L. GEOLOGY, SOILS, SEISMICITY AND MINERAL RESOURCES

This section evaluates the geology, soils, seismicity and mineral resources for Yolo County. Background information is based on the Yolo County General Plan Update Background Report,[1] and published and unpublished regional geologic reports and maps from the California Geological Survey (CGS), the United States Geological Survey (USGS) and the Natural Resources Conservation Service (NRCS). Soils are discussed in this section as related to ground stability, construction and erosion; a discussion of soils and agriculture issues is provided in Section IV.B, Agriculture, of this Draft EIR. Potential impacts associated with geology, soils, seismicity and mineral resources resulting from the Draft General Plan are analyzed and mitigation measures are recommended, as appropriate.

1. Setting

This section describes the existing conditions in Yolo County, including the physical environment, the seismic and geologic hazards within the County and the regulatory environment regarding geology, soils, seismicity and mineral resources.

a. Physical Environment. The geology, topography, soils and mineral resources within the County are described below.

(1) Geology and Topography. Roughly the eastern 70 percent of the County is located in the Great Valley geomorphic province of California, and consists of gently sloping to level alluvial plains. The remaining portion of the County is in the Coast Range geomorphic province.[2] Elevations in the County range from slightly above sea level in the southeastern corner of the County to more than 3,000 feet in the western area in the Coast Range. Geologic units in the Great Valley area generally consist of Quaternary alluvium or basin deposits, and the Quaternary Modesto and Riverbank Formations, both of which consist of somewhat older alluvium. Projecting into the valley area northwest of Woodland are the Dunnigan Hills. These consist of dissected and rolling terraces of the Tehama Formation (non-marine sandstone, siltstone, and volcaniclastic[3] rocks).

The western Coast Range portion of the County consists of moderately sloping to very steep uplands and terraces and is characterized by parallel ridges and valleys that trend slightly west of north. The rocks in the Coast Range consist of a number of Quaternary and Cretaceous geologic formations, including upturned marine sandstones, shales, mudstones, and conglomerates, with some volcaniclastic rocks. A small area of ultramafic rocks, one of which may contain serpentinite, occurs along Little Blue Ridge, west of Rumsey.[4]

(2) Volcanism. The Cascades Mountain range extends for more than 700 miles from Fraser River in southern British Columbia, Canada to Lassen Peak in northern California. Most of the

[1] Jones and Stokes, 2005. Background Report for the Yolo County General Plan Update, prepared for Yolo County, January.

[2] California Geological Survey, 2002, *California Geomorphic Provinces, Note 36*, California Dept. of Conservation.

[3] Rocks composed principally of broken rock fragments that are derived from pre-existing rocks or minerals and have been transported from their place of origin, in this case, consisting of volcanic fragments or sediments.

[4] Jones and Stokes, 2005. op. cit.

summits are extinct volcanoes, but Lassen Peak and several others have erupted in the recent past.[5] Three episodes of volcanism have occurred in the vicinity of the Lassen volcanic center in the past 1,100 years. These eruptions occurred at Chaos Crags, Cinder Cone, and lastly at Lassen Peak in 1914-1917. The most destructive explosion in this recent sequence at Lassen occurred on May 21, 1915 when a pyroclastic flow devastated forests as far as 4.1 miles northeast of the summit and lahars swept down several valleys radiating from the volcano. An ash plume rose more than 5.5 miles above the peak, and the prevailing winds scattered the ash across Nevada as far as 300 miles to the east. Lassen Peak is approximately 120 miles to the north-northeast of the County, a similar eruption with southerly winds could produce ash fall in Yolo County. Lassen Peak continued to produce smaller eruptions until about the middle of 1917.

The Clear Lake volcanic field is the westernmost site of recent volcanism in California, and is far to the west of the Cascade Range. The Clear Lake volcanic field contains lava domes, cinder cones, and maars (shallow, flat-floored craters). Mount Konocti, about 20 miles west-northwest of Yolo County, is the largest volcanic feature. Clear lake volcanism has been largely non-explosive, with the latest eruptive activity ending about 10,000 years ago. South of Clear Lake in the Mayacmas Mountains, a large silicic magma chamber provides the heat source for the Geysers, an actively producing geothermal field.

(3) Soils. Yolo County contains important soil resources. Twelve soil associations have been identified in Yolo County, as shown in Table IV.L-1. Seven of the associations are on lowland alluvial fans or are in basins. The remaining five associations are on uplands or terraces. Agricultural soil resources (e.g., Prime Farmland) are described in Section IV.B, Agriculture, of this Draft EIR. Soil characteristics from a geologic hazard perspective (e.g., expansive soils) are discussed below in the Seismic and Geologic Hazards subsection. Table IV.L-2 summarizes soil association characteristics that are not already provided in the legend of Figure IV.L-1.[6]

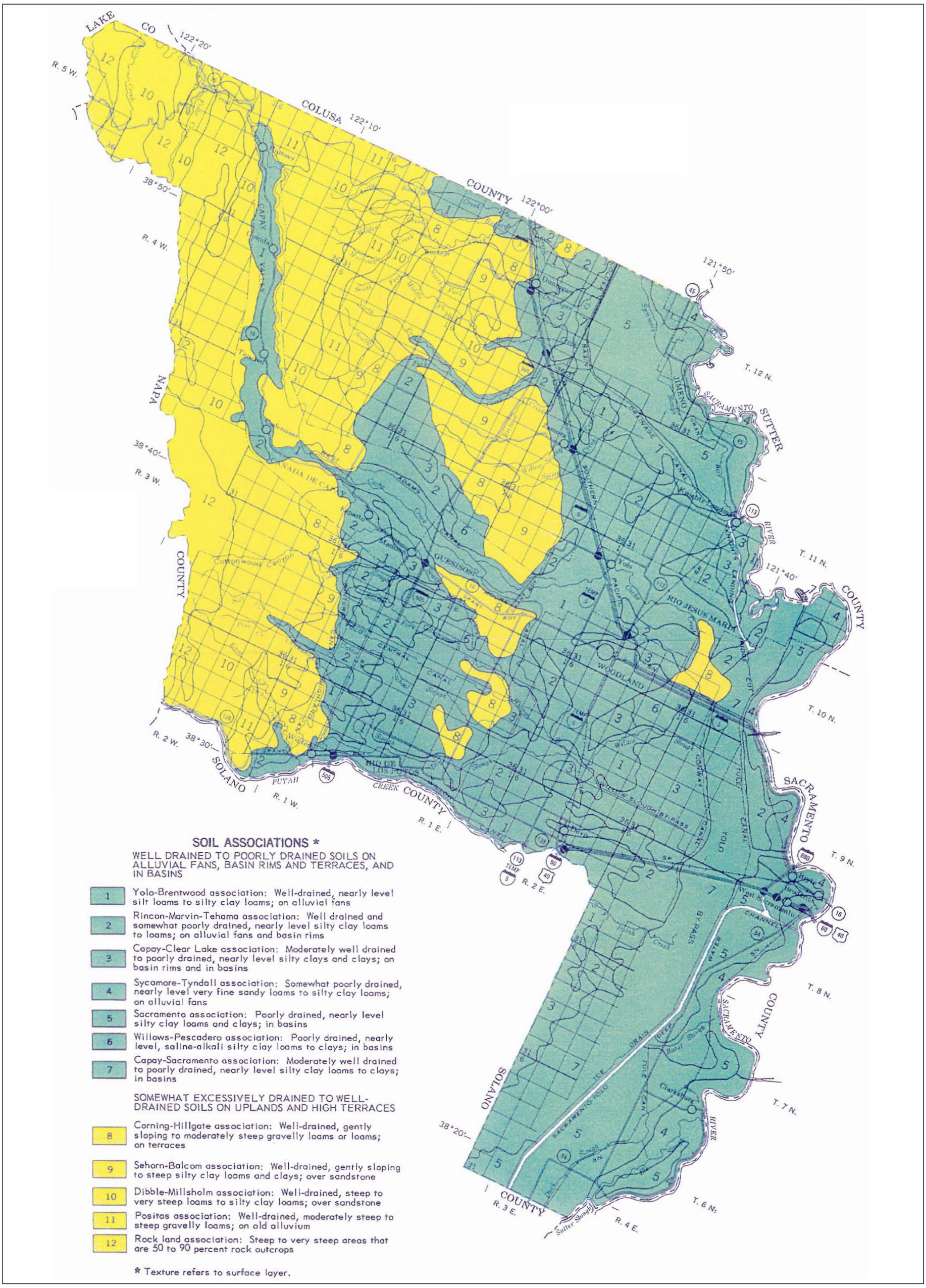
(4) Mineral Resources. Yolo County contains important mineral resources.[7] A variety of minerals were once mined in the County. The chief minerals presently mined are aggregate and natural gas.

Gold and Silver. The McLaughlin Mine is located in the northeastern corner of Yolo County, and extends into Napa and Lake Counties. It ceased gold and silver production operations in 2002. In the past, small amounts of gold and silver were mined from Cache and Putah Creeks. Mercury was mined in the northwestern part of the County, reached a peak of production during the first and second World Wars, and ceased in 1952.

[5] USGS, 2008. California Volcanoes and Volcanics, USGS Cascades Volcano Observatory. Accessed 12/04/08 at: vulcan.wr.usgs.gov/Volcanoes/California/framework.html.

[6] Jones and Stokes, 2005. op. cit.

[7] Jones and Stokes, 2005. op. cit.



SOIL ASSOCIATIONS *

WELL DRAINED TO POORLY DRAINED SOILS ON ALLUVIAL FANS, BASIN RIMS AND TERRACES, AND IN BASINS

1. Yolo-Brentwood association: Well-drained, nearly level silt loams to silty clay loams; on alluvial fans
2. Rincon-Marvin-Tehama association: Well drained and somewhat poorly drained, nearly level silty clay loams to loams; on alluvial fans and basin rims
3. Capay-Clear Lake association: Moderately well drained to poorly drained, nearly level silty clays and clays; on basin rims and in basins
4. Sycamore-Tyndall association: Somewhat poorly drained, nearly level very fine sandy loams to silty clay loams; on alluvial fans
5. Sacramento association: Poorly drained, nearly level silty clay loams and clays; in basins
6. Willows-Pescadero association: Poorly drained, nearly level, saline-alkali silty clay loams to clays; in basins
7. Capay-Sacramento association: Moderately well drained to poorly drained, nearly level silty clay loams to clays; in basins

SOMEWHAT EXCESSIVELY DRAINED TO WELL-DRAINED SOILS ON UPLANDS AND HIGH TERRACES

8. Corning-Hillgate association: Well-drained, gently sloping to moderately steep gravelly loams or loams; on terraces
9. Sehorn-Balcom association: Well-drained, gently sloping to steep silty clay loams and clays; over sandstone
10. Dibble-Millsholm association: Well-drained, steep to very steep loams to silty clay loams; over sandstone
11. Positas association: Well-drained, moderately steep to steep gravelly loams; on old alluvium
12. Rock land association: Steep to very steep areas that are 50 to 90 percent rock outcrops

* Texture refers to surface layer.

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FIGURE IV.L-1

Yolo County 2030 Countywide General Plan EIR

Regional Soils

SOURCE: JONES & STOKES, 2005

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Table IV.L-1: Soil Associations for Yolo County

Soil Association Name	Water Erosion Hazard	Linear Extensibility (shrink-swell)	Corrosivity (uncoated steel)	Soil Limitations for Septic Tank Filter Field
Yolo- Brentwood	None to slight	Yolo: Moderate Brentwood: High	Yolo: Low to Moderate Brentwood: High	Yolo: Moderate to Severe Brentwood: Severe
Rincon-Marvin- Tehema	None to slight	Rincon: Mod/High Marvin: Mod/High Tehema: Moderate	Rincon: Mod/High Marvin: High Tehema: Low/Moderate	Severe
Capay-Clear Lake	None to slight	High for most subtypes	High	Severe
Sycamore- Tyndall	None to slight	Moderate to High	Sycamore: High Tyndall: Low/Moderate	Severe for most subtypes
Sacramento	None to slight	Moderate to High	High	Severe
Willows- Pescadero	None to slight	Moderate to High	High	Severe
Capay- Sacramento	None to slight	High for most subtypes	High	Severe
Corning- Hillgate	Slight to high	Low to High	Low to High	Severe
Sehorn-Balcom	Moderate to very high	Sehorn: High Balcom: Moderate	Sehorn: High Balcom: Moderate	Severe
Dibble- Millsolm	Moderate to very high	Dibble: High Millsolm: Moderate	Dibble: High Millsolm: Moderate	Severe
Positas	Moderate to high	Low to High	Low to High	Severe
Rock land	Very high	--	--	--

Note: See legend on Figure IV.L-1 for thickness, texture, and landform characteristics of the soil associations.
Source: Soil Survey of Yolo County, California, June 1972.

Aggregate. The State of California has mapped the aggregate resources along lower Cache Creek as three Mineral Resource Zones: MRZ-1 comprises 1,458 acres, MRZ-2 comprises 18,452 acres, and MRZ-3 comprises 8,220 acres.[8] The Aggregate Resources Areas, including the extent of MRZ-2, is shown in Figure IV.L-2. Six aggregate mines (listed below) are currently operational in the County; all are located on the stream terraces of Cache Creek. All are commercial operations.[9]

- Syar Industries, Inc. (Madison plant)
- Teichert Aggregates (Esparto plant)
- CEMEX, Inc. (Madison plant)
- Granite Construction Company (Capay plant)
- Teichert Aggregates (Woodland plant)
- Schwarzgruber & Sons (Cache Creek plant)

Natural Gas. In recent years, natural gas has become more important to the regional economy. According to the California Department of Conservation (CDC) there are approximately 25 gas fields located within Yolo County.[10,11] Natural gas has been produced from the Dunnigan Hills northwest of Woodland, from the Fairfield Knolls gas field northeast of Winters, and from the Rumsey Hills area east of Rumsey. Natural gas wells have also been established in Clarksburg, Yolo, and Davis. A large

[8] See subsection 1.b(2) in this Chapter for a description of MRZ Classifications.

[9] Ibid.

[10] CDC, 2000. Energy Map of California, Map S-2, 3rd Edition.

[11] CDC, 2001. Oil, Gas, and Geothermal Fields in California, Map S-1

gas storage area (maximum capacity of 3.25 billion cubic feet) has been identified at the dry Pleasant Creek gas field, located approximately 2.5 miles northwest of Winters (see Figure IV.L-2).[12,13]

(5) Seismic and Geologic Hazards. This section describes the hazards associated with the geologic conditions and the potential for seismic events in the County.

Earthquakes and Surface Rupture. Surface rupture occurs when the ground surface is broken due to fault movement during an earthquake. Regional faults identified by the CGS are shown in Figure IV.L-3. The location of surface rupture generally can be assumed to be along an active major fault trace. The only fault in the County that has been identified by the CGS to be active, or potentially active, and subject to surface rupture (i.e., is delineated as an Alquist-Priolo Earthquake Fault zone) is the Hunting Creek Fault (sometimes referred to as the Hunting Creek-Berryessa Fault). The fault is located in the extreme northwestern corner of the County. Only a very short section of the fault occurs in the County; most of the trace is located in Lake and Napa counties. The Hunting Creek Fault is a right-lateral fault and has an average slip rate of 6 mm per year.[14] The maximum expected earthquake for this fault is estimated to be magnitude (M_w) 6.9 (earthquake magnitude is described more fully in the following paragraph). The only other active or potentially active fault in the County is the Dunnigan Hills Fault, which extends west of Interstate 5 between the town of Dunnigan and northwest of the town of Yolo. The fault has caused Holocene (i.e., the last 11,000 years) displacement, but not during historic (approximately 200 years) times. This fault is considered potentially active, but has not been delineated by the CGS as an Alquist-Priolo Earthquake Fault Zone, indicating that the CGS does not considered it likely to generate surface rupture. A number of older faults (e.g., Capay, Sweitzer, East Valley, and West Valley faults) occur in the western part of the County; however, displacement of these faults apparently occurred more than 1.6 million years ago. Accordingly, these faults are generally considered inactive. No known faults are located in any of the major inhabited areas of the County. The Coast Range-Sierran Block Boundary is partially located in the County, and is discussed below under seismic shaking sources.

Seismic Shaking. Seismic shaking (or ground shaking) is a general term referring to all aspects of motion of the earth's surface resulting from an earthquake, and is normally the major cause of damage in seismic events. The extent of ground shaking is controlled by the magnitude and intensity of the earthquake, distance from the epicenter, and local geologic conditions. Magnitude is a measure of the energy released by an earthquake; it is assessed by seismographs that measure the amplitude of seismic waves. Intensity is a subjective measure of the perceptible effects of seismic energy at a given point and varies with distance from the epicenter and local geologic conditions. The Modified Mercalli Intensity Scale (MMI) is the most commonly used scale for measurement of the subjective effects of earthquake intensity (Table IV.L-2). Intensity can also be quantitatively measured using accelerometers (strong motion seismographs) that record ground acceleration at a specific location, a measure of force applied to a structure under seismic shaking. Acceleration is measured as a fraction or percentage of the acceleration under gravity (g).

[12] CDC, 2006. Annual Report of the State Oil & Gas Supervisor, Division of Oil, Gas and Geothermal Resources. Publication PR06.

[13] Jones and Stokes, 2005. op. cit.

[14] Jones and Stokes, 2005. op. cit.

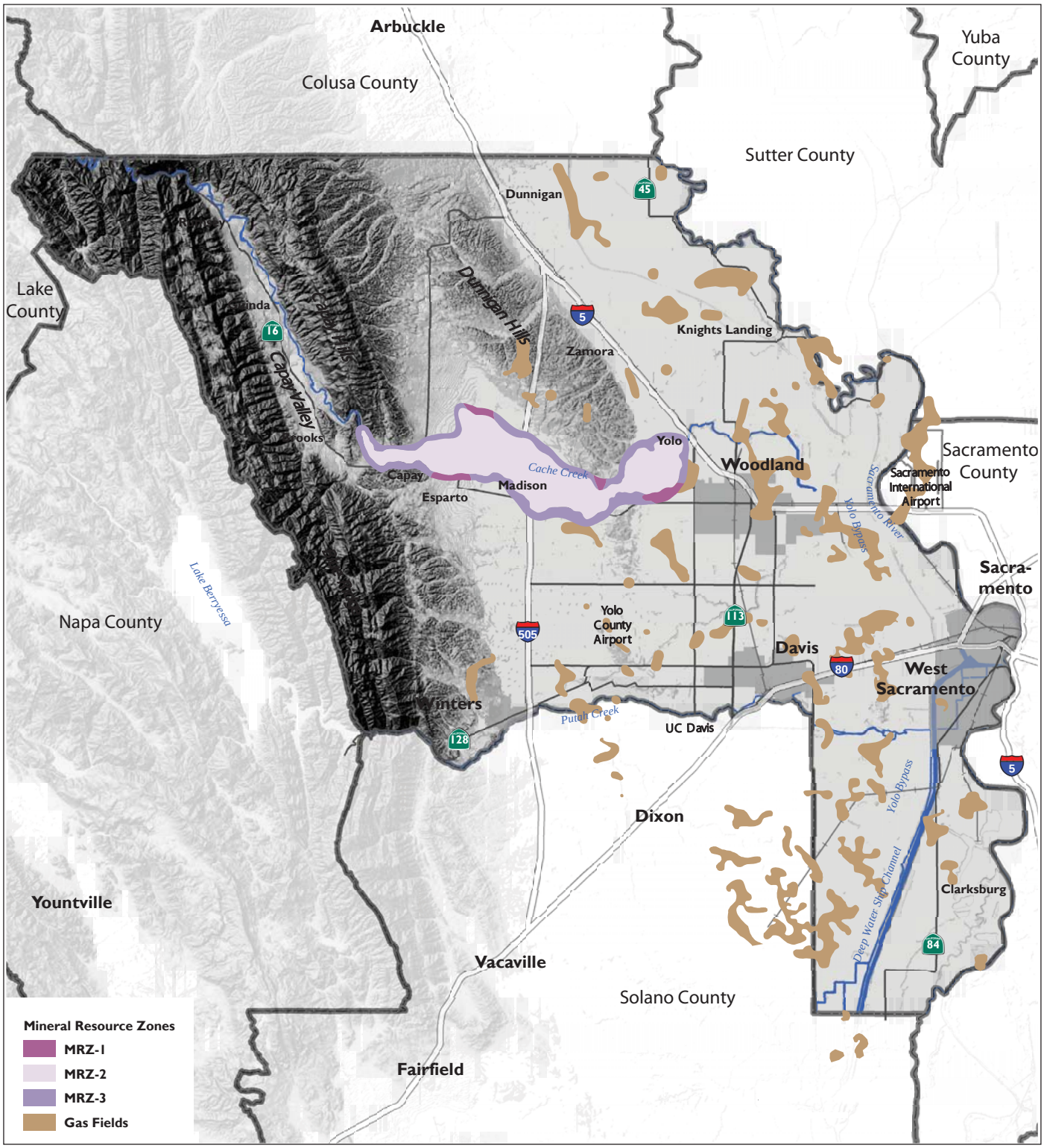

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FIGURE IV.L-2

Yolo County 2030 Countywide General Plan EIR
Regional Mineral and Gas Resources

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SOURCE: COUNTY OF YOL0, 2009.

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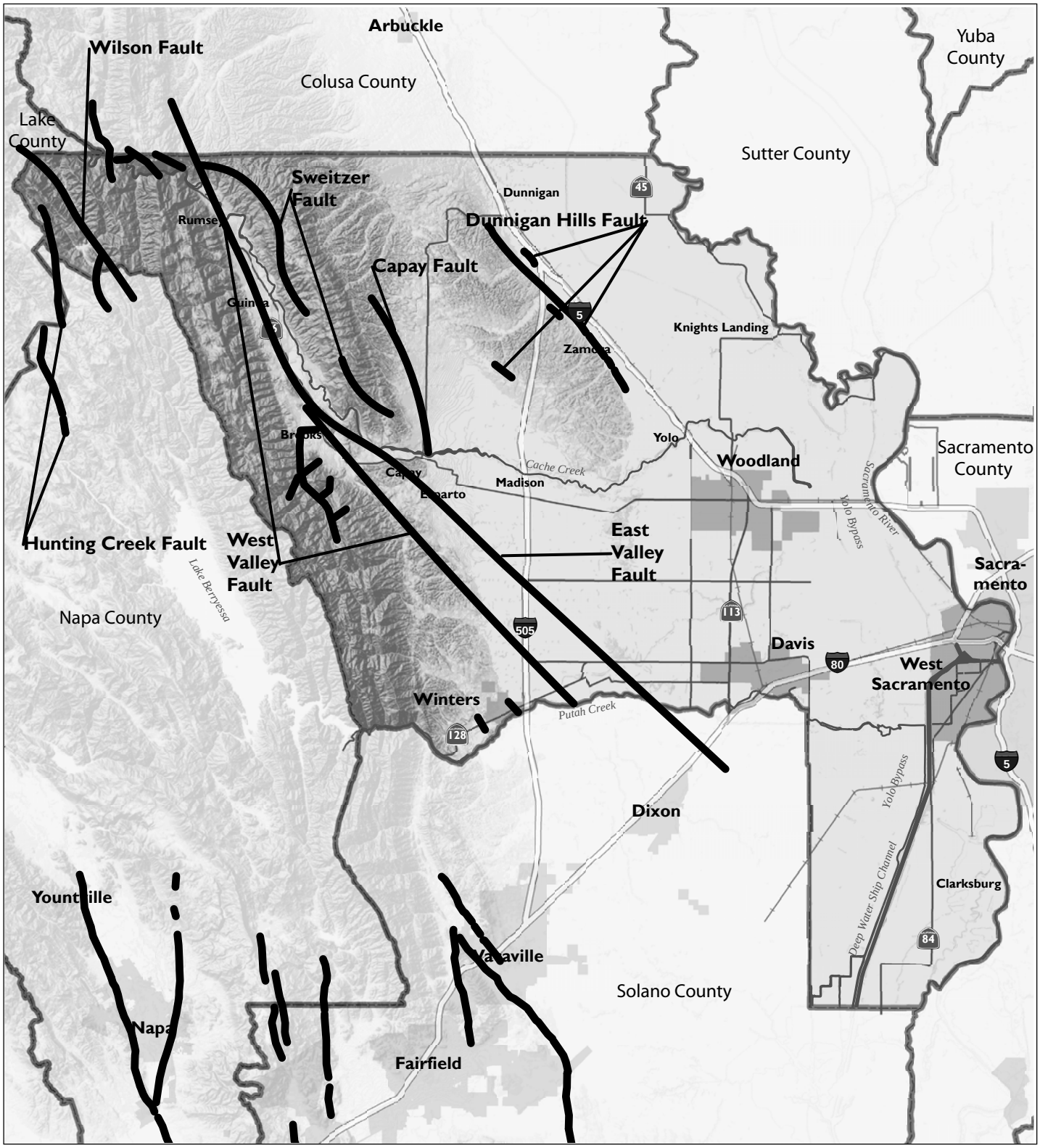

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FIGURE IV.L-3

Yolo County 2030 Countywide General Plan EIR
Faults

SOURCE: USGS, 1996; COTTON/BRIDGES/ASSOCIATES, 2004; YOLO COUNTY GIS, 2009

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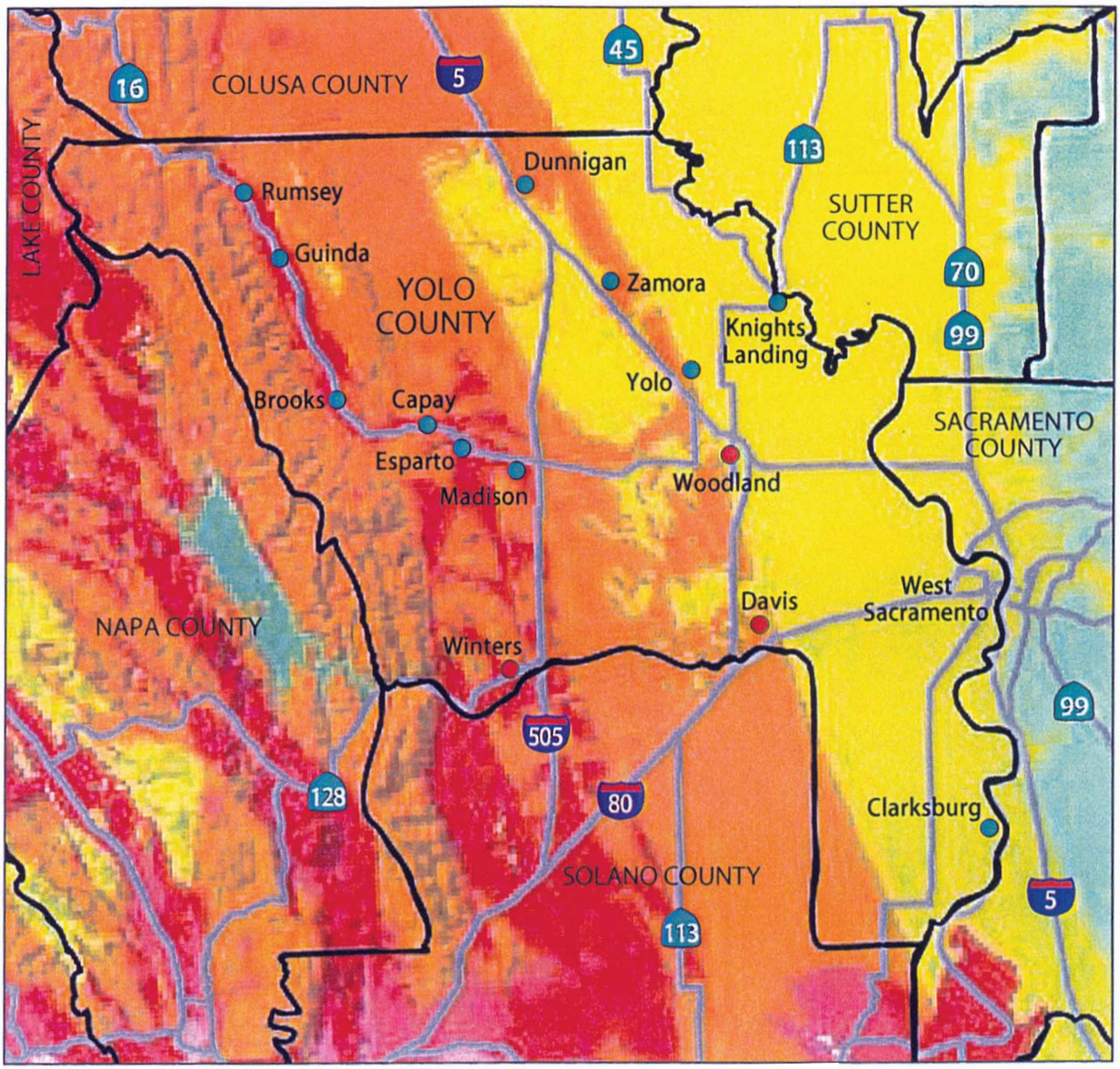
Table IV.L-2: Modified Mercalli Scale

M[a]	Category	Definition
	I	Not felt except by a very few under especially favorable circumstances.
3	II	Felt only by a few persons at rest, especially on upper floors of buildings. Delicately suspended objects may swing.
	III	Felt quite noticeably indoors, especially on upper floors of buildings, but many people do not recognize it as an earthquake. Standing motor cars may rock slightly. Vibration like passing of truck. Duration estimated.
4	IV	During the day felt indoors by many, outdoors by few. At night some awakened. Dishes, windows, doors disturbed; walls make cracking sound. Sensation like heavy truck striking building. Standing motor cars rocked noticeably.
	V	Felt by nearly everyone, many awakened. Some dishes, windows, etc., broken; a few instances of cracked plaster; unstable objects overturned. Disturbances of trees, poles, and other tall objects sometimes noticed. Pendulum clocks may stop.
5	VI	Felt by all, many frightened and run outdoors. Some heavy furniture moved; a few instances of fallen plaster or damaged chimneys. Damage slight.
6	VII	Everybody runs outdoors. Damage negligible in building of good design and construction; slight to moderate in well-built ordinary structures; considerable in poorly built or badly designed structures; some chimneys broken. Noticed by persons driving motor cars.
	VIII	Damage slight in specially designed structures; considerable in ordinary substantial buildings, with partial collapse; great in poorly built structures. Panel walls thrown out of frame structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture overturned. Sand and mud ejected in small amounts. Changes in well water. Persons driving motor cars disturbed.
7	IX	Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb; great in substantial buildings, with partial collapse. Buildings shifted off foundations. Ground cracked conspicuously. Underground pipes broken.
8	X	Some well-built wooden structures destroyed; most masonry and frame structures destroyed with foundations; ground badly cracked. Rails bent. Landslides considerable from river banks and steep slopes. Shifted sand and mud. Water splashed (slopped) over banks.
	XI	Few, if any, (masonry) structures remain standing. Bridges destroyed. Broad fissures in ground. Underground pipelines completely out of service. Earth slumps and land slips in soft ground. Rails bent greatly.
	XII	Damage total. Practically all works of construction are damaged greatly or destroyed. Waves seen on ground surface. Lines of sight and level are distorted.

[a] Richter magnitude correlation.
Source: California Geological Survey, 2002, How Earthquakes and Their Effects are Measured.

In addition to the Hunting Creek and Dunnigan Hills faults discussed above, major regional faults outside the County but in the Coast Ranges and in the Sierra Nevada foothills are capable of producing ground shaking in the County. As shown in Figure IV.L-4, the area is subject to range of ground shaking levels. The April 19, 1892 Vacaville-Winters earthquake measured approximately 6.9 on the Richter scale and caused severe damage in Winters and lesser damage in Davis, Woodland, and elsewhere in the County. The 1892 Vacaville-Winters earthquake was once attributed to the large regional feature, referred to as the Midland Fault, which extends into the County a short distance near Winters. The earthquake is now regarded by the CGS to have originated from a segment of a complex zone of faults, referred to as the Coast Range-Sierran Block Boundary (CRSBB), at the edge the western side of the lower Sacramento Valley.[15] The CRSBB forms the western geomorphic boundary

[15] Jones and Stokes, 2005. op. cit.



Level of Earthquake Hazard

These regions are near major, active faults and will on average experience stronger earthquake shaking more frequently. This intense shaking can damage even strong, modern buildings.

Range in Yolo County

Increasing Intensity

These regions are distant from known, active faults and will experience lower levels of shaking less frequently. In most earthquakes, only weaker, masonry buildings would be damaged. However, very infrequent earthquakes could still cause strong shaking here.

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Legend

- Counties
- Cities
- Unincorporated Areas
- Major Roads

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Note: Original map prepared for a statewide assessment. Some of the hazard levels do not occur within or near Yolo County.

Source: California Geological Survey, undated.

FIGURE IV.L-4

Yolo County 2030 Countywide General Plan EIR

Regional Ground Shaking Hazard

SOURCE: JONES & STOKES, 2005

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of the Central Valley with the Coast Ranges to the west. The CRSBB is currently recognized as a potential seismic source capable of generating moderate earthquakes that could affect the County.

Recent evaluations of the CRSBB indicate that tectonic compression occurs across the boundary as the Coast Range Block is tectonically pushed beneath the Sierran Block. The result of this active compression is the development of folds and thrust faults within the CRSBB. The faults associated with this zone do not typically propagate to the surface and are, therefore, called "blind thrusts." Because the faults are not expressed at the surface, identification of the locations of the faults cannot typically be determined on the basis of geomorphic evidence. However, the compressional zone is considered capable of generating moderate to large earthquakes that could produce strong seismic shaking throughout the region, including Yolo County.[16] Eleven moderate earthquakes (M 5.8 to 6.8) have been documented along the CRSBB zone during the last 150 years. The 1983 Coalinga earthquake (M 6.7) is a more recent example of an earthquake that occurred on a blind thrust within the CRSBB zone.

Peak Acceleration. Estimates of the peak ground acceleration have been made by the State for the Draft General Plan area based on probabilistic models that account for multiple seismic sources. Under these models, consideration of the probability of expected seismic events is incorporated into the determination of the level of ground shaking at a particular location. The expected peak horizontal acceleration (with a 10 percent chance of being exceeded in the next 50 years) generated by any of the seismic sources potentially affecting the Draft General Plan area is estimated by the California Geological Survey at about 0.21g[17] on the alluvium of the east County, to 0.47g in the foothills below Lake Berryessa and upper Cache Creek area.[18] This level of ground shaking in the Draft General Plan area is a potentially significant hazard.

(6) Liquefaction and Lateral Spreading. Liquefaction is the temporary transformation of loose, saturated granular sediments from a solid state to a liquefied state as a result of seismic ground shaking. In the process, the soil undergoes transient loss of strength, which commonly causes ground displacement or ground failure to occur. Since saturated soils are a necessary condition for liquefaction, soil layers in areas where the groundwater table is near the surface have higher liquefaction potential than those in which the water table is located at greater depths. No map of liquefaction hazard has been prepared on a Countywide basis. Upland areas are at relatively low risk of liquefaction, except in the intermountain valleys underlain by alluvium and shallow groundwater. Liquefaction is expected to be relatively higher in the Great Valley portion of the County, particularly along the floodplains of streams, where the sediments are generally sandier than other areas. Liquefaction may also lead to lateral spreading. Lateral spreading is a form of horizontal displacement of soil toward an open channel or other "free" face, such as an excavation boundary. Lateral spreading can result from either the slump of low cohesion unconsolidated material or more commonly by liquefaction of either the soil layer or a subsurface layer underlying soil material on a

[16] Working Group on Northern California Earthquake Potential, 1996. Database of Potential Sources for Earthquakes Larger Than Magnitude 6 in Northern California, US Department of the Interior OFR 96-705.

[17] Measured as a fraction or percentage of the acceleration compared to gravity (g).

[18] California Geological Survey (CGS), 2008, Probabilistic Seismic Hazards Mapping Ground Motion Page, accessed 29 November 2008, www.consrv.ca.gov/cgs/rghm/pshamap/pshamain.html.

slope, resulting in gravitationally driven movement.[19] Areas most prone to lateral spreading are those that consist of fill material that has been improperly engineered, that have steep, unstable banks, and that have high groundwater tables. The banks along the Deep Water Ship Channel and Turning Basin in West Sacramento may have such a condition. Damage caused by liquefaction and lateral spreading is generally most severe when liquefaction occurs within 15 to 20 feet of the ground surface.[20]

(7) Expansive Soils. Expansion and contraction of volume can occur when expansive soils undergo alternating cycles of wetting (swelling) and drying (shrinking). During these cycles, the volume of the soil changes markedly. As a consequence of such volume changes, structural damage to building and infrastructure may occur if the potentially expansive soils were not considered in building design and during construction. The soils of the Draft General Plan area generally have moderate to high shrink-swell potential and are classified as expansive soils, as shown in Figure IV.L-5.[21]

(8) Slope Stability. Slope failure can occur as either rapid movement of large masses of soil ("landslide") or slow, continuous movement ("creep"). The primary factors influencing the stability of a slope are: 1) the nature of the underlying soil or bedrock, 2) the geometry of the slope (height and steepness), 3) rainfall, and 4) the presence of previous landslide deposits. Landslides are commonly triggered by unusually high rainfall and the resulting soil saturation, by earthquakes, or a combination of these conditions. The general term "landslide" may include a wide range of slope failures, including but not limited to rock falls, deep failure of slopes, earthflows, and shallow debris flows. Some landslides occur as a result of human activities, such as timber harvest, undermining a slope, and improper drainage water management. Steep slopes underlain by Cretaceous rocks along Cache Creek are susceptible to landsliding and numerous large and small landslides have been mapped in this area. However, as shown in Figure IV.L-6, except for the communities of Capay and Brooks, landslides are generally not a significant hazard to life or property in the County. Most of the areas subject to landsliding are in agricultural use (e.g., grazing) or are otherwise undeveloped.

(9) Settlement and Differential Settlement. Settlement or differential settlement could occur if buildings or other improvements were built on low-strength foundation materials (including imported fill) or if improvements straddle the boundary between different types of subsurface materials (e.g., a boundary between native material and fill). Although differential settlement generally occurs slowly enough that its effects are not dangerous to inhabitants, it can cause significant building damage over time. Portions of the Draft General Plan area that contain loose or uncontrolled (non-engineered) fill may be susceptible to differential settlement.

b. Regulatory Framework. This section describes the applicable federal, State and local regulations that pertain to Yolo County.

(1) Federal Regulations – National Earthquake Hazards Reduction Program. The National Earthquake Hazards Reduction Program (NEHRP) was established by the U.S. Congress

[19] Rauch, Alan F., 1997, *EPOLLS: An Empirical Method for Predicting Surface Displacements due to Liquefaction-Induced Lateral Spreading in Earthquakes*, Ph. D. Dissertation, Virginia Tech, Blacksburg, VA.

[20] Jones and Stokes, 2005. op. cit.

[21] Natural Resources Conservation Service, 2007, op. cit.

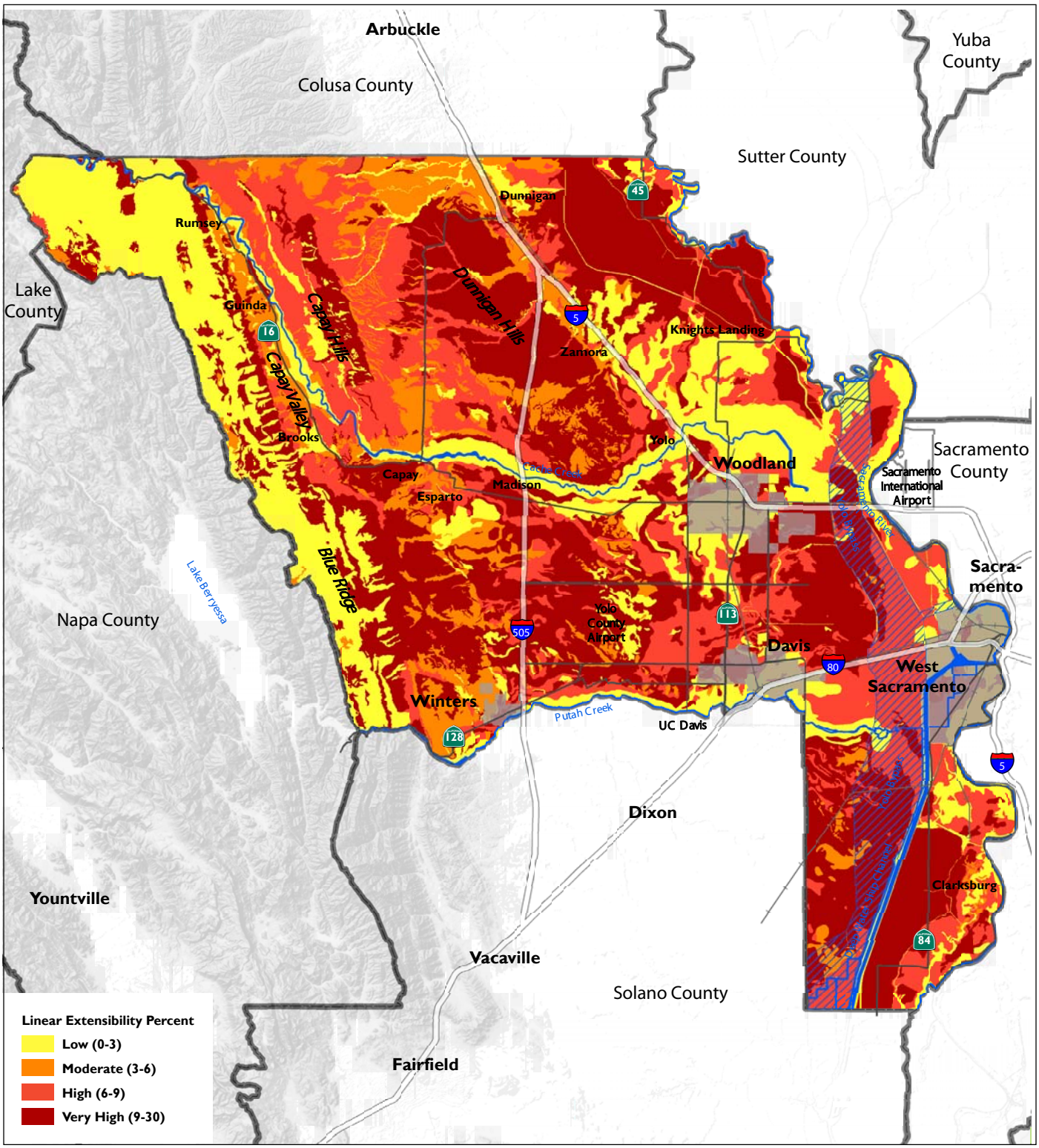

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FIGURE IV.L-5

Yolo County 2030 Countywide General Plan EIR
Expansive Soils

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SOURCE: NATURAL RESOURCES CONSERVATION SERVICE, 2007; COUNTY OF YOL0, 2009.

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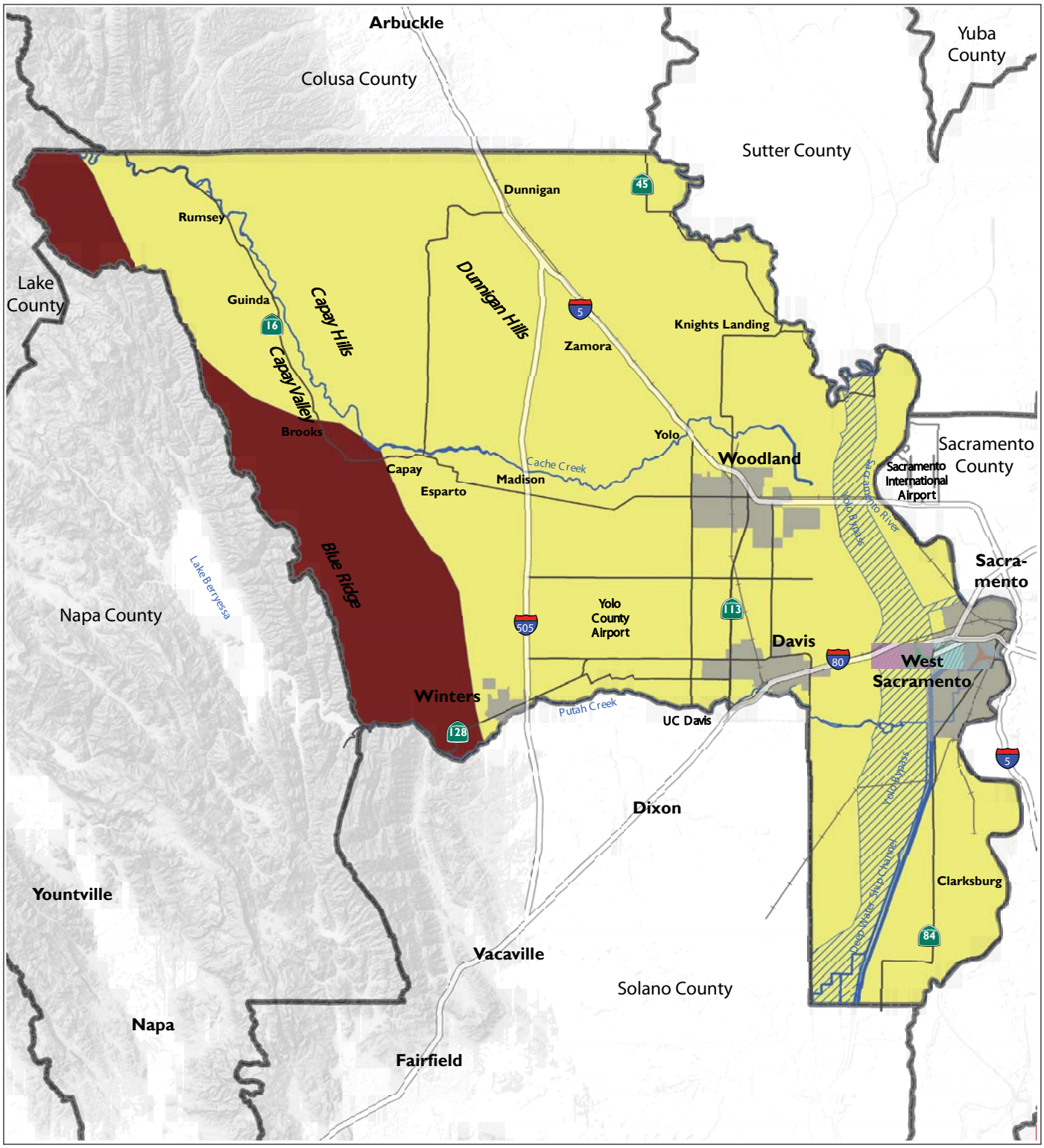

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FIGURE IV.L-6

Yolo County 2030 Countywide General Plan EIR
Landslide Susceptibility

SOURCE: USGS, 2001; COUNTY OF YOLO, 2009.

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when it passed the Earthquake Hazards Reduction Act of 1977, Public Law (PL) 95–124. In establishing NEHRP, Congress recognized that earthquake-related losses could be reduced through improved design and construction methods and practices, land use controls and redevelopment, prediction techniques and early-warning systems, coordinated emergency preparedness plans, and public education and involvement programs. The four basic NEHRP goals remain unchanged:

- Develop effective practices and policies for earthquake loss reduction and accelerate their implementation.
- Improve techniques for reducing earthquake vulnerabilities of facilities and systems.
- Improve earthquake hazards identification and risk assessment methods, and their use.
- Improve the understanding of earthquakes and their effects.

Several key Federal agencies contribute to earthquake mitigation efforts. There are four primary NEHRP agencies:

- National Institute of Standards and Technology (NIST) of the Department of Commerce
- National Science Foundation (NSF)
- United States Geological Survey (USGS) of the Department of the Interior
- Federal Emergency Management Agency (FEMA) of the Department of Homeland Security

Implementation of NEHRP priorities is accomplished primarily through original research, publications, and recommendations to assist and guide State, regional, and local agencies in the development of plans and policies to promote safety and emergency planning.

State. State regulations described below include the California Building Code, Alquist-Priolo Earthquake Fault Zoning Act, Seismic Hazards Mapping Act, regulations pertaining to oil, gas, and geothermal wells, and the Surface Mining and Reclamation Act of 1975.

California Building Code. The (2006) Uniform Building Code (UBC) is published by the International Conference of Building Officials (ICBO), and is the widely adopted model building code in the United States. The (2007) California Building Code (CBC) is another name for the body of regulations known as the California Code of Regulations (CCR), Title 24, Part 2, which is a portion of the California Building Standards Code (CBSC). The CBC incorporates by reference the UBC requirements with necessary California amendments. Title 24 is assigned to the California Building Standards Commission, which, by law, is responsible for coordinating all building standards. Under State law, all building standards must be centralized in Title 24 or they are not enforceable. Compliance with the 2007 California Building Code (CBC) requires that (with very limited exceptions) structures for human occupancy be designed and constructed to resist the effects of earthquake motions. The Seismic Design Category for a structure is determined in accordance with either; CBC Section 1613 - *Earthquake Loads*: or, American Society of Civil Engineers (ASCE) Standard No. 7-05, *Minimum Design Loads for Buildings and Other Structures*. In brief, based on the engineering properties and soil-type of soils at a proposed site, the site is assigned a Site Class ranging from A to F. The Site Class is then combined with Spectral Response (ground acceleration induced by earthquake) information for the location to arrive at a *Seismic Design Category* ranging from A to D; D being the most severe conditions. The classification of the site and related calculations must be determined by a qualified person and are site-specific.

Alquist-Priolo Earthquake Fault Zoning Act (A-PEFZA). Surface rupture is the most easily avoided seismic hazard. The A-PEFZA was passed in December 1972 to mitigate the hazard of surface faulting to structures for human occupancy. The A-PEFZA's main purpose is to prevent the construction of buildings used for human occupancy on the surface trace of active faults. The A-PEFZA only addresses the hazard of surface fault rupture and is not directed toward other earthquake hazards (the Seismic Hazards Mapping Act, passed in 1990, addresses non-surface fault rupture earthquake hazards, including liquefaction and seismically induced landslides). The law requires the State Geologist to establish and map regulatory zones, known as Earthquake Fault Zones, around the surface traces of active faults and to issue appropriate maps. The maps are distributed to all affected cities, counties, and State agencies for their use in planning and controlling new or renewed construction. Local agencies must regulate most development projects within the zones. Projects include all land divisions and most structures for human occupancy. Before a project can be permitted, agencies must require a geologic investigation to demonstrate that proposed buildings will not be constructed across active faults. The evaluation and written report of a specific site must be prepared by a licensed geologist. If an active fault is found, a structure for human occupancy cannot be placed over the trace of the fault and must be set back 50 feet from the fault trace.

Seismic Hazards Mapping Act (SHMA). In 1990, following the Loma Prieta earthquake, the California Legislature enacted the SHMA to protect the public from the effects of strong ground shaking, liquefaction, landslides and other seismic hazards. The SHMA established a State-wide mapping program to identify areas subject to violent shaking and ground failure; the program is intended to assist cities and counties in protecting public health and safety. The SHMA requires the State Geologist to delineate various seismic hazard zones and requires cities, counties, and other local permitting agencies to regulate certain development projects within these zones. As a result, the California Geologic Survey is mapping SHMA Zones and has completed seismic hazard mapping for the portions of California most susceptible to liquefaction, ground shaking, and landslides: primarily the San Francisco Bay area and Los Angeles basin. Before a development permit is granted for a site within a seismic hazard zone, a geotechnical investigation of the site must be conducted and appropriate mitigation measures incorporated into the project design. At the time of the preparation of this Draft EIR, the County has not yet been mapped in conformance with the SHMA.

Oil, Gas, and Geothermal Wells Regulations. The California Department of Conservation's Division of Oil, Gas, and Geothermal Resources oversee the drilling, operation, maintenance, and plugging and abandonment of oil, natural gas, and geothermal wells.[22] The regulatory program emphasizes the development of oil, natural gas, and geothermal resources in the State through sound engineering practices that protect the environment, prevent pollution, and ensure public safety. Other agencies that may be involved in the regulation of drilling wastes include the State Water Resources Control Board and appropriate Regional Water Quality Control Boards, the California Integrated Waste Management Board, the California Air Resources Board and appropriate Air Quality Management Districts or Air Pollution Control Districts, and the Department of Toxic Substances Control.[23] Applicable State law comes from the California Code of Regulations (CCR) Title 14, Natural Resources of the California; Division 2, Chapter 4, Development, Regulation, and Conservation of Oil and Gas Resources. This chapter governs natural gas well drilling, operation, and

[22] Resources Agency, 2007. Publication No. PRC04: California Code of Regulations, Title 14, Division, 2, Chapters 2-4. Division of Gas, Oil and Geothermal Resources, March.

[23] Drilling Waste Management Systems, 2008. State Regulations: California, US Department of Energy: the Argonne National Laboratory Project, accessed 11/28/08 at: web.ead.anl.gov/dwm/contact/index.cfm

abandonment procedures. It provides detailed standards and regulations that operators and local jurisdictions must comply with.[24]

Surface Mining and Reclamation Act of 1975. The principal legislation addressing mineral resources in California is the State Surface Mining and Reclamation Act of 1975 (SMARA) (Public Resources Code Sections 2710–2719), which was enacted in response to land use conflicts between urban growth and essential mineral production. The stated purpose of SMARA is to provide a comprehensive surface mining and reclamation policy that will encourage the production and conservation of mineral resources while ensuring that adverse environmental effects of mining are prevented or minimized; that mined lands are reclaimed and residual hazards to public health and safety are eliminated; and that consideration is given to recreation, watershed, wildlife, aesthetic, and other related values. [25]

SMARA provides for the evaluation of an area's mineral resources using a system of Mineral Resource Zone (MRZ) classifications that reflect the known or inferred presence and significance of a given mineral resource. The MRZ classifications are based on available geologic information, including geologic mapping and other information on surface exposures, drilling records, and mine data; and socioeconomic factors such as market conditions and urban development patterns. The MRZ classifications are defined as follows:

MRZ-1—Areas where adequate information indicates that no significant mineral deposits are present, or where it is judged that little likelihood exists for their presence.

MRZ-2—Areas where adequate information indicates that significant mineral deposits are present, or where it is judged that a high likelihood for their presence exists.

MRZ-3—Areas containing mineral deposits, the significance of which cannot be evaluated from available data.

MRZ-4—Areas where available information is inadequate for assignment into any other MRZ.

SMARA governs the use and conservation of a wide variety of mineral resources. However, certain resources and activities are exempt from the provisions of SMARA. Subject to certain conditions, exempted activities include excavation and grading conducted for farming, onsite construction, or recovery from flooding or other natural disaster. In addition to mineral resource conservation, SMARA regulates surface mining in California. The California Mining and Geology Board have established mine reclamation regulations that fulfill the reclamation requirements of SMARA.

A mining report is required to be submitted annually by mine operators to the Department of Conservation.[26] The report must include such information as the amount of land disturbed during the previous year, acreage reclaimed during the previous year, and amendments made to the reclamation plan. The requirement for an annual monitoring report was added to SMARA in 1990 as a result of

[24] California State Department of Conservation, 2008. Oil, Gas and Geothermal Programs Page, accessed 11/28/08 at: http://www.consrv.ca.gov/dog/Pages/index.aspx.

[25] CGS, 2008. Mineral Resources and Mineral Hazards Mapping Program. Accessed 11/28/08 at: www.consrv.ca.gov/cgs/minerals/Pages/Index.aspx

[26] California Department of Conservation, 2007. *Surface Mining and Reclamation Act and Associated Regulations,* Office of Mine Reclamation, January. Accessed 12/05/08 at: www.conservation.ca.gov/omr/smara/Pages/Index.aspx

AB 3903, Chapter 1101. Reclamation Plan. Before a mining project is approved, a reclamation plan must be prepared and approved by the lead agency. The plan must include such information as the following:

- maximum anticipated depth of extraction,
- quantity and type of materials to be extracted,
- time span of the operation,
- mine waste disposal method,
- manner in which reclamation will be accomplished including erosion control measures,
- post-reclamation land use, and
- how the reclamation will affect future mining in the area.

Additionally, SMARA specifies that lead agencies require financial assurances of each mining operation to ensure reclamation is performed in accordance with the approved reclamation plan. The financial assurances may take the form of surety bonds, irrevocable letters of credit, trust funds, or similar mechanism. Most of the mining operations along Cache Creek are subject to all of SMARA's requirements. However, two of the mines, one of which is inactive, were operating before SMARA was enacted. These "grandfathered" operations are nevertheless subject to certain regulatory requirements, such as providing financial assurances and implementing reclamation plans.[27]

(2) Local Regulations. The Yolo County Municipal Code and the Cache Creek Area Plan contain applicable local regulations as described below.

Yolo County Cache Creek Area Plan. The Off-Channel Mining Plan for Lower Cache Creek (OCMP) together with the Cache Creek Resources Management Plan for Lower Cache Creek (CCRMP) comprise the Cache Creek Area Plan (CCAP). The CCAP describes approaches for managing riparian habitats along Cache Creek from the Capay Dam to I-5, in particular, for restoring habitats, reducing erosion, maintaining flood capacity, and improving water quality. Among the goals of the plan is to promote coordination of local, State, and federal regulation of activities within Cache Creek. The OCMP was established as a comprehensive and integrated planning framework for regulating and protecting the Cache Creek area. The OCMP accommodates gravel mining on the creek terraces (but not in-channel) while emphasizing habitat restoration, open space, and reclamation of mined lands to agricultural use. The OCMP describes a future groundwater recharge and storage program and allows for future recreation opportunities along the creek. The CCRMP is a comprehensive creek management plan that eliminated commercial in-channel aggregate mining, established an improvement program from implementing on-going projects to improve channel stability, and ensured restoration of riparian habitat along creek banks in the future.

Yolo County Code. Regulations provided in the Title 10 of the Yolo County Code are described below.

Chapter 3. The Cache Creek Area Plan In-Channel Maintenance Mining Ordinance was enacted to implement the provisions of the CCAP as related to allowance of in-channel activities. Pursuant to the CCAP, commercial in-channel mining is precluded within Cache Creek. Limited

[27] Jones and Stokes, 2005. op. cit.

excavation activities related to stream stabilization, flood protection, and riparian restoration (referred to as "maintenance mining") may be performed pursuant to the CCRMP and the Cache Creek Improvement Program (CCIP). This maintenance mining is necessary and required in order to protect structures, infrastructure, and land uses along the creek and downstream, from damage from natural creek forces (e.g., flooding, erosion, deposition, washout). Stabilizing the channel banks and profiles pursuant to the CCRMP/CCIP results in reduced erosion, increased in-channel recharge, and additional riparian habitat opportunities. Approved projects requiring excavation of channel banks and removal of riparian vegetation are required to be revegetated consistent with the performance standards set out in the CCRMP and the CCAP upon the completion of excavation activities.

Chapter 4. Off-Channel Surface Mining, Title 10 of the Yolo County code, pertains to both in-channel and off-channel mining within the lower Cache Creek watershed. It sets forth monitoring requirements so that mining activities must be conducted in a way that protects public health and safety and requires that mining operations are adapted to site-specific conditions.

Chapter 5. Surface Mining Reclamation, Title 10 of the Yolo County code (known as the Surface Mining Reclamation Ordinance of Yolo County), ensures reclamation of mined lands to minimize the adverse effects of mining on the environment and to protect public health and safety. It requires that reclamation plans be adapted to site-specific conditions and be designed to reclaim mined areas so as to maximize beneficial uses; in particular, agriculture, wildlife habitat, or recreation.

Regulations provided in Title 7 of the Yolo County Code are described below.

Building Codes. The adopted building codes in effect in Yolo County include:

- 2007 CCR Title 24 as adopted and amended by Yolo County
- 2007 California Building Code based on the 2006 International Building Code
- 2007 California Electrical Code based on the 2005 National Electrical Code
- 2007 California Plumbing Code based on the 2006 Uniform Plumbing Code
- 2007 California Mechanical Code based on the 2006 Uniform Mechanical Code
- 2007 California Fire Code based on the 2006 International Fire Code
- 2005 California Energy Standards

The 2007 CBC, as adopted by the County, includes more stringent requirements for seismic structural engineering, and foundation design guidance than previous CBC editions. Compliance with code enhances seismic safety and minimizes the effects of unstable soils and other geologic hazards by providing superior engineering guidance and recommendations.

Building Permits. Title 7 "Building Regulations" of the Yolo County Municipal Code defines the regulations, conditions, and circumstances requiring application for a Building Permit for projects within the County. In general, project buildings and structures that would need to comply with regulations encapsulated in the above defined codes would require a building permit. There are various exceptions for certain structures dedicated to agricultural uses.

Grading permits. For construction projects that result in one or more acres of land disturbance, coverage under the NPDES Construction General Permit (CGP) is required. A complete discussion of NPDES permitting requirements is included in Section K: Hydrology and Water Quality of this EIR.

As part of the application process for CGP coverage, a Yolo County Grading Permit Application submitted to the Yolo County Planning and Public Works Department may be required.[28] Section 10 of the Yolo County Improvement Standards provides general requirements for grading activities in the County, and notes that grading shall conform to the conditions and terms described in Title 7 (Building Regulations) of the Yolo County Code and the terms of the Improvements Standards, which include conditions under which grading permits for subdivision improvements would be granted.[29] Grading permits are generally *not* required for the following works described below. However, a Flood Hazard Development Permit would be required for any work being done in a FEMA-designated High Hazard Flood Zone. Normal agricultural activities are exempted from grading permit requirements.

- Earthwork as approved by the Building Official, such as grading in an isolated, self-contained area if there is no danger to private or public property.
- Excavation below the finished grade for basements and footings of a building, retaining wall or other structure if such structure is authorized by a valid building permit. This shall not exempt any fill or excavation having an unsupported height greater than 5 feet after the completion of such structure. (Planning Department permits required).
- Mining, quarrying, excavating, processing, stockpiling of rock, sand, gravel, aggregate or clay where established and provided for by law, provided such operations do not affect the lateral support or increase the stresses in or pressure upon any adjacent or contiguous property. (Planning approval required).
- Exploratory excavations under the direction of soil engineers or engineering geologists.
- An excavation which either less than two feet in depth, or which does not create a cut slope greater than five feet in height and steeper than 1.5 horizontal to 1.0 vertical.
- A fill less than one foot in depth and placed on natural terrain with a slope flatter than 5.0 horizontal to 1.0 vertical, or less than three feet in depth, not intended to support structures, which does not exceed 50 cubic yards on any one lot and does not obstruct a drainage course.

Regulations provided in Title 6 of the Yolo County Code are described below.

Septic Systems.[30] Yolo County Code Section 6-8.603 requires a Sewage Disposal Permit for the construction, re-construction, repair, or abandonment of a septic system. The guidelines document provided by Environmental Health of Yolo County provides an extensive discussion of design parameters and requirements, including site concerns and practical guidance in permitting, system selection and sizing.

2. Draft 2030 Countywide General Plan for Yolo County

The following is a list of relevant Draft General Plan policies and actions related to geology, soils, seismicity and mineral resources.

[28] Yolo County, 2009. Grading Permit Application, accessed 03/31/09 at: www.yolocounty.org/Modules/ShowDocument.aspx?documentid=3519

[29] Yolo County Department of Planning and Public Works, 2008. County of Yolo Improvement Standards, 5 August.

[30] Yolo County Environmental Health, 2004. Guidelines to the Planning, Installation, and Maintenance of Septic Systems in Yolo County.

Conservation and Open Space Element

- Policy CO-3.1: Encourage the production and conservation of mineral resources, balanced by the consideration of important social values, including recreation, water, wildlife, agriculture, aesthetics, flood control, and other environmental factors.
- Policy CO-3.2: Ensure that mineral extraction and reclamation operations are compatible with land uses both on-site and within the surrounding area, and are performed in a manner that does not adversely affect the environment.
- Policy CO-3.3: Encourage the extraction of natural gas where compatible with both on-site and surrounding land uses, and when performed in a manner that does not adversely affect the environment.
- Policy CO-3.4: Within the Delta Primary Zone, ensure compatibility of permitted land use activities with applicable, natural gas policies of the Land Use and Resource Management Plan of the Delta Protection Commission.
- Policy CO-5.1: Coordinate with water purveyors and water users to manage supplies to avoid long-term overdraft, water quality degradation, land subsidence and other potential problems.
- Policy CO-5.5: Integrate balanced waste management programs that emphasize multiple benefits and balance competing needs into all aspects of the planning and development process.
- Policy CO-5.6: Improve and protect water quality for municipal, agricultural, and environmental uses.
- Policy CO-5.7: Support mercury regulations that are based on good science and reflect an appropriate balancing of sometimes competing public values including health, food chain, reclamation and restoration of Cache Creek, sustainable and economically viable Delta agriculture, necessary mineral extraction, flood control, erosion control, water quality, and habitat restoration.
- Action CO-A37: Designate and zone lands containing identified mineral deposits to protect them from the encroachment of incompatible land uses so that aggregate resources remain available for the future. (Policy CO-3.1)
- Action CO-A38: Amend the County Code to allow landowners to apply for redesignation of their property when it can be demonstrated that mineral resources are not present or are not economically feasible. (Policy CO-3.1)
- Action CO-A39: Encourage the responsible development of aggregate deposits along Cache Creek as significant both to the economy of Yolo County and the region. (Policy CO-3.1)
- Action CO-A40: Encourage recycling of aggregate materials and products. (Policy CO-3.1)
- Action CO-A41: Regularly review regulations to ensure that they support an economically viable and competitive local aggregate industry. (Policy CO-3.1)
- Action CO-A42: Implement the Cache Creek Area Plan to ensure the carefully managed use and conservation of sand and gravel resources, riparian habitat, ground and surface water, and recreational opportunities.(Policy CO-3.1)
- Action CO-A43: Monitor updates to the State Mineral Resource classification map and incorporate any needed revisions to the County's zoning and land use map. (Policy CO-3.1)
- Action CO-A44: Coordinate individual surface mining reclamation plans so that the development of an expanded riparian corridor along Cache Creek may be achieved. (Policy CO-3.1)
- Action CO-A45: Prohibit commercial mining in or adjoining Putah Creek. (Policy CO-3.1, Policy CO-3.2)
- Action CO-A46: Maintain standards and procedures for regulating surface mining and reclamation operations so that potential hazards and adverse environmental effects are reduced or eliminated. (Policy CO-3.1, Policy CO-3.2)

- Action CO-A47: Ensure that mined areas are reclaimed to a usable condition that is readily adaptable for alternative land uses, such as agriculture, wildlife habitat, recreation, and groundwater management facilities.
- Action CO-A48: Regularly update surface mining and reclamation standards to incorporate changes to State requirements, environment conditions, and County priorities. (Policy CO-3.1)
- Action CO-A49: Consider the exploration, drilling, and extraction of natural gas as compatible with agriculture and open space uses. (Policy CO-3.3)
- Action CO-A50: Evaluate any impacts to identified natural gas fields as part of the development review process. (Policy CO-3.3)
- Action CO-A51: Require that abandoned gas wells be sealed in accordance with State of California Division of Oil, Gas and Geothermal Resources regulations and that all drilling or production facilities be removed. Further require that the disturbed surface area be reincorporated into adjoining agricultural operations or revegetated with native vegetation within one year after abandonment. (Policy CO-3.3)
- Action CO-A52: Maintain and implement local and State criteria and development standards for the production, injection, and drilling of natural gas deposits. Ensure that the construction and operation of natural gas storage facilities meet all safety standards of the State of California Division of Oil, Gas and Geothermal Resources. (Policy CO-3.3)
- Action CO-A80: Develop a County grading ordinance that maintains existing terrain, channels, and vegetation to the extent possible, in order to minimize the disruption of natural systems. (Policy CO-5.5, Policy CO-5.6)
- Action CO-A92: Require the implementation of Best Management Practices (BMPs) to minimize erosion, sedimentation, and water quality degradation resulting from new development and increases in impervious surfaces. (Policy CO-5.5, Policy CO-5.6)

Health and Safety Element

- Policy HS-1.1: Regulate land development to avoid unreasonable exposure to geologic hazards.
- Policy HS-1.2: All development and construction proposals shall be reviewed by the County to ensure conformance to applicable building standards.
- Policy HS-1.3: Require environmental documents prepared in connection with CEQA to address seismic safety issues and to provide adequate mitigation for existing and potential hazards identified.
- Action HS-A1: Require a geotechnical analysis for construction in areas with potential geological hazards and/or for purposes of environmental analysis. Recommendations of the geotechnical analysis shall be implemented. (Policy HS-1.1, Policy HS-1.2, Policy HS-1.3)
- Action HS-A2: Rely upon the most current and comprehensive geological hazard mapping available in the evaluation of potential seismic hazards associated with proposed new development. (Policy HS-1.3)
- Action HS-A3: Continue to participate in the Yolo County Subsidence Network and implement its recommendations. (Policy HS-1.2, Policy HS-1.3)
- Action HS-A4: Integrate geologic hazard information into the County Geographical Information System (Policy___)
- Action HS-A12: Review development proposals to ensure that the need to maintain flood control capacity is balanced with consideration of the environmental health of watercourses that convey floodwaters so as not to cause significant erosion, sedimentation, water quality problems, or loss of habitat. (Policy HS-2.1)

3. Impacts and Mitigation Measures

This section provides an assessment of the potential adverse impacts related to geologic, soils, seismicity and mineral resources associated with implementation of the Draft General Plan, the proposed project. It establishes the thresholds of significance for impacts and then evaluates the Draft General Plan. Where potentially significant impacts of the proposed project are identified, mitigation measures are recommended.

a. Significance Criteria. The Draft General Plan would have a significant geology, soils, or mineral resources impact if it would:

- Expose people or structures to substantial risk of loss, injury, or death involving:
  - Rupture of a known active or potentially active earthquake fault;
  - Strong seismic ground shaking;
  - Seismic-related ground failure, including liquefaction; or
  - Landslides;
- Expose people, structures, or infrastructure to increased risk of injury or damage due to the presence of expansive soils, corrosive soils, soil settlement or compaction, or other geological conditions.
- Result in substantial erosion, loss of top soil, or unstable slope or soil conditions through alteration of topographic features, dewatering, or changes in drainage patterns.
- Result in the loss of availability of a known mineral resource;
- Result in the destruction, covering, or adverse modification of a unique geologic or physical feature;
- Substantially conflict with applicable plans, policies and regulations of other agencies where such conflict would result in an adverse physical change in the environment; or
- Result in new policies that would result in significant adverse physical impacts as compared to the 1983 General Plan policies.

b. Impacts Analysis. The following section provides an evaluation and analysis for the potential impacts of the Draft General Plan for each of the criteria of significance listed above.

(1) Expose People or Structures to Substantial Risk Related to Geohazards. This discussion addresses the first three significance criteria listed above. The growth and changes to land use in the unincorporated County resulting from build-out under the Draft General Plan would result in increased development, approximately 41,435 new residents, and/or other physical changes in the County that could be affected by geological hazards. Build-out under the Draft General Plan would therefore result in additional people and structures being exposed to geohazards, including seismic risks, liquefaction, slope instability, soil settlement or compaction, and adverse soil conditions (e.g., expansive soils, corrosive soils). Some of these geohazards, particularly those related to seismic shaking, could result in injuries and/or fatalities; all of the geohazards discussed could result in damage to structures and property. Existing federal and State programs, including NEHRP, the A-PEFZA, the SHMA and the CBC, are designed to provide accurate and timely information detailing

seismic hazards, impose regulatory requirements regarding geotechnical and soils investigations, provide limitations on the locations of structures for human habitation, impose requirements for hazard notices to potential users, and establish structural standards for requirements for buildings and grading projects. The policies and actions of the Draft General Plan would guide new development and reduce impacts relative to geohazards. It is the stated intent of the Health and Safety Element of the Draft General Plan that it, ". . . ensures that appropriate consideration of both natural and human-made hazards and risks are factored into land use decision-making."

As shown in Table III-2 in Chapter III, Project Description, the increased development (dwelling units, commercial and industrial buildings, schools, public buildings, etc…) would generally take place on land designated for specific plan (3,285 acres), residential (3,088 acres), commercial (651 acres), industrial (1,049 acres), and public and quasi-public uses (7,001 acres). Additionally, farm dwellings and industrial and commercial buildings directly-related to and supporting agriculture can be constructed on land designated for agricultural uses. Implementation of the Draft General Plan would therefore result in additional people and structures being exposed to geohazards, including seismic risks, liquefaction, slope instability, soil settlement or compaction, and adverse soil conditions (e.g., expansive soils, corrosive soils).

The Draft General Plan requires Specific Plans to be prepared for the community areas of Dunnigan, Elkhorn, Knights Landing, and Madison (totaling 3,285 acres) per General Plan Policy CC-3.1, and these four specific plan areas will be subject to subsequent environmental review, likely in the form of future EIRs on the specific plans. For the other land use areas (approximately 3,088 acres designated for residential land uses and 1,700 acres designed for commercial and industrial land uses) where development may occur, the County will consider future applications and make determinations as to their consistency with the General Plan and other regulations and whether they would be allowed to develop by-right (without subsequent discretionary approvals) and/or may rely on this EIR and any subsequent site-level technical studies and resource inventories as required by County staff.

Action AS-H1 of the Draft General Plan specifies that the County "require a geotechnical analysis for construction in areas with potential geological hazards and/or for purposes of environmental analysis". Geologic and seismic hazards vary across the County. Site-specific geologic investigation and analysis by a licensed professional and conducted in accordance with standard industry practices and State provided guidance, such as the CGS Special Publication 117 of 2008, *Guidelines for Evaluating and Mitigating Seismic Hazards in California*, will minimize risk associated with these hazards. For instance, due to the distances involved to major regional faults compared to some parts of California, Yolo county is subject to relatively low risk from seismic shaking; nonetheless, active local faults like the Hunting Creek Fault or the CRSBB may result in significant shaking in the County. Potential impacts from geohazards such as expansive soils (that cover roughly three-quarters of the County) can be mitigated by site-specific geotechnical investigation and implementation of the standard remedial measures (e.g., soil removal, foundation design). Similarly, slope stability issues, such as those in the hills around the Capay Valley and along the western mountains of the County, can be addressed by site-specific geotechnical work. Action AS-H1 specifies that the "recommendations of the geotechnical analysis shall be implemented." In addition, as required by Policy HS-1.2 "all development and construction proposals shall be reviewed by the County to ensure conformance to applicable building standards." Policy CC-4.11 (as modified per Mitigation Measure LU-2b), also addresses the project-specific identification of geological hazards by requiring a geotechnical and/or soils study as determined necessary by County staff.

Implementation of these as well as policies and actions HS-1.1, HS-1.3, AS-H2, AS-H3, and CO-A76 would further reduce potential impacts related to new development and increased exposure to geohazards to a less-than-significant level.

(2) Result in Erosion or Loss of Top Soil Through the Alteration of Topography, Dewatering, or Changes in Drainage Patterns. Build-out under the Draft General Plan would include changes to land use resulting in new development. Development processes could result in changes in drainage patterns or construction-related dewatering activities that result in a significant environmental impact. The Draft General Plan includes policies and actions specifically designed to minimize erosion and preserve top soil. Action CO-A89 requires implementation of BMPs during the development process to minimize erosion to protect water quality, and would minimize soil loss. Action HS-A12 addresses the need to balance maintenance of flood control capacity with environmental concerns, and to minimize erosion and sedimentation (also related to top soil loss). These actions, combined with the development of a Grading Ordinance as required under Action CO-A80 and implementation of Policy CC-4.11, would provide the County with the needed tools and regulatory oversight to ensure erosion associated with new development is minimized and top soil is preserved. Erosion and sedimentation issues are further addressed in Section IV.K, Hydrology and Water Quality of this EIR.

As shown in Table III-8 in Chapter III, Project Description, the increased development would take place primarily in Dunnigan, Esparto, Knights Landing, and Madison (a total at build-out of 3,088 acres for residential uses, and 1,700 acres for industrial and commercial use). These community areas do not have any special characteristics that make them particularly susceptible to erosion.[31] Implementation of the Draft General Plan policies and actions described above, in conjunction with compliance with existing regulatory programs would ensure that Draft General Plan impacts related to erosion, changes in drainage patterns, and potential loss of top soil would be less than significant.

(3) Loss of Availability of Mineral Resources. Adoption and implementation of the Draft General Plan would include changes to land use resulting in new residential, commercial, industrial, agricultural, recreational, and other development activity. The Cache Creek Area Plan (CCAP) was adopted in 1996 as a part of the County's General Plan. This plan regulates and manages the County's significant aggregate (sand and gravel) resources along Cache Creek. There are over 18,000 acres of high-grade aggregate resources (over 900 million tons) in the Cache Creek deposit and the County allows for commercial mining of these resources through a separate policy and regulatory framework contained in the CCAP. The CCAP and all programs and ordinances that implement it were subject to environmental review and permit approval during a comprehensive planning process that took place in 1995 and 1996. The CCAP has a 30-year planning horizon which extends through 2027. The County is presently undergoing a mandatory ten-year review of the off-channel mining components of the CCAP.

In addition, the Draft General Plan contains policies and actions specifically designed to support and promote the responsible management of mineral resources within the County. In part, Policy CO-3.1 calls for the management of mineral resources while balancing production against consideration of social values. In conjunction with Action CO-A30, which protects lands containing identified mineral

[31] Jones and Stokes, 2005. op. cit.

deposits from the encroachment of incompatible land uses, Draft General Plan actions CO-A30 and CO-A36 also ensure mineral resources remain available for the future. Geographic areas for new or expanded development under the Draft General Plan have been selected, in part, with the intent that they not interfere with the continued management of the County's mineral resources. In addition to the policies and actions listed above, implementation of policies and actions CO-3.2 through CO-3.4 and CO-A37 through CO-A50 would further address potential impacts related to new development and loss of mineral resources.

Implementation of the Draft General Plan policies and actions described above, in conjunction with compliance with existing regulatory programs would ensure that Draft General Plan impacts related to growth and potential loss of known mineral resources would be less than significant.

(4) Destruction or Modification of a Unique Geologic Feature. Unique geologic features are not common in Yolo County. The geologic processes in the County are generally the same as those in other parts of the State. The County has not developed an inventory of unique geologic features. However, it is likely that some features stand out as being unique in one way or another within the boundaries of the County. For instance, the type location for "Yolo Series Soil" is located at a particular site on the University of California at Davis. By definition, the documented soil profile at this singular location serves as the reference standard for this particular soil type.[32] A geologic feature is considered unique if it:[33]

- Is the best example of its kind locally or regionally;
- Embodies the distinctive characteristics of a geologic principle that is exclusive local or regional;
- Provides a key piece of geologic information important in geology or geologic history;
- Is a "type locality" of a geologic feature;
- Is a geologic formation that is exclusive locally or regionally;
- Contains a mineral that is not known to occur elsewhere in the County; or
- Is used repeatedly as a teaching tool.

The County considers its rich soils to be significant geological resources and the Draft General Plan contains hundreds of policies that directly and indirectly protect soils. Additionally, the CCAP specifically manages the County's significant Cache Creek aggregate deposits. The Draft General Plan includes one policy specifically designed to protect unique physical features of the County:

- Policy CC-1.15: The following features shall be protected and preserved along designated scenic roadways and routes:
    - Trees and other natural or unique vegetation
    - Landforms and natural or unique features
    - Views and vistas

[32] NRCS, 2000. Official Series Description - Yolo Series. December.

[33] Land Use and Environmental Group, 2007. Guidelines for Determining Significance: Unique Geology, County of San Diego, 30 July.

However, this policy does not include protections for unique *geologic* features. Potential loss of unique geologic features associated with new development under the Draft General Plan would be a significant impact.

Impact GEO-1: Implementation of the Draft General Plan could result in the destruction or modification of a unique geologic feature. (S)

Implementation of the following mitigation measure would ensure that Draft General Plan impacts related to growth and the potential to impact unique geologic features would be less than significant.

Mitigation Measure GEO-1a: The Draft General Plan shall be amended to include the following new policy in the Conservation and Open Space Element.

Policy CO-#: The County's unique geologic or physical features, which include geologic or soil "type localities" and formations or outcrops of special interest, shall be preserved and protected.

Mitigation Measure GEO-1b: The Draft General Plan shall be amended to include the following new action in the Conservation and Open Space Element.

Action CO-A#: The County's unique geologic or physical features, which include geologic or soil "type localities" and formations or outcrops of special interest, shall be researched, inventoried, mapped, and data added to the County GIS database. (LTS)

(5) Conflict with Plans and Policies of Other Agencies. Geology, soils, seismicity and mineral resources issues are less governed by overlying State or regional plans than some policy areas; however, there is a complex regulatory environment for these topics that include both recommended and mandatory policies for local implementation. The Draft General Plan is consistent with the regulatory environment regarding geology, soils, and mineral resources of: the California Building Code, the Alquist-Priolo Earthquake Fault Zoning Act, the Seismic Hazards Mapping Act, and the State Surface Mining and Reclamation Act as described in this DEIR. Additionally, the inclusion of Policy CO-3.4 that requires compatibility of permitted land use activities within the Delta Primary Zone ensures consistency with the Land Use and Resource Management Plan of the Delta Protection Commission. As a result, implementation of the Draft General Plan would result in a less-than-significant impact related to policy conflicts with these agencies as regards geology, soils, seismicity and mineral resources.

(6) Result in Adverse Impacts from Draft General Plan Policies Compared to 1983 General Plan Policies. Based on a review of the 1983 General Plan policies related to geology, soils, seismicity and mineral resources in the Land Use, Conservation, Open Space, and Safety and Seismic Safety elements this analysis determined that the proposed policies of the Draft GP are either equivalent to or more rigorous than those in place currently under the 1983 General Plan. In general, the Draft General Plan would provide more stringent environmental protection and greater accountability in the regulation of development activities that would be affected by geology, soils, and seismicity hazards. Implementation of the Draft General Plan in place of the prior 1983 General Plan would not result in a significant adverse physical impact related to geology, soils, and mineral resources.