3.3.11 Geology and Soils

Introduction

The purpose of the Geology and Soils section is to evaluate whether the proposed project would create a physical change in surface or subsurface soil or rock characteristics, or would expose people or structures to major geotechnical hazards. Changes could also include the damage or destruction of unique geologic/physical features.

Responsible Agencies

The primary agency with regard to geologic conditions in the State is the California Department of Conservation, Division of Mines and Geology [http://www.consrv.ca.gov/dmg](http://www.consrv.ca.gov/dmg) The Division of Mines and Geology gathers data and publishes maps and reports about earthquake faults, ground motion and other seismic hazards, mineral resources and mines (see UC CEQA Handbook Section 3.3.15, Mineral Resources), landslide hazards, and fundamental California geology.

Other agencies that may also be Responsible Agencies, depending on the site-specific conditions or geologic resources that could be affected, include:

- Division of Oil, Gas and Geothermal Resources, which oversees the exploration and development of oil, gas, and geothermal resources and regulates construction and operation of wells [http://www.consrv.ca.gov/dog/](http://www.consrv.ca.gov/dog/)

- State Mining and Geology Board, which provides policy advice for earthquake fault, groundshaking, liquefaction, and landslide hazard-mapping programs [http://www.consrv.ca.gov/smgb/](http://www.consrv.ca.gov/smgb/)

- Seismic Safety Commission, which advises the Governor, the Legislature, and the public on earthquake policy-related issues, develops and monitors seismic risk mitigation programs, and sponsors legislation regarding seismic safety. [http://www.seismic.ca.gov/](http://www.seismic.ca.gov/)

LRDP EIR

- The geology and soils analysis should focus on whether the proposed project would create a physical change in surface or subsurface soil or rock characteristics, or would expose people or structures to major geotechnical hazards.

The Geology and Soils section of the LRDP EIR should be based on a generalized summary of geologic and seismic activity and features, such as faults in the region, as well as a description of topographic and hydrologic features, slope, soil and substrate characteristics, groundwater elevations, and other geotechnical conditions that could affect structures.

The Geology and Soils section should consider the location and type of projects relative to the known geologic and soils conditions to qualitatively evaluate the potential for adverse geologic
effects. In addition to the potential for seismic hazards, landslides, or avalanche, the section should assess whether: excavation and grading would significantly alter land features that could be subject to or result in erosion or unstable slopes; foundations would be subject to liquefaction, settlement, expansive soils or other soils conditions that could affect structural integrity; or involve excavation or foundations that could encounter groundwater.

The UC seismic policy requires new UC facilities to comply with the current seismic provisions of the California Code of Regulations (CCR), Title 24, California Building Standards Code, or local seismic requirements, whichever requirements are more stringent. Title 24 of the CCR regulates the design criteria for new University of California buildings to ensure that they are structurally sound under static and dynamic conditions, and are free of geotechnical hazards [http://www.ucop.edu/facil/fmc/facilman/volume1/rpsafety.html]. A certain level of geologic and seismic safety is therefore integrated into the safe building practice inherent in compliance with the code.

**Project EIR**

To the extent not analyzed in an LRDP EIR, the Geology and Soils section of the Project EIR or the Initial Study should analyze whether the site for a specific project would result in any effects that were not anticipated or evaluated by the LRDP EIR.

**Standards of Significance**

Would the project:

- Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:
  - Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault? Refer to Division of Mines and Geology Special Publication 42.
  - Strong seismic groundshaking?
  - Seismic related ground failure, including liquefaction?
  - 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 or most current edition), 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?

• Exceed an applicable LRDP or program EIR standard of significance?

**Analytical Methods**

The description of existing conditions and the impact analysis should be based on the following information:

• At the campus LRDP level, a general technical study prepared by a geologist, engineering geologist, or civil or structural engineer with expertise in geotechnical issues registered in the State of California.

• At the project level, the site plan and building footprint, if appropriate, reviewed by the registered professional to ensure that project siting and design provides adequate protection from features such as faults and unstable slopes (if the project site is within a geologically sensitive area). Site-specific information and recommendations presented in the site-specific study should be summarized in the setting and impact analysis.

• If project features have not been developed to a level that would allow for preparation of a geotechnical study or detailed analysis, other published technical information should be used to generally characterize site-specific conditions for use in evaluating project effects. These resources (some of which are available in digital format suitable for GIS mapping) include:

  o general geologic information and maps available from California Division of Mines and Geology [http://www.consrv.ca.gov/dmg/](http://www.consrv.ca.gov/dmg/)


  o county soil surveys published by the Natural Resources Conservation Service [http://www.ca.nrcs.usda.gov/](http://www.ca.nrcs.usda.gov/)

  o topographic maps published by the U.S. Geological Survey [http://www.usgs.gov/](http://www.usgs.gov/), which can be combined with other data sources to create slope maps
o groundwater elevation maps published by Department of Water Resources
  http://wdl.water.ca.gov/gw/admin/main_menu_gw.asp

o local general plans and general plan background documents (useful for identifying
  locations where local jurisdictions have identified geologic hazards, such as erosive
  soils, landslides, avalanches, liquefaction, expansive soils), and other environmental
  documents for projects in the vicinity http://www.ceres.ca.gov/planning

• When using digital GIS data, the metadata should be carefully reviewed, along with a
  comparison to published (paper) materials or other documents to ensure accuracy of
  mapping.

• The approximate areal extent and volume of grading, excavation, and cut-and-fill slopes,
  methods to control potential hazards, and disposition of waste soils should be also be
  described. Methods included in the project to reduce potential hazards should be described
  in the impact analysis.

• The geotechnical evaluation should consider potential cumulative effects, including growth-
  related increases in the number of people and property that could be exposed to geologic
  hazards.

**Generally Feasible Mitigation Measures**

• A site-specific geotechnical study shall be performed for projects in geologically sensitive
  areas prior to final design to identify potential concerns and recommended measures to
  reduce hazards. Recommendations in the geotechnical study should be implemented. The
  study must be prepared by a geologist, engineering geologist, or civil or structural engineer
  with expertise in geotechnical issues who is registered in the State of California.

• Proposed development must comply with the Alquist-Priolo Earthquake Fault Zoning Act
  (formerly Special Studies Zone Act), which requires site-specific evaluation and restricts the
  construction of buildings on or near active fault traces.

• Determine the maximum slope above which development would not occur. Avoid placing
  structures in areas characterized by unstable slopes or soils that are subject to liquefaction or
  differential settlement.

• Anchor non-structural building elements (i.e., fixtures, permanent equipment, etc.) to
  minimize potential hazards from earthquakes.