3.6

GEOLOGY, SOILS, AND MINERAL RESOURCES

3.6 Geology, Soils, and Mineral Resources

This section of the Draft EIR evaluates seismic hazards, soil characteristics, erosion potential, and other geological hazards that could occur in the regional vicinity of the project site and makes determinations on the significance of these impacts. This section is primarily based on a geotechnical investigation prepared for the project site in 1998 by Brown and Mills, Inc for the Flying J Travel Plaza (Appendix G). The soils of the project site are discussed in greater detail in Section 3.1, *Agricultural Resources*. During the Notice of Preparation (NOP) period, no comments were received from public citizens regarding geology, soils and mineral resources.

3.6.1 SETTING

Environmental Setting

REGIONAL GEOLOGY

The project site is located within the northern portion of the Great Valley geomorphic province, a large elongated northwest-trending asymmetric structural trough that has been filled with a tremendously thick sequence of sediments ranging in age from Jurassic to recent. Within the site vicinity, the Great Valley is bounded on the east by the Cascade Ranges and on the north and west by the Klamath Mountains. Sediments that form the thick valley section were largely derived from erosion of these surrounding mountain ranges.

Within the immediate vicinity of the project site, Great Valley sediments consist predominantly of loose, recently deposited silts (of the Churn Creek flood plain) underlain (at relatively shallow depths) by Holocene-age alluvium of the Riverbank Formation. In general, the Riverbank Formation is composed of weathered reddish gravel, sand, and silt which form clearly recognizable alluvial terraces and fans.

FAULTING AND SEISMICITY

The project site is located within a region of California which is considered to have a relatively low seismic potential. The closest known active fault (or fault zone) mapped by the California Department of Conservation is the Hat Creek – McArthur – Mayfield fault zone, located approximately 55 miles to the northeast of the site. Other significant active faults (or fault zones) located within the site region include the Cedar Mountain – Mahogany Mountain fault zone, located approximately 75 miles to the northeast, and the Trinadad fault, located approximately 80 miles to the west. For this report, a fault is considered active if there is evidence of Holecene (within the past 10,000 to 12,000 years) surface displacement along one or more of its segments or branches. According to the California Department of Conservation, California Geological Survey, Alquist-Priolo Earthquake Fault Zones Map the proposed project site does not lie within a fault zone.

SURFACE AND SUBSURFACE CONDITIONS

The existing topography of the project site is relatively level. Shasta County has adopted a grading ordinance and requires a grading permit prior to any earth work.

Near-surface soils encountered consisted predominantly of very-loose to dense sandy silt and loose silty sand to depths of about 7 to 13.5 feet below existing site grade. Below these near-surface soils, medium-dense to very-dense silty sand/gravel (with cobbles and possible boulders) were encountered to the maximum depth explored (approximately 16.5 feet below existing site grade).

Groundwater was encountered in some areas of the project site by the geotechnical investigation at depths of approximately 10 to 13 feet below existing site grade. In other areas of the project site, borings did not encounter seepage or free groundwater. A more detailed description of the subsurface conditions encountered during field investigation can be found in Appendix G.

SLOPE STABILITY AND EROSION

The site is generally flat and slopes potentially subject to failure were not observed. The currently stable conditions may be changed by slope alterations due to cuts or fills, and changes to drainage patterns. In general, the potential for land sliding or slope failure on the site is very low due to the level nature of the site.

EXPANSIVE SOILS

Some soils have a potential to swell when they absorb water and shrink when they dry out. These expansive soils generally contain clays that expand when moisture is absorbed into the crystal structure. Most of Shasta County is characterized by moderately expansive soils with areas of low expansiveness in the South Central Region and southeastern corner of the County. Small scattered areas of highly expansive soils occur in the mountains of the Western Upland, French Gulch, and North East Shasta County Planning Areas. This hazard is identifiable through standard soil tests. Its effects on structures can be mitigated through the requirement of proper engineering design and standard corrective measures. The proposed project is not considered to be in an area of Shasta County that is characterized by expansive soils.

Regulatory Setting

FEDERAL

There are no specific federal regulations.

STATE

Alquist-Priolo Earthquake Fault Zoning Act

The Alquist-Priolo Earthquake Fault Zoning Act (CPRC Division 2, Chapter 7.5) was passed in 1972 in an effort to reduce the potential human safety risks associated with surface faults by

preventing the construction of buildings used for human occupancy on the surface trace of active faults. The law only addresses the hazard of surface fault rupture and is not directed toward other earthquake hazards. The act requires the State Geologist to establish 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.

Seismic Hazards Mapping Act

The Seismic Hazards Mapping Act, passed in 1990, mandates the California Department of Conservation to identify and map "seismic hazard zones." These zones are defined as those areas that are subject to strong earthquake shaking, liquefaction, landsliding, or earthquake-induced ground failure. The act also mandates cities and counties to use these maps to regulate development within identified seismic hazard areas.

International Building Code/California Building Code

The International Building Code (IBC) incorporates data regarding the response of structures to seismic events as a basis for structural design. The IBC considers primary lateral seismic forces and general soil types. The objective of the IBC is to protect the life safety of building occupants and the public. The IBC provisions are enforced by the County through the building permit process during which plans for proposed structures are examined for compliance with the applicable provisions of the IBC. In large earthquakes, compliance with provisions of the IBC would reduce the risk of complete structural failure, although structural damage may be expected. All new construction must comply with the current version of the IBC.

LOCAL

Shasta County Grading Ordinance

Shasta County requires project applicants to obtain a grading permit in order to regulate construction-related sediment and protect air and water quality.

Shasta County General Plan

Policy SG-a: Development proposals for critical or high density structures, as defined in the Uniform Building Code, located within a half mile of any fault identified as an Earthquake Fault Zone by the California Division of Mines and Geology shall include a geologic study of potential fault rupture. Geologic studies which are undertaken shall be performed by a registered geologist according to general guidelines of the California Division of Mines and Geology. Proposals for critical structures, as defined in the Uniform Building Code, within the study area shall include a site-specific seismic hazards evaluation, including ground motion criteria for the design of new buildings and structures.

Policy SG-b: In order to minimize development that would be endangered by landslides, geological investigations by a registered geologist or a geological engineer will be required on all subdivision and/or developments where the preliminary staff report indicates the possibility of landslides on or adjacent to the development. A landslide map shall be developed and maintained as these reports are accumulated for reference by the development sponsors.

Policy SG-e: When soil tests reveal the presence of expansive soils, engineering design measures designed to eliminate or mitigate their impacts shall be employed.

Policy SG-g: Shasta County should comply with the requirements of the Seismic Hazards Mapping Act, when the Seismic Hazards Maps for the County are completed and made available by the State Geologist. The Maps will include liquefaction hazard zones and earthquake-induced landslide hazard zones.

Table 3.6-1 provides a discussion of the proposed project's consistency with applicable portions of *Shasta County General Plan* Policies related to geology and soils.

Table 3.6-1
General Plan Consistency – Geology, Soils and Mineral Resources

Policy No.	Finding	Discussion
SG-a	Consistent	The proposed project would not contain critical or high density structures. Additionally, the project site is not located within ½ mile of any fault identified as an Earthquake Fault Zone by the State of California.
SG-b	Consistent	The project site is relatively flat and the proposed project will not be endangered by landslides. Additionally, a geological investigation was prepared for the project by a registered geological engineer.
SG-e	Consistent	The geotechnical investigation performed for the project site did not reveal any expansive soils on the site.
SG-g	Consistent	Seismic Hazard Zones for Shasta County have not yet been identified and mapped by the California Department of Conservation.

3.6.2 THRESHOLDS OF SIGNIFICANCE

Consistent with Appendix G of the CEQA Guidelines, the proposed project is considered to have a significant impact on the environment if it would:

- Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:

  i. Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault

  ii. Strong seismic ground shaking

iii. Seismic-related ground failure, including liquefaction

iv. Landslides

- Result in substantial soil erosion or the loss of topsoil
- Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction or collapse
- Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial risks to life or property
- Have soils incapable of adequately supporting the use of septic tanks or alternative waste water disposal systems where sewers are not available for the disposal of waste water
- Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state
- Result in the loss of availability of a locally important mineral resource recovery site delineated on a local general plan, specific plan or other land use plan

3.6.3 IMPACTS AND MITIGATION MEASURES

Impact #3.6-1: Exposure of people and structures to potential substantial adverse effects, including the risk of loss, injury, or death involving rupture of a known earthquake fault, strong seismic ground shaking, ground failure, or landslides.

Discussion/Conclusion: As discussed above, there are no known active faults near (within 50 miles) the project site and the region is considered to have a relatively low seismic potential. Additionally, the project site is not within a regulatory zone as shown on the most recent Alquist-Priolo Earthquake Fault Zoning Map. The potential for rupture of a known earthquake fault on the project site is non-existent.

The project site has a low risk of fault rupture; however, there is the potential for low-to-moderate levels of ground shaking in the event of an earthquake on any one of several, distant faults. The potential for strong seismic ground shaking is relatively low; however, the project will require the incorporation of modern design/construction standards.

Liquefaction is a process whereby soil is temporarily transformed to a fluid state during intense and prolonged ground shaking. The primary factors deciding liquefaction potential of a soil deposit are: (1) the level and duration of seismic ground motions; (2) the type and consistency of the soils; and (3) the depth to groundwater. As discussed above, the project site has a low potential for seismic ground motion. Soils at the project site are generally described as fine grained and relatively dense and are therefore not of the type and/or consistency that support

liquefaction. The depth to groundwater, according to the majority of the exploratory borings performed on the project site by Brown and Mills, Inc., is between 10 to 13 feet below existing grade. Although the depth to groundwater is relatively shallow, the overall potential for liquefaction is very low.

The project site consists of relatively flat topography. Additionally, no deep cuts and fill will be required during construction of the proposed project. The potential for landslides is very low.

This impact is ***potentially significant*** with regard to the potential for strong seismic groundshaking.

Mitigation Measures

Implementation of the following mitigation measure will reduce this impact to a level that is ***less than significant***.

Mitigation Measure #3.6-1:

Structures and any other site improvements shall be designed to withstand a low-to-moderate level of ground shaking. In the event the International Building Code/California Building Code (IBC/CBC) is used for earthquake design, structural features of the project shall be designed using a Type S_2 soil profile, an "S Factor" of 1.2, and a Soil Type 2 as recommended by the geotechnical investigation performed on a portion of the project site.

Impact #3.6-2: Result in substantial soil erosion or the loss of topsoil.

Discussion/Conclusion: The construction phase of the project may result in soil erosion and the loss of topsoil. The project applicant will be required to prepare a Storm Water Pollution Prevention Program (SWPPP) in order to comply with Clean Water Act regulations. As part of the SWPPP, the applicant will be required to identify and implement erosion control measures to prevent substantial soil erosion and the loss of topsoil. Additionally, the project will not require any excavation and only minimal grading thereby reducing the potential for such erosion. This impact is ***less than significant***.

Mitigation Measures

No mitigation measures are required.

Impact #3.6-3: Result in potential hazards due to construction on expansive or otherwise unstable soils.

Discussion/Conclusion: Landslides and liquefaction are discussed in Impact 3.6-1 above. The project site has relatively level topography and no existing unstable soils. The project design does not include any construction activities such as excavations or deep cuts and fill which have

the potential to result in unstable soil conditions including lateral spreading, subsidence, and collapse.

Expansive soils are those soils that shrink and swell in response to changes in moisture content potentially causing serious damage to overlying structures. The geotechnical investigation performed on a portion of the project site did not reveal any evidence of expansive soils. This impact is ***less than significant***.

Mitigation Measures

No mitigation measures are required.

Impact #3.6-4: Contain soils that are incapable of adequately supporting the proposed onsite wastewater disposal system.

Discussion/Conclusion: The proposed project will use a wastewater treatment facility onsite to treat and dispose of wastewater. The general soil-related requirements for such systems include: (1) no excessively well-drained material such as coarse sand and gravel which is highly permeable and can cause wastewater to leak directly into groundwater; and (2) no shallow horizontal restrictive soil layers which can cause wastewater to surface or flow horizontally outside of the drainage field.

According to the exploratory borings drilled for the geotechnical investigation the soils are primarily composed of dense sandy silt and silty sand with some gravel. The Official Soil Description for the primary soil series (Churn) describes it as well or moderately-well drained and moderately to moderately-slowly permeable.

Most of the exploratory borings did not encounter any restrictive layers on the project site; however, boring was terminated in some places due to an inability of the drill to continue. The shallowest depth at which boring was terminated was eight feet which is not considered shallow for this purpose.

The soils of the project site are capable of supporting a septic tank or alternative wastewater disposal systems. Design of the plant disposal facilities will require a site visit and analysis by a qualified soil scientist or engineer as well as county approval. This impact is ***less than significant***.

Mitigation Measures

No mitigation measures are required.

Impact #3.6-5: Result in the loss of availability of known mineral resource or a locally important mineral resource recovery site.

Discussion/Conclusion: The proposed project will not result in the loss of availability of a known mineral resource that would be of value to the region and residents of the state. There are

no known mineral resources of regional value located on the proposed project site. Additionally the proposed project would not result in the loss of availability of a locally important mineral resource recovery site. The proposed project site is not identified in the General Plan Minerals Element or any other land use plan that addresses minerals resources as containing a locally important mineral resource. This impact is ***less than significant***.

Mitigation Measures

No mitigation measures are required.