

---

## 9. GEOLOGY, SOILS, AND MINERALS

---

This EIR chapter describes the existing geological, soil, and mineral conditions in the planning area. The chapter includes the regulatory framework necessary to evaluate potential environmental impacts resulting from the 2040 General Plan, describes potential impacts that could result from the General Plan, and discusses General Plan goals, policies, and implementation programs that would avoid or reduce those potential impacts. Although this chapter includes mineral resources, there are no areas within the planning area where mineral resources of value to the state or region are found (Dept. of Conservation, Div. of Mines and Geology 1996).<sup>1</sup>

### 9.1 SETTING

The environmental and regulatory setting of the Burlingame planning area with respect to geology, soils, and minerals is described in detail in Section 6.9 (Natural Resources: Geology and Soils) of the General Plan Existing Conditions Report (City of Burlingame, 2015). Pursuant to Section 15150 of the State CEQA Guidelines, the Existing Conditions Report is incorporated into the Draft Program EIR by reference. The Existing Conditions Report is available at the City of Burlingame 2040 General Plan website at:

<http://www.Burlingame.org/GENERALPLAN/>

Copies of the Existing Conditions Report may be viewed during regular business hours (8:00 a.m. to 5:00 p.m.), Monday through Friday, at the City of Burlingame Planning Division, 501 Primrose Road, Burlingame, CA 94010.

#### **9.1.1 Environmental Setting**

The Geology and Soils section (Section 6.9) of the Existing Conditions Report describes the existing conditions related to geology (including seismic hazards), soils, and minerals. The major findings of Section 6.9 relevant to these issues are described below. Since there are no mineral resources of statewide or regional significance within the planning area, this topic is not addressed further.

- A portion of the San Andreas Fault, including an Earthquake Fault Zone designated by the State Department of Conservation, is approximately 1,000 feet west of the City. The fault has a 6.4 percent probability of experiencing a 6.7+ magnitude earthquake by 2044.
- The eastern portion of the planning area is located in a very high liquefaction susceptibility zone, as designated by the Association of Bay Area Governments (ABAG) Earthquake and Hazards Program.
- Existing landslide distribution data from ABAG's Earthquake and Hazards Program shows that the western hills in Burlingame are in an area designated as "mostly landslides."

---

<sup>1</sup> [ftp://ftp.consrv.ca.gov/pub/dmg/pubs/ofr/OFR\\_96-03/OFR\\_96-03\\_Plate14.pdf](ftp://ftp.consrv.ca.gov/pub/dmg/pubs/ofr/OFR_96-03/OFR_96-03_Plate14.pdf)

- The eastern portion of the planning area is located on soils that contain clay, which have potential to be expansive.
- The City of Burlingame implements regulations and programs to minimize the risk of geologic and seismic hazards. These regulations and programs include the Unreinforced Masonry Building Hazard Reduction Program, the City Municipal Building Code and building permit process, the City Grading and Clearing Permit process, the Multi-Jurisdictional Local Hazard Mitigation Plan with the City of Burlingame Annex document, and the Burlingame Neighborhood Network program.

### **9.1.2 Regulatory Setting**

The Existing Conditions Report Geology and Soils section describes the state and local regulatory setting relevant to geology (including seismic hazards) and soils.

#### **Federal**

Federal regulations are not applicable to the geology and soils in Burlingame.

#### **State**

**California Government Code Section 65302(g).** This code requires general plans to include a safety element that provides for the protection of the community from unreasonable risks associated with the effects of seismically induced surface rupture, ground shaking, ground failure, tsunami, seiche, and dam failure; slope instability leading to mudslides and landslides; subsidence; liquefaction; and other seismic hazards. The element must also include mapping of known geologic or seismic hazards.

**Alquist-Priolo Earthquake Fault Zoning Act.** The Alquist-Priolo Earthquake Fault Zoning Act (Public Resources Code Sections 2621-2630) was passed in 1972 to mitigate the potential hazard of surface faults to structures for human occupancy. The main purpose of the Act is to prevent the construction of human-occupied buildings over active faults. The Act only addresses the hazard of 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 maps to all affected cities, counties, and State agencies for their use in planning and controlling development. Local agencies must regulate most development projects within the zones, and there generally can be no construction for human occupancy within 50 feet of an active fault zone.

**Seismic Hazards Mapping Act.** The Seismic Hazards Mapping Act (Public Resources Code Sections 2690-2699.6) was passed in 1990 to address earthquake hazards other than fault rupture, including liquefaction and seismically induced landslides. Seismic Hazard Zones are mapped by the State Geologist to assist local governments in land use planning. The purpose of the Act is to "reduce the threat to public safety and to minimize the loss of life and property by identifying and mitigating these seismic hazards."

The ABAG Earthquake and Hazards Program map shows the location of Alquist-Priolo Earthquake Fault Zones and Seismic Hazard Zones, collectively referred to as Earthquake Zones of Required Investigation. These zones are delineated to assist cities and counties in fulfilling their responsibilities for protecting the public from the effects of surface fault rupture and

earthquake-triggered ground failure as required by the Alquist-Priolo Earthquake Fault Zoning Act and the Seismic Hazards Mapping Act. Further information on Earthquake Zones of Required Investigation is available from the California Geological Survey (CGS). The Geographic Information System (GIS) digital files of these regulatory zones released by the California Geological Survey (CGS) are the official maps. GIS files are available at the CGS website [www.conservation.ca.gov/cgs/](http://www.conservation.ca.gov/cgs/).

**California Building Code.** The California Building Standards Code (CBSC), Title 24, serves as the basis for the design and construction of buildings in California. The purpose of the CBSC is to establish minimum standards to safeguard the public health, safety, and general welfare through structural strength, means of egress facilities, and general stability by controlling the design, construction, quality of materials, use and occupancy, location, and maintenance of building and structures. The CBSC contains specific requirements for seismic safety, excavation, foundations, retaining walls, and site demolition. It also regulates grading activities, including drainage and erosion control.

The California Building Code (Part 2 of the 12-part CBSC) is updated every three years by order of the legislature, with supplements published in intervening years. State law mandates that local government enforce the California Building Code. In addition, a city, county, or city and county may establish more restrictive building standards reasonably necessary because of local climatic, geological, or topographical conditions.

## State

**Association of Bay Area Governments.** The Association of Bay Area Governments (ABAG) adopted the ABAG Multi-Jurisdictional Local Hazard Mitigation Plan (*Taming Natural Disasters*) as an overall strategy to maintain and enhance disaster response of the region, as well as to fulfill the requirements of the Federal Disaster Mitigation Act of 2000. Each partner jurisdiction (including Burlingame) is required to submit an “annex” document that contains jurisdiction-specific hazard mitigation strategies to attach to the Multi-Jurisdictional Plan. The ABAG Plan focuses on (1) identifying natural hazards the community and region face (e.g., earthquakes, severe weather), (2) assessing the community’s and region’s vulnerability to these hazards, and (3) identifying specific preventive actions that can be taken to reduce the risk from the hazards. The City of Burlingame participated in the planning process, adopted its Local Hazard Mitigation Plan (“annex”), and formally adopted the ABAG plan. Adoption of the ABAG Multi-Jurisdictional Plan allows the City of Burlingame to become eligible for federal disaster assistance.

**Unreinforced Masonry Building Hazard Reduction Program.** Chapter 18.28 of the Burlingame Municipal Code identifies the need to seismic retrofit and upgrade selected buildings, defines the scope of unreinforced masonry buildings subject to this code, establishes minimum standards for structural repair/seismic resistance, and sets a time frame for the reasonable implementation of this program.

The scope of buildings subject to this code includes high-risk buildings and medium-risk buildings. Unreinforced masonry buildings used exclusively for residential purposes containing five or less units are exempt from complying with this code.

## 9.2 ENVIRONMENTAL EFFECTS

This section describes potential impacts related to geology (including seismicity) and soils that could result from the General Plan, and discusses General Plan goals, policies, and

implementation programs that would avoid or reduce those potential impacts. The section also recommends mitigation measures as needed to reduce significant impacts.

### 9.2.1 Significance Criteria

Per the CEQA Guidelines, implementation of the City of Burlingame 2040 General Plan would have a significant impact related to geology, soils, and minerals if it would:

- (a) Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:
  - 1) 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 (Division of Mines and Geology Special Publication 42);
  - 2) Strong seismic ground shaking;
  - 3) Seismic-related ground failure, including liquefaction; or
  - 4) Landslides;
- (b) Result in substantial soil erosion or the loss of topsoil;
- (c) 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 landsliding, lateral spreading, subsidence, liquefaction, or collapse;
- (d) Be located on expansive soil, as defined by Table 18-1-B of the Uniform Building Code, creating substantial risks to life or property;
- (e) Have soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems where sewers are not available for the disposal of wastewater;

Regarding criterion (e), the planning area is served by a comprehensive, integrated wastewater collection, treatment, and disposal system. Neither septic tank systems nor alternative wastewater disposal systems are proposed as part of General Plan implementation. No impact will result, and this issue is not discussed further in this EIR.

### 9.2.2 Analysis Methodology

The methodology for evaluating potential environmental impacts related to geology, soils, and minerals followed this basic sequence:

- (1) The General Plan Existing Conditions Report was evaluated to identify existing environmental conditions and problems related to geology, soils, and seismicity, including the regulatory framework that applies to these issues.
- (2) The CEQA Statute and Guidelines (2017), including Appendix G (Environmental Checklist Form), were consulted to identify environmental impact topics and issues that

should be addressed in the program EIR. In part, this process resulted in the significance criteria listed in subsection 9.2.1 above.

- (3) The General Plan Policy Document, including the associated development capacity assumptions (see EIR Section 3.6), was analyzed to identify goals, policies, implementation programs (“policies” for short), and potential outcomes that address the significance criteria. This analysis resulted in two basic conclusions regarding policies and outcomes: (a) many policies would avoid or reduce potential environmental impacts, and (b) some policies or outcomes could result in new environmental impacts or increase the severity of existing environmental problems.
- (4) For potential environmental impacts that would result from the 2040 General Plan, mitigation measures were designed to avoid or reduce each impact to a less-than-significant level. If implementation of all identified feasible mitigations cannot reduce the impact to a less-than-significant level, then the impact is considered significant and unavoidable.

### **9.2.3 Environmental Impacts**

#### **Potential Impacts of Future Development under the 2040 General Plan**

Development pursuant to General Plan land use policy built on or near the San Andreas Fault zone could expose people and structures to a fault rupture. The San Andreas fault has the potential of generating earthquakes of magnitudes ranging from 6.5 to 7.5 on the Richter scale. Strong earthquakes can cause widespread property damage, injury, and loss of life. Secondary impacts include fires and disruption of utilities and service systems. (Significance Criterion 9.2.1 [a])

Two of the three required factors for liquefaction to occur are prevalent throughout the eastern portion of the Planning area (the potential for strong ground shaking and loose, unconsolidated sediments). (Significance Criterion 9.2.1 [a])

Future development under the General Plan could cause impacts associated with soil erosion, resulting in increased fugitive dust, which affects air quality, and water quality degradation due to increased sedimentation. Erosion of topsoil results in the loss of nutrient-rich soils that support the establishment and continuance of vegetation. (Significance Criterion 9.2.1 [b])

The eastern portion of the planning area is subject to impacts associated with settlement and compressible soils due to the widespread presence of young, unconsolidated alluvial soils which are highly susceptible to liquefaction. Settlement, collapse, and subsidence are all related to the generally loose and dry nature of the Planning area’s soils. The lack of clay bonds that support soil strength in unconsolidated soils makes them susceptible to weakness under pressure. Impacts associated with expansive soils are generally structurally related, including cracked walls and foundations. (Significance Criterion 9.2.1 [c])

The western hills in Burlingame are in an area designated in ABAG’s Earthquake and Hazards Program as “mostly landslides.” Thus, development in the western hills could cause impacts on structures and utilities from landslides, lateral spreading, or hillside collapse. (Significance Criterion 9.2.1 [c])

The soils within the Bayfront and alluvial zones in Burlingame contain clay and, therefore, have shrink/swell potential (i.e., are expansive soils). The organic and expansive soils within Burlingame could be subject to subsidence. Development on expansive soils could cause impacts on structures and utilities. (Significance Criterion 9.2.1 [d])

### How Existing Regulations and General Plan Policies Reduce Impacts

Table 9-1 is aligned with the relevant Existing Regulations and General Plan policies that relate to geology, soils, and minerals. Column 1 (Objective) lists each General Plan goal, policy, and implementation program (“policy” for short), organized by General Plan element, that addresses the potential impact identified in Table 9-1. Column 2 is a summary of the regulation and the text of the policy. Column 3 answers the question, “How does the regulation/policy avoid or reduce the potential impact?” Column 4 identifies the applicable significance criteria that is addressed by the regulation/policy.

The verbs in Column 3 are intended to be applied consistently. The verb “ensures” means that the policy is sufficient to guarantee the result identified in the policy. The verb “helps” means that the policy contributes to avoiding or reducing the identified potential impact; in many cases, “helps” is used for a policy that can be applied to avoid or reduce a wide range of potential impacts. The verb “implements” is used for General Plan implementation programs to indicate that the program provides the details to put the associated policy into action.

**Table 9-1: Proposed Burlingame Existing Regulations and General Plan Policies to Avoid or Reduce Impacts on Geology and Soils**

Regulation/Policy	Description of Regulation/Policy	How Does It Avoid or Reduce Impact?	Applicable Significance Criteria
<b>Existing Regulation</b>			
Alquist-Priolo Earthquake Fault Zoning Act	The purpose of the Act is to prevent the construction of human-occupied buildings over active faults. The Act only addresses the hazard of fault rupture and is not directed toward other earthquake hazards.	Prevents the construction of human-occupied buildings over active faults.	(a) Seismic related hazards
Seismic Hazards Mapping Act	The Seismic Hazards Mapping Act was passed in 1990 to address earthquake hazards other than fault rupture, including liquefaction and seismically induced landslides. Seismic Hazard Zones are mapped by the State Geologist to assist local governments in land use planning. The purpose of the Act is to "reduce the threat to public safety and to minimize the loss of life and property by identifying and mitigating these seismic hazards."	Reduces the threat to public safety and minimizes the loss of life and property by identifying and mitigating seismic hazards.	(a) Seismic related hazards

**Table 9-1: Proposed Burlingame Existing Regulations and General Plan Policies to Avoid or Reduce Impacts on Geology and Soils**

Regulation/Policy	Description of Regulation/Policy	How Does It Avoid or Reduce Impact?	Applicable Significance Criteria
California Building Code	The California Building Standards Code (CBSC), Title 24, serves as the basis for the design and construction of buildings in California. The purpose of the CBSC is to establish minimum standards to safeguard the public health, safety, and general welfare through structural strength, means of egress facilities, and general stability by controlling the design, construction, quality of materials, use and occupancy, location, and maintenance of building and structures. The CBSC contains specific requirements for seismic safety, excavation, foundations, retaining walls, and site demolition.	Ensures that construction projects are properly designed and constructed to minimize the effects of seismic hazards, unstable soils or other unstable geologic units, and expansive soils.	(a) Seismic related hazards (b) Substantial soil erosion (c) Unstable geologic units or soil (d) Expansive soils
Association of Bay Area Governments (ABAG)	ABAG adopted the ABAG Multi-Jurisdictional Local Hazard Mitigation Plan ("Taming Natural Disasters") as an overall strategy to maintain and enhance disaster response of the region, as well as to fulfill the requirements of the Federal Disaster Mitigation Act of 2000. Each partner jurisdiction (including Burlingame) is required to submit an "Annex" document that contains jurisdiction-specific hazard mitigation strategies to attach to the Multi-Jurisdictional Plan.	Ensures that the Hazards Mitigation Plan strategies are prioritized and associated operations adequately funded. Reduces seismic and related geologic risks through the hazards mitigation planning.	(a) Seismic related hazards
Unreinforced Masonry Building Hazard Reduction Program	Chapter 18.28 of the Burlingame Municipal Code identifies the need to seismic retrofit and upgrade selected buildings, defines the scope of unreinforced masonry buildings subject	Ensures that individual project sites are evaluated for seismic and geologic risks. Encourages protection from seismic hazards.	(a) Seismic related hazards

**Table 9-1: Proposed Burlingame Existing Regulations and General Plan Policies to Avoid or Reduce Impacts on Geology and Soils**

Regulation/Policy	Description of Regulation/Policy	How Does It Avoid or Reduce Impact?	Applicable Significance Criteria
	to this code, establishes minimum standards for structural repair/seismic resistance, and sets a time frame for the reasonable implementation of this program.		
<b>Community Safety Element</b>			
Goal CS-7	Protect people and buildings in Burlingame by reducing the risks associated with geologic and seismic hazards	Reduces seismic and related geologic risks.	(a) Seismic related hazards
Policy CS-7.1: Geotechnical and Structural Analysis	Require any site with a slope exceeding 10 percent to reference the Landslide Hazard Potential Zone maps of the State of California for all required geotechnical and structural analysis.	Helps minimize exposure of people and structures to risks of hillside development, including potential landslides. Avoids soil erosion and the loss of topsoil on unstable and steep slopes. Ensures that construction is seismically and geotechnically sound.	(a) Seismic related hazards (b) Substantial soil erosion (c) Unstable geologic units or soil (d) Expansive soils
Policy CS-7.2: Residential Upgrades	Require that any residential facility that is being increased more than 50 percent assessed value or physical size conform to all provisions of the current building code throughout the entire structure.	Ensures that residential building renovations of a certain size are evaluated for seismic and geologic risks, and remediated to be consistent with the current building code.	(a) Seismic related hazards (b) Substantial soil erosion (c) Unstable geologic units or soil (d) Expansive soils
Policy CS-7.3: Geologic Review	Create and implement a geologic review procedure that requires geologic reports be prepared as part of the development review process.	Ensures that individual project sites are evaluated for seismic and geologic risks.	(a) Seismic related hazards (b) Substantial soil erosion (c) Unstable geologic units or soil (d) Expansive soils

## Conclusions

In most cases, no one goal, policy, or implementation measure is expected to completely avoid or reduce an identified potential environmental impact. However, the collective, cumulative mitigating benefits of the policies listed in Table 9-1 will result in a less-than-significant impact related to the identified significance criterion. This conclusion is consistent with the purpose and use of a program EIR for a general plan (see EIR Introduction, Chapter 1).

Based on the methodology described above, 2040 General Plan impacts related to geology and soils would be ***less than significant*** (see criteria [a] through [d] in subsection 9.2.1, “Significance Criteria,” above). No mitigation is required.