in excess of 30 percent will generally be avoided. In addition, per MM 4.8.2a , prior to development of the project site, a site specific geotechnical investigation will be prepared, which considers subsurface risks and provides measures for avoidance and/or means to reduce these risks.
Utilize soil conservation techniques intended to minimize soil erosion. (Policy 2.2.16)	Yes	Refer to analysis of Phase 2 consistency with Specific Plan Policy 2.2.13 above. Additional discussion related to soil conservation techniques and soil erosion can be found in Section 4.7, Hydrology and Water Quality.
Cluster development on flatter ridge top areas to avoid impacts on steep slopes and drainages. (Policy 2.2.22)	Yes	Refer to analysis of Phase 2 consistency with Specific Plan Policy 2.2.13 above.
Grading practices shall minimize disruption to the natural topography; protect and enhance the project's aesthetics; minimize risk to health and property from improper control of storm drain water runoff, erosion and sedimentation; and provide for efficient construction operations. (Policy 8.8.1)	Yes	Refer to analysis of Phase 2 consistency with Specific Plan Policy 2.2.13 above. Additional discussion related to storm drainage can be found in Section 4.7, Hydrology and Water Quality.
Housing shall be concentrated on ridge tops and other flatter areas, generally less than 30% slope, in order to reduce the need for grading and preserve forested slopes and ravines. Localized minor ravines may be filled and retaining walls may be utilized to provide continuity and efficiency of housing development. In some cases, mass grading may be utilized to provide efficient and compact development areas by cutting the tops of the ridges to allow double loaded roadways and efficient, buildable lots.	Yes	Refer to analysis of Phase 2 consistency with Specific Plan Policy 2.2.13 above.

Specific Plan Policies	Consistency with Specific Plan	Analysis
(Policy 8.8.5)		
Grading operations shall be planned and implemented to efficiently control erosion and sedimentation. (Policy 8.8.10)	Yes	Refer to analysis of Phase 2 consistency with Specific Plan Policy 2.2.13 above. Additional discussion related to erosion and sedimentation is located in Section 4.7, Hydrology and Water Quality.

4.8.3. IMPACTS AND MITIGATION MEASURES

STANDARDS OF SIGNIFICANCE

The City of Anderson has determined that a project may have significant impacts on geology and soils if it does any of the following:

- 1) Expose people or structures to potential substantial adverse effects, including the risk of loss, injury or death, involving:
 - i) Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault? Refer to Division of Mines and Geology Special Publication 42.
 - ii) Strong seismic ground shaking.
 - iii) Seismic-related ground failure, including liquefaction.
 - iv) Landslides.
- 2) Result in substantial soil erosion or the loss of topsoil.
- 3) Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction or collapse.
- 4) Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial risks to life or property.
- 5) Have soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems where sewers are not available for the disposal of wastewater.
- 6) Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state.
- 7) Result in the loss of availability of a locally important mineral resource recovery site delineated on a local general plan, specific plan or other land use plan.

4.8 GEOLOGY AND SOILS

METHODOLOGY

PMC staff reviewed all project-related information provided by the applicant, as well as geologic maps and information available from Shasta County and the City of Anderson. Evaluation of the potential geologic, soil, and hazardous material impacts were based on information obtained from the Shasta County USDA Soil Survey, various geologic publications and maps available from the California Division of Mines and Geology that are relevant to the project site and surrounding region. Additional information was acquired from the applicant and local, state, and federal agencies. A detailed list of sources for information utilized during preparation of this portion of the report is included in the reference section, located at the end of this section of the EIR. Geologic impact analysis considers impacts of site development associated with residential, commercial, institutional, agricultural and recreational development, as well as roadway construction and on-site and off-site infrastructure construction. As noted in Section 3.0, Project Description, not all details regarding the extent and design of residential, commercial, institutional and recreational development have been identified at this stage of project planning due to the long-term nature of project buildout. While this section does address soil erosion potential of the project, the reader is referred to Section 4.7, Hydrology and Water Quality, for an analysis of water quality impacts.

PROGRAM LEVEL (PROJECT BUILDOUT) IMPACTS AND MITIGATION MEASURES

Seismic Ground Shaking

Impact 4.8.1 Development of the project may expose structures and people to substantial adverse effects involving the rupture of a known fault, strong seismic ground shaking, seismic-related ground failure (including liquefaction) or landslides. This impact is considered **less than significant**.

As noted above, there are no known faults in the immediate vicinity of the project area. The nearest identified faults are the Bear Creek Fault, approximately 4.5 miles northeast, and the Battle Creek Fault, approximately 5 miles south. The Bear Creek Fault has shown no sign of activity in the last 1.6 million years. Portions of the Battle Creek Fault have shown signs of movement within the past 700,000 years, but there is no evidence of more recent movements.

Earthquakes have been recorded in Shasta County as far back as 1904, but none have been strong enough to severely damage homes, bridges and buildings. The Earthquake Epicenter Map of California indicates that there have been no recorded earthquakes in Shasta County with a magnitude greater than 5.9 (VII – Modified Mercalli Intensity scale). Areas that experience this intensity typically endure slight to moderate damage in older (masonry) structures and considerable damage in poorly built or inadequately designed structures.

Since the potential for strong ground shaking is minimal, the potential for liquefaction and other seismic-related ground failures caused by strong ground shaking is considered to be less than significant. In addition, development on the site would be required to comply with UBC Zone 3 seismic standards. This impact is considered **less than significant**.

Mitigation Measures

None required.

Soil Erosion

Impact 4.8.2 Development of the proposed project may result in soil erosion or the loss of topsoil. This impact is considered **potentially significant**.

The project area consists of approximately 2,248 acres, characterized by a broad, flat east-west ridge with peninsulas of smaller ridges offering relatively flat areas divided by major and secondary seasonal drainages trending primarily north-south. Slopes within the seasonal drainages exceed 30 percent in some locations. (See **Figure 4.8-1, The Vineyards at Anderson, Slope**) The topography of the project site varies, with elevations ranging from approximately 440 to 690 feet.

Development of the Specific Plan area would result in soil disturbance and substantial cut and fill to prepare building pads, roads, and utility trenches. Soil disturbance would also result from the development of pedestrian trails, planting of vineyards and, in some cases, the creation of parks. Soil erosion rates are determined by soil types, vegetative cover, topography, and slope gradients. Without proper excavation methods and adequate erosion and sediment controls, the project may result in potentially significant slope instability and erosion-related impacts.

The Vineyards of Anderson Specific Plan contains several policies that address soil stability and erosion. Policy 2.2.13 states, "Design with sensitivity to existing landforms and vegetation." Specific Plan Policy 2.2.16 directs the use of soil conservation techniques in order to reduce erosion. Policy 8.8.10 states that grading operations shall be planned and implemented to efficiently control erosion and sedimentation.

Specific Plan Policy 8.8.5 states, "Housing shall be concentrated on ridge tops and other flatter areas, generally less than 30 percent slope, in order to reduce the need for grading and preserve forested slopes and ravines. Localized minor ravines may be filled and retaining walls may be utilized to provide continuity and efficiency of housing development. In some cases mass grading may be utilized to provide efficient and compact development areas by cutting the tops of the ridges to allow double loaded roadways and efficient, buildable lots." Similarly, Policy 2.2.22 states that in order to avoid impacts on steep slopes and drainages, development shall be clustered on relatively flat ridge top areas. In accordance with these policies, development of the project will occur predominantly on relatively flat portions of the ridge tops on the project sites. Areas with slope in excess of 30 percent slope will generally be avoided.

State law requires compliance with a number of provisions that will further reduce the potential for erosion. These include:

- A Storm Water Pollution Prevention Plan (SWPPP) is required with a SWRCB construction permit for compliance with the Clean Water Act (CWA) 402(B) for all associated construction activities on site. This plan addresses erosion potential during construction and includes best management practices (BMPs) to reduce soil erosion.
- A National Pollution Discharge Elimination System Permit (NPDES) is required from SWRCB for development of the lots. Similar to the SWPPP, the NPDES establishes erosion control methods.

Although state law, including SWPPP requirements, will reduce impacts to soil erosion, the project could still result in impacts that are considered **potentially significant**.

4.8 GEOLOGY AND SOILS

Mitigation Measures

Implement **MM 4.7.1a** and **MM 4.7.1b** as described in Section 4.7, Hydrology and Water Quality; and

MM 4.8.2a Prior to the approval of project improvement plans for each phase, the project applicant shall provide the City with a final geotechnical subsurface investigation report for that phase. The final investigation shall incorporate the following measures:

- The final Geotechnical Engineering Report shall address and make recommendations on the following: a) road, pavement, and parking areas; b) structural foundation, including retaining wall design; c) grading practices; d) erosion/winterization; e) special problems discovered on-site (i.e., groundwater, expansive/unstable soils, etc.); and f) slope stability.
- Subsurface soils samples shall be collected and appropriate geotechnical analytical work on these samples must be completed in order to adequately define the characteristics of underlying materials.
- Field investigations, sampling and laboratory testing of samples will assist geotechnical evaluations of subsurface materials in areas where other types of improvements are proposed. The bearing capacities of earth materials beneath roadways and buildings will be determined and will be required for adequate foundation design. Where unsuitable materials prone to expansion or consolidation are located, these materials may be conditioned or removed and replaced with materials more suitable for future structures.

The project applicant shall include engineering details and methods to be incorporated into project improvement plans that ensure stable slope conditions on the site during and after construction. All structures and site improvements shall follow seismic design criteria addressed in the Uniform Building Code.

Timing/Implementation: Prior to approval of improvement plans.

Enforcement/Monitoring: City of Anderson Public Works Department and City Engineer.

MM 4.8.2b Proposed grading, drainage improvements, vegetation, and tree removal shall be shown on the Improvement Plans for each phase. No grading, clearing, or tree disturbance shall occur until the improvement plans are approved and all required temporary construction fencing has been installed and inspected by the City. All cut/fill slopes shall be at 2:1 (horizontal/vertical) unless a soils report supports a steeper slope and City of Anderson Public Works concurs with said recommendation.

The project applicant shall revegetate all disturbed areas. Revegetation undertaken from April 1 to October 1 shall include regular watering, as necessary, to ensure adequate growth. A winterization plan shall be provided with project improvement plans. It is the project applicant's responsibility to assure proper installation and maintenance of erosion control/winterization during project construction. Where soil stockpiling or borrow areas are to remain for more than

one construction season, proper erosion control measures shall be applied as specified in the Improvement Plans/Grading Plans. The improvement plans shall specify erosion control where roadside drainage is off of the pavement, to the satisfaction of the City.

If, at any time during construction, a field review by City personnel indicates a significant deviation from the proposed grading shown on the Improvement Plans, specifically with regard to slope heights, slope ratio, erosion control, winterization, tree disturbance, and/or pad elevations and configurations, the plans shall be reviewed by the City for a determination of substantial conformance to the project approvals prior to any further work proceeding.

Timing/Implementation: Prior to approval of improvement plans and inspections during project construction.

Enforcement/Monitoring: City of Anderson Engineering and Public Works Department and City Engineer.

Implementation of the above mitigation measures, combined with **MM 4.7.1a** and **MM 4.7.1b** described in Section 4.7, Hydrology and Water Quality, would ensure full and complete assessment of subsurface conditions across the site and help ensure the proposed grading and utility plan is feasible, minimize uncertainties associated with adverse conditions, and increase quality control in design of improvements, thus reducing the potential for soil erosion and soil stability to a level that is considered **less than significant**.

Geologic Stability

Impact 4.8.3 Buildout of the project may result in structures and/or infrastructure being located on unstable geologic units or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction or collapse. This impact is considered to be **potentially significant**.

Soils within the project area consist of sedimentary deposits associated with the Red Bluff Formation and Newtown series soils. These soils are not known to be unstable or pose constraints to development. Further, per **MM 4.8.2a**, a final geotechnical subsurface investigation report for each phase of development would be required by the City prior to approval of improvement plans. This report would identify any geologic hazards within the project area, and when combined with **MM 4.8.2b**, would reduce potential impacts associated with geologic instability to a level that is considered **less than significant**.

Also, as discussed in Impact 4.8.1, the potential for liquefaction is considered to be **less than significant**.

Subsidence usually occurs as a result of excessive groundwater pumping. While the project does include the extraction of groundwater to serve proposed land uses, the project area overlays the Redding Groundwater Basin, which is an area of high-yielding aquifers. For a discussion of available water supplies and groundwater recharge rates, please refer to Section 4.7, Hydrology and Water Quality. As discussed in Section 4.7, the pumping of groundwater to serve the project would not be substantially greater than the groundwater recharge rate. As a result, subsidence, if it were to occur, would be **less than significant**.

4.8 GEOLOGY AND SOILS

Mitigation Measures

Implementation of **MM 4.8.2a** and **MM 4.8.2b**, along with policies included in the Vineyards at Anderson Specific Plan, will reduce impacts to a level that is considered **less than significant**.

Expansive Soils

Impact 4.8.4 Development of the proposed project may result in structures or infrastructure being located on an expansive soil as defined in Table 18-1-B of the Uniform Building Code. This impact is considered **potentially significant**.

The project will be located on soils that have a low to moderate shrink swell potential. Although it is not known if this will result in structural damage, as discussed in Impact 4.8.2, implementation of **MM 4.8.2a** includes soils testing, and adequate geotechnical requirements to ensure that soils are suitable to support the development of structures and infrastructure.

Mitigation Measures

Implementation of **MM 4.8.2a** will reduce potential impacts associated with expansive soils to a level that is considered **less than significant**.

Soil Suitability for Wastewater Disposal

Impact 4.8.5 Buildout of the proposed project would not result in the disposal of wastewater, via septic tanks or alternative wastewater disposal systems, in areas where soils are inadequately suited for such wastewater disposal. **No impact**.

All wastewater associated with the proposed project would be conveyed to, and treated at, the City of Anderson Wastewater Treatment Plant. Therefore, no septic tanks or alternative wastewater disposal systems will be required. **No impact**.

Mitigation Measures

None required.

Mineral Resources

Impact 4.8.6 The proposed project would not result in the loss of availability of a known mineral resource that would be of value to the region, nor would the project result in the loss of availability of a locally important mineral resource recovery site delineated on a local general plan, specific plan or other land use plan. **No impact**.

As discussed previously in this section of the Draft EIR, there are no known noteworthy mineral resources in the vicinity of the project, nor is there any mineral resource sources identified in the project vicinity as delineated on a local general plan, specific plan or other land use plan. **No impact**.

Mitigation Measures

None required.

PROJECT LEVEL (PHASE 2) IMPACTS AND MITIGATION MEASURES**Seismic Ground Shaking**

Impact 4.8.7 Development of Phase 2 of the project as defined in the Specific Plan may expose structures and people to substantial adverse effects involving the rupture of a known fault, strong seismic ground shaking, seismic-related ground failure (including liquefaction) or landslides. This impact is considered **less than significant**.

As noted in Impact 4.8.1, there are no known faults in the immediate vicinity of the project area and the potential for strong ground shaking is minimal. Additionally, the project development would be required to comply with UBC Zone 3 seismic standards. This impact is considered to be **less than significant**.

Mitigation Measures

None required.

Soil Erosion

Impact 4.8.8 Development of Phase 2 of the proposed project may result in soil erosion or the loss of topsoil. This impact is considered to be **potentially significant**.

Phase 2 of the proposed project consists of a tentative subdivision map to create 722 single-family residential lots, a 3.3-acre private recreation center, a 9.2 acre public park, 1.9 acres of commercial development, a one-acre fire station site, approximately 2.75 miles of trails, and associated roads and infrastructure to serve the subdivision. The topography of the Phase 2 project site varies, with elevations ranging from approximately 550 to 690 feet and slopes exceeding 30 percent in some of the seasonal drainages.

Implementation of Phase 2 would result in soil disturbance and substantial cut and fill as building pads, roads, and utility trenches are prepared. Soil disturbance would also result from the development of pedestrian trails, planting of vineyards, and development of the public park. Without proper erosion and sediment controls and excavation methods, the project may result in **potentially significant** soil erosion.

In order to address this potential impact, the Vineyards of Anderson Specific Plan contains several policies that relate to soil stability and erosion. For example, Policy 8.8.10 states, "Grading operations shall be planned and implemented to efficiently control erosion and sedimentation." Similarly, Policy 2.2.22 states that in order to avoid impacts on steep slopes and drainages, development shall be clustered on the relatively flat ridge tops. (Please refer to Table 4.8-4 for a complete list of Specific Plan policies relevant to geology and soils in the context of CEQA.)

State law requires compliance with a number of provisions that will further reduce the potential for erosion. These include:

- A Storm Water Pollution Prevention Plan (SWPPP) is required with a State Water Resources Control Board (SWRCB) construction permit in order to comply with the Clean Water Act (CWA) 402(B) for all associated construction activities on-site. This plan addresses erosion potential during construction and includes best management practices (BMPs) to reduce soil erosion.

4.8 GEOLOGY AND SOILS

- A National Pollution Discharge Elimination System Permit (NPDES) is required from SWRCB for development of the lots. Similar to the SWPPP, the NPDES establishes erosion control measures.

Mitigation Measures

Implementation of **MM 4.8.2a** and **MM 4.8.2b** described herein above, along with **MM 4.7.7a**, and **MM 4.7.2b** described in Section 4.7, Hydrology and Water Quality, and permitting requirements by the State Water Resources Control Board would ensure that project impacts with regard to soil erosion and the loss of topsoil would be **less than significant**.

Geologic Stability

Impact 4.8.9 Development of Phase 2 of the project may result in structures and/or infrastructure being located on unstable geologic units, or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction or collapse. This impact is considered **potentially significant**.

Soils within Phase 2 primarily consist of sedimentary deposits associated with the Red Bluff Formation and Newtown series soils. With the implementation of **MM 4.8.2a** and **MM 4.8.2b** described herein above, a final geotechnical subsurface investigation report will be provided to the City prior to approval of improvement plans. This report would identify any geologic hazards within Phase 2 of the project area, and when combined with **MM 4.8.2b**, would reduce potential impacts associated with geologic instability to a level that is considered **less than significant**.

As discussed in Impact 4.8.1, the potential for liquefaction is considered to be **less than significant**.

Subsidence usually occurs as a result of excessive groundwater pumping. While the tentative map for Phase 2 does include a proposed well site to serve this phase of development, the Specific Plan area overlays the Redding Groundwater Basin, which is an area of high-yielding aquifers. For a discussion of available water supplies and groundwater recharge rates, please refer to Section 4.7, Hydrology and Water Quality. As discussed in Section 4.7, the pumping of groundwater to serve the project would not be substantially greater than the groundwater recharge rate. As a result, subsidence, if it were to occur, would be **less than significant**.

Mitigation Measures

Implementation of **MM 4.8.2a** and **MM 4.8.2b**, as discussed above, along with policies included in the Vineyards at Anderson Specific Plan, would reduce potential impacts to a level that is considered to be **less than significant**.

Expansive Soils

Impact 4.8.10 Development of Phase 2 of the proposed project may result in structures or infrastructure being located on an expansive soil as defined in Table 18-1-B of the Uniform Building Code. This impact is considered **potentially significant**.

Phase 2 would be located on soils that have a low to moderate shrink swell potential. Although it is not known if this will result in structural damage, implementation of **MM 4.8.2a** described herein

above would ensure that soils are suitable to support the development of structures and infrastructure.

Mitigation Measures

Implementation of **MM 4.8.2a** will reduce potential impacts associated with expansive soils to a level that is considered **less than significant**.

Soil Suitability for Wastewater Disposal

Impact 4.8.11 Implementation of Phase 2 of the project would not result in the disposal of wastewater, via septic tanks or alternative wastewater disposal systems, in areas where soils are inadequately suited for such wastewater disposal. **No impact.**

All wastewater associated with Phase 2 of the proposed project would be conveyed to, and treated at, the City of Anderson Wastewater Treatment Plant. Therefore, no septic tanks or alternative wastewater disposal systems will be required. **No impact.**

Mitigation Measures

None required.

Mineral Resources

Impact 4.8.12 Implementation of Phase 2 would not result in the loss of availability of a known mineral resource that would be of value to the region, nor would it result in the loss of availability of a locally important mineral resource recovery site delineated on a local general plan, specific plan or other land use plan. **No impact.**

As discussed previously in this section of the Draft EIR, there are no known noteworthy mineral resources in the vicinity of the Phase 2, nor are there any mineral resources delineated on a local general plan, specific plan or other land use plan. **No impact.**

Mitigation Measures

None required.

4.8.4 CUMULATIVE SETTING, IMPACTS, AND MITIGATION MEASURES

CUMULATIVE SETTING

Geotechnical impacts tend to be site specific rather than cumulative in nature and each development site would be subject to, at a minimum, site development and construction standards relative to seismic and other geologic conditions that are prevalent within the region. Impacts regarding surficial deposits, namely erosion and sediment deposition, can be cumulative in nature within a watershed. The reader is referred to Section 4.7, Hydrology and Water Quality, regarding cumulative water quality impacts from soil erosion.

4.8 GEOLOGY AND SOILS

CUMULATIVE GEOLOGIC AND SOIL IMPACTS

Impacts to Geology and Soils

Impact 4.8.13 Implementation of the proposed project in combination with reasonably foreseeable development would not contribute to cumulative geologic and soil impacts, as the impacts would be site-specific. Under cumulative conditions this impact is considered **less than significant**.

Impacts associated with geology and soils are based on existing site-specific conditions that are situated within the subsurface materials that underlay the project site. These inherent conditions are an end-result of natural historic events that have played out through vast periods of geologic time.

Further, implementation of mitigation measures **MM 4.8.2a** and **MM 4.8.2b** described herein above, along with implementation of **MM 4.7.2a** and **4.7.2b** described in Section 4.7, Hydrology and Water Quality, would ensure that the project's contribution to cumulative geologic and soil impacts in the region would be **less than significant**.

Mitigation Measures

None required.

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