2.2.3 GEOLOGICAL AND SOIL RESOURCES

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, earthquakes, and erosion.

REGULATORY SETTING

Local

City of Elk Grove Codes and Regulations

Grading Provisions

The City of Elk Grove's Buildings and Construction Ordinance (Title 16 Chapter 16.44 of the City Code) establishes administrative procedures, minimum standards of review, and implementation and enforcement procedures for controlling erosion, sedimentation and other pollutant runoff, including construction debris and hazardous substances used on construction sites, and disruption of existing drainage and related environmental damage caused by land clearing and grubbing, grading, filing, and land excavation activities. The ordinance applies to projects that will disturb 268 cubic meters (350 cubic yards) or more of soil. The intent of the ordinance is to minimize damage to surrounding properties and public rights-of-way, degradation of the water quality of water courses, and disruption of natural or City authorized drainage flows caused by construction activities, and to comply with the provisions of the City's National Pollutant Discharge Elimination System (NPDES) Permit Number CA0082597, issued by the California Regional Water Quality Control Board (CRWQCB). The City of Elk Grove is co-permittee on a NPDES Permit along with Sacramento County and the cities of Sacramento, Folsom, Galt, and Citrus Heights.

City of Elk Grove General Plan

The City of Elk Grove General Plan identifies three policies and two action items that relate to geologic issues within the city, as they relate to the proposed project:

- **CAQ-5** Roads and structures shall be designed, built, and landscaped so as to minimize erosion during and after construction.
- **SA-25** The city supports efforts by federal, state, and other local jurisdictions to investigate local seismic and geological hazards and support those programs that effectively mitigate these hazards.
- **SA-25-**Action 1 Implement the Uniform Building Code to ensure that structures meet all applicable seismic standards.
- **SA-26** The city shall seek to ensure that new structures are protected from damage caused by geologic and/or soil conditions.

- SA-26 Action 1 Require that a geotechnical report or other appropriate analysis be conducted to determine the shrink/swell potential and stability of the soil for public and private construction project and identifies measures necessary to ensure stable conditions.

City of Sacramento Codes and Regulations

Grading Provisions

The City of Sacramento's Erosion and Sediment Control Ordinance (Title 15, Chapter 88, Section 15.88 of the City Code) is "enacted for the purpose of regulating grading on property within the city limits of the city to safeguard life, limb, health, property and the public welfare; to avoid pollution of watercourses with nutrients, sediments, or other materials generated or caused by surface water runoff; to comply with the city's national pollution discharge elimination system (NPDES) Permit No. CA0082597, provision D2, issued by the California regional water quality control board; and to ensure that the intended use of a graded site within the city limits is consistent with the city general plan, any specific plans adopted thereto and all applicable city ordinances and regulations. The grading ordinance is intended to control all aspects of grading operations within the city limits of the city [of Sacramento]." The grading ordinance is administered for the City of Sacramento by the Department of Utilities through the building permit process, improvement plan process, or capital improvement project process, as applicable.

City of Sacramento General Plan

The City of Sacramento has no General Plan policies that relate to geologic issues within the city, as they relate to the proposed project.

AFFECTED ENVIRONMENT

Local Geology and Project Site Topography

Regional Setting

The majority of Sacramento County, as well as the entire City of Elk Grove and the project site, lay within the Great Valley geomorphic province[1]. The Great Valley geomorphic province is generally described as a relatively flat alluvial plain, about 80 km (50 miles) wide and 644 km (400 miles) long, with thick sequences of sedimentary deposits of Jurassic through Holocene age. The ground surface elevation in the vicinity of the project area, as shown on a collection of USGS Topographic Map quadrangles, ranges from approximately 3.0 to 46 meters (10 to 150 feet) above mean sea level.

Project Site

The project site is underlain with Quaternary Alluvium Terraces. Based on the USGS 7.5' quadrangle map of Elk Grove, the site is approximately 12 meters (40 feet) above mean sea level with topography that is generally level throughout the site, except for SR 99, which is depressed

[1] A "geomorphic province" is an area with similar geologic origin and erosional/depositional history.

to approximately 7.6 meters (25 feet) below the Sheldon Road overpass. There are no distinctive geological features, such as rock outcroppings, within the project area.

Faults and Seismicity

The project area is located in an area of relatively low seismic potential. No earthquake faults are known to exist at or near the project site. Sacramento County is less affected by seismic events and other geologic hazards than other portions of the state. Nevertheless, some property damage has occurred in the past. The damage that was experienced has largely been the result of major seismic events occurring in adjacent areas, especially the San Francisco Bay area and, to a lesser extent, the foothills of the Sierra Nevada Mountain Range. The areas of Sacramento County most vulnerable to seismic and geologic hazards are those areas subject to liquefaction, shaking, and subsidence. The Central Valley, like most of California, is a seismically active region.

Ground Shaking

Ground shaking is motion that occurs as a result of energy released during faulting. The damage or collapse of buildings and other structures caused by ground shaking is among the most serious seismic hazards. The intensity of shaking and its potential impact on buildings is determined by the physical characteristics of the underlying soil and rock, building materials and workmanship, earthquake magnitude and location of epicenter, and the character and duration of ground motion. Much of Sacramento County is located on alluvium, which increases the amplitude of the earthquake wave. Ground motion lasts longer and waves are amplified more on loose, water-saturated materials than on solid rock. As a result, structures located on alluvium typically suffer greater damage than those located on solid rock.

The California Division of Mines and Geology map shows the eastern and central portions of Sacramento County, which include the project site, in a relatively low intensity groundshaking zone. The geologic literature indicates that no major active faults transect Sacramento County. While Sacramento County has experienced relatively little seismic activity, faulting in neighboring regions, especially the San Francisco Bay area and the Sierra Nevada, suggests that the County could be affected by future ground motion originating elsewhere. Because of this, the project is required to meet the seismic standards contained in the Uniform Building Code of Seismic Zone 3 in order to minimize impacts resulting from ground motion originating outside the region.

Liquefaction

Liquefiable soils are low-density soils that, when saturated and concurrently subjected to high intensity ground shaking, dilate due to excessive hydrostatic forces and behave as a liquid rather than a soil matrix. The evaluation of potential for liquefaction is complex and factors that must be considered include soil type, soil density, groundwater tower, and the duration and intensity of shaking. Liquefaction is most likely to occur in deposits of water-saturated alluvium or similar deposits of artificial fill. Within Sacramento County, the Delta and downtown Sacramento are the two areas most suscepticble to liquefaction in the event of an earthquake. However, given the relatively dense/stiff nature of the soils underlying the site, combined with

the lack of groundwater in the upper 15 meters (50 feet) of soil, the potential for liquefaction is considered to be low.

FAULTS AND SEISMICITY IMPACTS

No Build Alternative

Under the No Build alternative, there would be no changes made to the existing structure or configuration of the interchange because the project would not be implemented.

Build Alternatives (2A and 3A)

The project area is located in an area of low seismic risk. The design and construction of the site facilities will incorporate protections against known seismic hazards. Impacts associated with faults and seismicity hazards are subject to uniform site development and construction standards relative to seismic and other geologic conditions that are prevalent within the region.

CEQA FINDING

Under CEQA, the proposed project would result in substantial geologic impacts if it would result in:

- Exposure of people or structures to seismic-related ground failure, including liquefacation; or

- Locating on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefacation, or collapse.

As previously stated, the project site is not located in a seismically active region. The project would be designed in conformance with applicable construction standards. Therfore, seismically related impacts are considered **less than significant**.

AFFECTED ENVIRONMENT – SOILS

According to the U.S. Department of Agriculture Soil Conservation Service Soil Survey Map of Sacramento County - Florin Quadrangle, the soils on the project site are classified as:

- Dierssen sandy clay loam, drained, 0-2% slopes;
- San Joaquin silt loam, leveled, 0-1% slopes;
- San Joaquin silt loam, 0-3% slopes;
- San Joaquin silt loam, 3-8% slopes;
- San Joaquin-Durixeralfs complex, 0-1% slopes; and
- San Joaquin-Galt complex, 0-3% slopes.

Figure 2.2.3-1 illustrates the various soils identified within the project area.

The Dierssen soil series contains moderately deep, poorly drained soils. The surface layer typically consists of sandy clay loam that is about 36 cm (14 inches) thick with a clay subsoil approximately 43 cm (17 inches) thick. Permeability is slow in the Dierssen soil and the potential of soil to shrink or expand with changing moisture conditions (shrink-swell potential) is high.

The San Joaquin series slopes from 0 to 8 percent and consists of moderately deep and moderately well drained soils on low terraces. The surface layer is generally brown silt loam about 58 cm (23 inches) thick and the subsoil is a claypan of yellowish red clay loam about 13 cm (5.0 inches) thick. The shrink-swell potential for San Joaquin soil is high.

Durixeralfs consist of well-drained to moderately well-drained soils that usually exist in cut areas where most, or all, of the original surface layer has been removed. The depth to a duripan is usually 25 to 76 cm (10 to 30 inches) with slopes ranging from 0 to 2 percent. The permeability is slow or very slow in the Durixeralfs.

The Galt series consists of moderately well-drained soils in the basins of low terraces. These soils are moderately deep over a duripan with a typical depth to the duripan of 51 to 102 cm (20 to 40 inches) and a slope ranging from 0 to 5 percent. The Galt soil, located in depressional areas, is limited by ponding, the fine texture of the surface layer, and the high shrink-swell potential.

SOILS IMPACTS

No Build Alternative

Under the No Build alternative, changes to the existing interchange would not be made because the project would not be implemented.

Build Alternatives (2A and 3A)

Settlement caused by soils with a high shrink-swell potential could occur at structures. Structures could be damaged by differential settlement due to soil expansion and contraction. When structures are located on expansive soils, foundations have the tendency to rise during the wet season and shrink during the dry season.

Movements can vary under structures, which in turn, create new stresses on various sections of the foundation and connected utilities. These variations in ground settlement can lead to structural failure and damage to infrastructure.

Impact 2.2.3-1 According to the USDA Soil Conservation Service, Soil Survey of Sacramento County, California, 1993, the project site is located in an area with a high shrink-swell potential. This could result in structure settlement and potential damage from differential settlement.

MITIGATION MEASURES

MM 2.2.3-1 Prior to approval of grading or improvement plans, whichever occurs first, the City of Elk Grove shall conduct a soil sample and laboratory test to determine the expansion potential and stability of the soil for development of the project site. If it is determined that the area contains expansive soils, one or more of the following mitigation measures shall be employed to remove the expansive soils:

- Expansive soils shall be excavated and replaced with non-expansive materials. The required depth of excavation shall be specified by a registered civil engineer based on actual soil conditions;
- Expansive soils shall be treated in place by mixing them with lime. Lime-treatment alters the chemical composition of the expansive clay minerals such that the soil becomes non-expansive; or
- Other engineering practices for mitigation of expansive soil conditions considered appropriate by Caltrans and the City of Elk Grove Public Works Department shall be implemented.

CEQA FINDING

Under CEQA the proposed project would result in substantial impacts to soils if it would result in:

- Substantial soil erosion or the loss to topsoil; or
- Locating on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (UBC) (1994), creating substantial risks to life or property.

The proposed project would be located on soils with a high shrink-swell potential potentially resulting in settlement and associated damage. This is considered a **potentially significant impact**. Implementation of mitigation measures 2.2.3-1 will reduce the risks associated with expansive soils to a **less than significant impact**.

EROSION IMPACTS

No Build Alternative

Under the No Build alternative, changes to the existing interchange would not be made because the project would not be implemented.

Build Alternatives (2A and 3A)

The proposed project would involve grading and earthmoving as part of construction. Disturbed soils are prone to erosion and off-site transport, which is more likely to occur during the rainy season when rainfall is heavy and frequent.

Impact 2.2.3-2 Construction of the project would involve grading, other earth movement, and the use of heavy machinery. There is the potential for erosion resulting from the construction of the project.

MITIGATION MEASURES

MM 2.2.3-2 Under the requirements of the Clean Water Act amendments of 1972, the project construction contractor would be required to file a notice of intent (NOI) under the State's NPDES General Construction Permit (CAS0002). The City would be required to adhere to conditions under the City's NPDES permit set forth by the Regional Water Quality Control Board (RWQCB) and also prepare and submit a Storm Water Pollution Prevention Plan (SWPPP) to be administered throughout all phases of grading and project construction. The SWPPP would incorporate BMPs to ensure that potential water quality impacts during construction are minimized. BMPs that would be implemented during site grading and construction are included in the Water Quality Section of this EIR/EA. Implementation of this mitigation would reduce the potential for erosion and sedimentation impact to water resources.

CEQA FINDING

Under CEQA the proposed project would result in substantial impacts to soils if it would result in:

- Substantial soil erosion or the loss to topsoil; or
- Locating on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (UBC) (1994), creating substantial risks to life or property.

Potential for erosion associated with construction activities is considered a **potentially significant impact**. Mitigation measure 2.2.3-2 would reduce the potential of soil erosion to a **less than significant impact.**