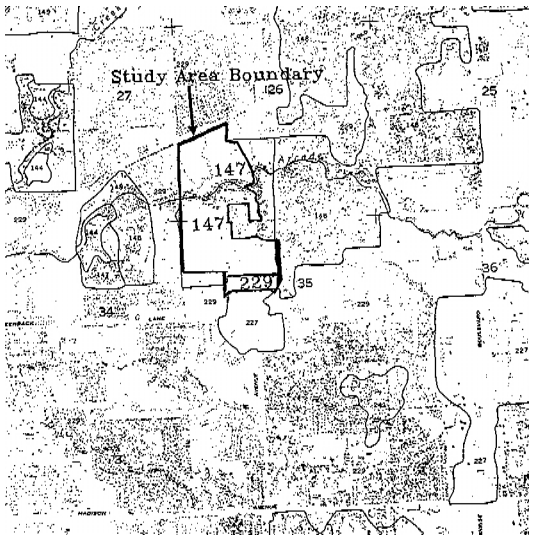


Study Area Soils Map.

## 4.8.1 ENVIRONMENTAL ISSUE

This section discusses the geology of the project site and general vicinity, and analyzes issues such as potential exposure of people and property to geologic hazards, landform alteration, and erosion.

## 4.8.2 METHODOLOGY

Evaluation of potential geologic and soil impacts of the proposed project was based on review of information contained in the Citrus Heights General Plan - Summary of Background Information, literature prepared by the California Division of Mines and Geology, information from the U.S. Natural Resources Conservation Service, mapping published by the U.S. Geologic Survey and other documents prepared for the Stock Ranch property.

## 4.8.3 SIGNIFICANCE CRITERIA

To assess the level of significance for impacts to geology and soils, CEQA guidelines applicable to the proposed project site were used. The proposed project would be considered to have a significant impact to geology and soils, if it would:

1) Locate structures for human occupancy within the trace of an active fault;

2) Expose people to strong seismic groundshaking;

3) Result in potential damage from liquefaction;

4) Expose people or property to hazards from landslides or mudflows;

5) Result in erosion, changes in topography or unstable soil conditions from excavation, grading, of filling; or

6) Be subject to potential damage from expansive soils.

## 4.8.4 EXISTING SETTING AND BACKGROUND

**Regional Setting**

The Citrus Heights area is located geologically in the Great Valley, which is bound by the California Coastal Ranges on the west and the Sierra Nevada Mountains on the east. The Great Valley is characterized by thick layers of generally flat-lying sedimentary rocks overlain by silty soils. These soils range in thickness from a few inches to more than 200 feet near the Sacramento

River corridor. Citrus Heights is located in an area containing peat deposits, as well as relatively thick deposits of silt and clay with thinner deposits of sand and gravel. Groundwater in the vicinity of the city generally flows to the west and ranges in depth form approximately 80 feet above mean sea level (msl) in the east to 20 feet below msl in the west (County of Sacramento, 1996).

**Faults and Seismicity**

The Central Valley, like most of California, is a seismically active region. Seismicity is due to complex regional tectonic processes that include movement along major crustal plates and uplift. The California Mining and Geology Board has defined "active" faults as those for which there is evidence of surface displacement within the last 11,000 years. Potentially active faults are defined as those faults that there is evidence of surface displacement within the last 1.6 million years.

Citrus Heights has no known seismic faults. The primary hazard associated with seismic activity in the Citrus Heights area involves potential groundshaking from more distant faults.

**Active Faults**

Although there are no active faults in the immediate vicinity of Citrus Heights, several large active and potentially active faults are located within the surrounding region. The closest active fault mapped by the California Division of Mines and Geology is the Foothills Fault System located approximately 15 miles northeast of Citrus Heights. The last significant seismic event recorded in the area occurred in 1908 when an earthquake estimated at greater than 4.0 on the Richter Scale occurred on an unnamed fault in southwestern Placer County probably centered between Folsom and Auburn, and Placerville and Roseville (BMI, 1997). No significant seismic event has been recorded in the Citrus Heights vicinity since that time.

**Table 4.8-1** lists the major regional faults in the area. Active or potentially active faults that may pose hazards include the Green Valley-Concord, Hayward, San Andreas and Calaveras Faults.

**Potentially Active Faults**

Three local faults lie within approximately 20 miles of Citrus Heights, all of which are considered potentially active. These include the Volcano Hill Fault, northeast of the Citrus Heights city limits, the Linda Creek Fault (which has uncertain existence and activity status) extending southerly along a portion of Linda Creek in the southern portion of the City of Roseville and into Sacramento County, and a third unnamed fault. The unnamed fault is a west-east oriented fault between the City of Rocklin and Folsom Reservoir. Portions of this fault are concealed, and may be connected to the Bear Mountain Fault Zone. The probability that these faults would significantly affect Citrus Heights is considered to be small (Stickney, 1998). Groundshaking felt in Citrus Heights is more likely to be the result of seismic activity along coastal faults (Stickney, 1998). As stated above, no significant seismic activity has been recorded in the Citrus Heights area since 1908.

**Table 4.8-1**
**Active and Potentially Active Regional Faults**

| Fault | Location to Study Area | Earthquake Year / Location | Historic Activity | MCE[3] |
|---|---|---|---|---|
| Midland Fault[1] | 32 miles W | Pre-quaternary (older than 1.6 million years) | -- | 7.0 |
| Dunnigan Hills[1] | 35 miles W | Holocene (200-10,000 years) | -- | 6.5 |
| Unnamed Fault (Coast Range-Sierran Block) | 45 miles W | 1892, Vacaville-Winters | 6.5-7.0 | 7.0 |
| Green Valley-Concord | 60 miles SW | Holocene (200-10,000 y.) | "creep" | 7.0 |
| Foothills Fault System[2] | 15 miles NE | 1975, Oroville | 5.7 | 6.5 |
| Coast Range-Sierra Block Boundary | 35 miles SW | 1892, Vacaville-Winters | -- | 7.0 |
| Hayward | 60 miles SW | 1836, 1868 | 6.8 | 6.5-7.0 |
| Calaveras | 50 miles SW | 1861 | -- | 6.5-7.0 |
| San Andreas | 80 miles SW | 1906, 1989 Loma Prieta | -- | 8.3 |

[1] Evidence of Quaternary (less than 1.6 million years) faulting is not definitive for this fault zone

[2] Evidence of Late Quaternary (less than 100,000 years old) faulting is not definitive for this entire fault zone

[3] MCE is the Maximum Credible Earthquake, defined as the strongest earthquake that is likely to be generated along an active fault zone, based on the geologic character of the fault and the earthquake history

*Source: Placer County, 1997; El Dorado County, 1997*

**Secondary Hazards**

Active faults can result in a variety of secondary hazards including groundshaking, liquefaction and settlement. Groundshaking is the motion that occurs during the shifting of a fault. There have been no recent fault movements in the County of Sacramento. However, this region has experienced groundshaking from the movements of faults located east and west of the County. Liquefaction is the loss of soil strength due to seismic activity in association with water-saturated soils. Liquefaction leads to a "quicksand" type condition for structures built in poorly consolidated water saturated sediments or artificial fill. Settlement is the compaction of soils due to seismic activity. Settlement of soil can range from a few inches to several feet.

The probability of the above hazards affecting the Citrus Heights area is low. Overall, the City is located in a low severity zone assuming maximum earthquake intensity. However, the City of Citrus Heights Draft General Plan (August 2000) acknowledges that groundshaking is considered the primary seismic threat in Citrus Heights. All structures are recommended to be designed for Seismic Zone 3 in accordance with the provisions of the Uniform Building Code to minimize any impacts resulting from seismic activity (City of Citrus Heights, 2000b).

**Soils**

The Soil Survey of Sacramento County, prepared by the United States Department of Agriculture (USDA), Natural Resource Conservation Service (formerly Soil Conservation Service) maps soil types in most of Sacramento County, including the Citrus Heights area. Two types of soils are found on the Stock Ranch project site: Urban Land-Xerarents-Fiddyment Complex and Fiddyment-Orangevale Complex, 2 to 8 (Huffman and Associates, 1992). Characteristics of these soils are summarized in **Table 4.8-2**.

**Table 4.8-2**
**Soil Characteristics Within the Project Site**

| Soil Type | Soil Slope | Erosion Hazard | Shrink/Swell* Potential |
|---|---|---|---|
| Urban Land-Xerarents-Fiddyment Complex | 0-8% | Slight | Moderate |
| Fiddyment-Orangevale Complex | 2-8% | Slight to moderate | Moderate |

* Expansiveness
*Source: U.S. Department of Agriculture, 1997*
Urban Land-Xerarents-Fiddyment complex is found on filled areas of hills (i.e. areas shaped for urban development. Xerarents form in fill material mixed by grading and excavation activities.

Fiddyment's surface layer is brown sandy loam. The subsoil is a claypan consisting of brown clay loam. The next layer is silica-cemented hardpan approximately 12" thick over siltstone. Water sometimes perches in Fiddyment for short periods after heavy storms. Orangevale is a deep and well-drained soil. The surface layer is a yellowish brown coarse sandy loam about 15" thick. Underlying layers consist of sandy clay loam and coarse sandy loam.

The majority of shrink/swell (or expansive) soils in the City of Citrus Heights, including those found on the project site, have moderate shrink-swell potential. Shrink-swell potential refers to the soils ability to expand when wet and contract when dry. Shrinking and swelling of soil can damage roads, dams, building foundations and other structures.

Erosion is a natural geologic process where landforms are worn down or reshaped over time by natural factors such as wind or water. The Citrus Heights area has slight to moderate erosion ratings. In general, erosion occurs where there are steep slopes and the soil is continually exposed to wind and rain. The primary areas on the project site prone to erosion are the banks of Arcade Creek and San Juan Creek.

**Slope Stability**

The overall topography of the City of Citrus Heights, as well as the project site, is relatively flat. As a result, no landslides or landslide deposits have been mapped within the city.

**Mineral Resources**

There are no mineral resources and no aggregate and clay resources located in the Citrus Heights area.

**Physical Characteristics and Setting of the Project Site**

The project site is relatively flat with variations in surface elevation from past grading, dumping and recreational vehicle use. Areas of slopes are limited to the banks of Arcade Creek and San Juan Creek. Portions of Arcade Creek and San Juan Creek, including their confluence, occur on the project site. Arcade Creek enters the mid-section of the project site from the east and meanders approximately 3,740 feet across the site to the western property line as an incised channel with 8' high, deeply cut banks. A portion of San Juan Creek enters the project site from the east and meanders approximately 1,000 feet through the southern half of the project site. The channel of San Juan Creek is deeply incised with 8'-12' high cut banks (County of Sacramento, 1992).

## *4.8.5 PROJECT IMPACTS AND MITIGATION MEASURES*

The proposed project would require grading to level the site for development. This would modify the existing condition of the property. Structures, paving, landscaping and lighting would be introduced on the project site. This would increase the intensity of land use and activity occurring on the Stock Ranch site.

**Seismic Groundshaking Hazards**

**Impact 4.8-1:** Development in the project area could potentially expose people and structures to seismic groundshaking during an earthquake. This is considered a potentially significant impact. *Note: This impact can be mitigated to an acceptable level. See discussion below.*

Although no recent fault movement has been recorded locally, the region has historically experienced groundshaking from distant fault activity. Groundshaking is considered the primary seismic threat in Citrus Heights. As previously stated, no active faults are located in the immediate area of the project. However, in the event of an earthquake originating from a fault within the region (i.e. within 80 miles – See **Table 4.8-1**), the project site may be subject to groundshaking. The likelihood of any damage resulting from a seismic event is considered minimal for two reasons:

- First, due to the relative distance of active faults in respect to the project area, the intensity of shaking would be greatly diminished.

- Second, the project would be required to adhere to the Uniform Building Code, which is expected to provide an adequate level of safety for the buildings and persons within them.

For these reasons, impacts to the project resulting from seismic groundshaking are considered **less than significant**. Note: Because conformance with the UBC is required for all projects by City regulation, this is not proposed as a mitigation measure.

**Expansive Soils**

**Impact 4.8-2:** Soils on the project site may have potential for expansiveness. This is considered a potentially significant impact. *Note: This impact can be mitigated to an acceptable level. See discussion below.*

The project site is underlain by Fiddyment-Orangevale complex and Urban Land-Xerarents-Fiddyment. Both soils have moderate potential for expansiveness, or as it is more commonly referred to, shrink-swell potential. Because the soils may expand when wet and contract when dry, foundation structures may experience cracking when this phenomenon occurs. To avoid any adverse impacts associated with expansive soils, the project applicant would be required to have a geotechnical report prepared which would include testing of soils to determine expansion potential. The findings of the report and associated testing would be used to engineer the soil prior to foundation construction. Soils engineering may require excavation of expansive soils and replacement with non-expansive materials, treatment of expansive soils by mixing them with lime, etc. Geotechnical engineering, as required by the City Building Code, would reduce impacts associated with expansive soils to **less than significant**.

**Soil Erosion**

**Impact 4.8.3** Development of the project would include grading a substantial portion of land that could result in short-term soil erosion and possible transport of soils to Arcade and San Juan Creeks. This is considered a potentially significant impact. The long-term effect would be reduced soil erosion on site. *Note: This impact can be mitigated to an acceptable level. See discussion below.*

Development of the proposed Stock Ranch project would include large-scale earthmoving and grading activities. Construction activities would increase the amount of soils prone to erosion by wind and, in the winter months, rain. Both Arcade Creek and San Juan Creek meander through out the site and could be subject to increased levels of siltation if soils disturbed by construction activities are transported to receiving waters. Although the soils on the project site exhibit slight to moderate erosion properties, the magnitude of soil disturbance on the site could result in project-induced onsite erosion and subsequent sedimentation in the Arcade and San Juan Creeks during clearing and grading. These impacts are **potentially significant**. However, the Guide contains Design Guidelines for site grading which specify that building sites should be designated to conform to the existing natural topography and minimize earthwork and grading as much as possible. Further, the Development Standards require that grading plans be sensitive to natural drainage patterns.

The provisions for grading included in the Guide will reduce erosion impacts. However, several additional mitigations identified below would further reduce potential for erosion resulting from construction and implementation of the proposed project.

Mitigation Measures

**MM4.8.3a** Implementation of the following mitigation measures would reduce construction-related erosion and sedimentation impacts to **less-than-significant** levels:

1) Prior to obtaining a grading permit, the applicant shall prepare an erosion control plan consistent with the construction site management plan developed for the National Pollutant Discharge Elimination System (NPDES) permit.

2) No construction activities of any kind, including grading (cuts or fills), trenching, stockpiling of materials, etc., shall occur within buffer areas established along all reaches of Arcade and San Juan Creeks per Chapter 27 (Tributary Standards) of the City of Citrus Heights Zoning Code.

3) Grading areas left unprotected during the rainy season shall be stabilized. Stabilization measures may include NPDES Construction activities best management practices (BMPs) such as straw bales or sand bag barriers.

| | |
|---|---|
| Responsibility for Implementation: | Applicant |
| Responsibility for Monitoring: | City of Citrus Heights (Public Works/Engineering Departments) |
| Timing: | The applicant shall provide a grading plan to the City of Citrus Heights demonstrating compliance with this requirement prior to the issuance of any grading permits. Monitoring for compliance with the plan shall occur during the construction phase of the project as part of the City's standard inspections associated with grading and building permits. |

## *4.8.6 CUMULATIVE IMPACTS*

The proposed Stock Ranch project site is surrounded by urban and suburban development. Impacts associated with geology and soils would be site specific and are either less than significant or can be reduced to less than significant with implementation of the mitigation measures listed above. The proposed project is not anticipated to contribute to cumulative significant impacts related to geology and soils. Therefore, cumulative impacts are less than significant.

## *REFERENCES*

*City of Citrus Heights General Plan Summary of Background Information*. April 1999.

County of Sacramento. 1992. *Final Environmental Impact Report for Stock Ranch General Plan Amendment Community Plan Amendment and Rezone.*

EIP Associates. *Stock Ranch Draft Guide for Development.* August 30, 2000.

Huffman and Associates. 1992. *Stock Ranch Delineation Report*. June 1992.