

4.6 GEOLOGIC AND SEISMIC HAZARDS

This Section describes the current conditions relating to the geologic and seismic characteristics of the City of Cypress. This Section concludes with an analysis of geologic and seismic impacts associated with implementation of the proposed General Plan Update.

4.6.1 ENVIRONMENTAL SETTING

GEOLOGY

Cypress is composed of quaternary deposits of alluvium and colluvium. Alluvium results from sediments deposited from running water and colluvium forms as rock fragments and soil material accumulate at the base of steep slopes.

Cypress' geologic structure does not include any active or potentially active faults. The City is, however, located in a seismically active region. The following five faults lie within close proximity to Cypress: Norwalk, El Modena, Whittier-Elsinore, Elysian, and Newport-Inglewood. In addition to these faults, the San Andreas Fault is situated approximately 45 miles north of Cypress. The San Andreas Fault is anticipated to deliver up to an 8.3 earthquake within the next thirty years.

SOILS

The following discussion is based on information contained in the *Soil Survey of Orange County and Western Part of Riverside County* conducted by the U.S. Soil Conservation Service. The U.S. Soil Conservation Service identifies a number of soils in Cypress. These soils include the San Emigdio Series, Metz Series, Hueneme Series and Bolsa Series, all of which are suitable for urban development (see Exhibit 4.6-1, *Soils Map*).

San Emigdio Series. These soils are found throughout the northern and central portions of Cypress. They are nearly level and consist of well-drained soils on floodplains and alluvial fans.

Metz Series. These soils are also nearly level. They include somewhat excessively drained sands on alluvial fans and flood plains. They are predominantly located in northeastern Cypress.

Hueneme Series. This series consists of poorly drained soils on alluvial fans and floodplains, which are located in northern Cypress.

Bolsa Series. The Bolsa Series consists of somewhat poorly drained soils on alluvial fans. These soils are situated in southern Cypress near the Los Alamitos Race Track and Cypress Golf Course.

AGRICULTURE PRODUCTION RESOURCES

Cypress was originally an agriculture and dairy community, featuring row crops and citrus trees. However, like much of Orange County, Cypress developed rapidly during the 1960s and 1970s, and agricultural acreages were converted to urban uses. A few row crops (predominantly strawberries) remain in southern Cypress. This land is, however, planned and zoned for business park development.

MINERAL RESOURCES

The State Division of Mines and Geology identifies mineral resource areas throughout the State. According to the *Geologic Map of Orange County* showing Mines and Mineral Deposits, Cypress does not contain any mineral resources.

Insert Exhibit 4.6-1, Soils Map

SEISMIC HAZARDS

The following section describes the presence and characteristics of seismic hazards in Cypress, including earthquake faults, surface rupture, ground shaking, liquefaction, hazardous buildings, and seismic response.

EARTHQUAKE FAULTS

While no active or potentially active faults are located within the City of Cypress, the entire Southern California region is considered to be seismically active. Five faults are situated within close proximity to Cypress: Newport-Inglewood, Norwalk, El Modena, Whittier-Elsinore, and Elysian Park. The San Andreas and San Jacinto faults are located further from Cypress than these five faults, but have the potential to deliver larger magnitude earthquakes. Exhibit 4.6-2, *Regional Fault Map*, depicts these faults.

Newport-Inglewood Fault. The Newport-Inglewood fault zone is a series of echelon northwest-trending and vertically-dipping faults extending from the southern edge of the Santa Monica Mountains southeastward to the offshore area near Newport Beach. From north to south, the fault segments are:

- Charnock Fault;
- Overland Avenue Fault;
- Inglewood Fault;
- Potrero Fault;
- Avalon-Compton Fault;
- Cherry Hill Fault; and
- Seal Beach Fault.

Numerous shocks of 4.0 magnitude or greater, as well as the historic 6.3 magnitude Long Beach Earthquake in March 1933, have been generated within this fault zone and suggest an active seismic history. Although there has been no observed ground displacement associated with the Newport-Inglewood Fault Zone, there may have been subsurface fault displacement of approximately seven inches associated with the October 21, 1941, and June 18, 1944, earthquakes. This fault zone could generate a 7.6-plus magnitude maximum credible earthquake.

Norwalk Fault. The Norwalk Fault is approximately 16 miles long and lies approximately five miles north of Cypress. Seismic activity has occurred along this fault.

El Modena Fault. The El Modena Fault is a north trending fault located approximately 10 miles north of Cypress. Evidence suggests that the fault was active at one time; however, the fault is now thought to be inactive.

Whittier-Elsinore Fault. The Whittier-Elsinore Fault is situated approximately 10 to 12 miles north of the City. There have been several minor earthquakes along this fault. Seismic history reveals that the fault is able to produce a seismic event of magnitude 6.0 or greater.

Elysian Park Fault. The Elysian Park Fault is located approximately 15 to 20 miles north of the City in the Montebello and Monterey Park areas. The Elysian Park Fault produced the 1987 Whittier Narrows 5.9 magnitude earthquake.

Insert Exhibit 4.6-2, Regional Fault Map

San Andreas Fault. The San Andreas Fault extends over 600 miles, encompassing virtually the entire length of California. The fault is divided into segments that have somewhat distinctive behavior patterns. The southern segment is over 300 miles long and occasionally delivers large earthquakes. The San Andreas is located approximately 60 miles north of the City of Cypress.

The last great earthquake on this segment was the 1857 Fort Tejon earthquake that is believed to have caused a rupture extending 200 miles. Several other earthquakes have been attributed to the San Andreas Fault; the last one to affect Southern California was a 6.7 magnitude quake in 1899. It is estimated by geologists that this fault may have the potential to generate an earthquake of magnitude 8.5 on the Richter scale, which is designated as the maximum credible earthquake.

San Jacinto Fault. The San Jacinto Fault branches from the San Andreas Fault on the north side of the San Gabriel Mountains and parallels the San Andreas to the Mexico-California border. This fault is located approximately 40 miles north of Cypress. The San Jacinto fault has been very active, and damaging earthquakes have occurred along its entire length. The last earthquake on this fault exceeding 6.0 occurred in 1968. Ten damaging earthquakes have been attributed to this fault since the 1800s, ranging from 5.4 to 6.8 on the Richter scale.

SURFACE RUPTURE AND GROUND SHAKING

Surface rupture resulting from earthquakes is unlikely to occur in Cypress as no faults have been identified within the City boundaries. The nearest active faults, the El Modena and Norwalk Faults, lie approximately five to ten miles north of Cypress. Other faults located outside the Cypress area include the Newport Inglewood, Whittier-Elsinore, Elysian Park, San Jacinto, and San Andreas.

The future impact of earthquakes on Cypress depends on several factors. The particular fault, fault location, distance from the City, and magnitude of the earthquake all determine the degree of shaking that will occur in the City. In addition, the soil and geologic structure underlying Cypress influences the amount of damage that the City may experience. The soils underlying Cypress include alluvium deposits that may become unstable during intense groundshaking.

The Newport-Inglewood Fault is anticipated to generate the most destructive ground shaking in Cypress. The El Modena and Norwalk Faults, though closer to the City, are predicted to generate smaller magnitude earthquakes. The San Jacinto Fault is very active and has historically produced 6.0 to 7.0 earthquakes. However, as Cypress lies approximately 40 miles to the south, the distance between the City and this fault would alleviate the ground shaking impact.

LIQUEFACTION HAZARDS

Liquefaction is a subsidiary hazard associated with intense ground shaking. During seismic events, the earth accelerates and soils can destabilize. When sufficient water is present in the soil, the destabilized soil and water can mix, resulting in liquefaction. Liquefaction is generally associated with shallow ground water conditions and the presence of loose and sandy soils or alluvial deposits. According to the Cypress Disaster Plan and the Orange County Safety Element, Cypress, like most of Orange County, has granular sandy soil with high water content (refer to Exhibit 4.6-3, *Seismic Hazard Map*). Areas with these conditions may experience liquefaction during extreme ground shaking.

HAZARDOUS BUILDINGS

During a seismic event, Cypress may be subjected to high levels of ground shaking. As a result, buildings within the community could sustain substantial damage. Tilt-up structures, unreinforced masonry buildings, older buildings, buildings over four stories, and mobile homes are particularly

Insert Exhibit 4.6-3, Seismic Hazard Map

susceptible to earthquake damage. Concrete tilt-ups built prior to 1974 may be particularly susceptible to damage. The Cypress Building Department has identified one unreinforced masonry structure within the City boundaries. There are also two mobile home parks in the City, which accommodate 373 mobile homes.

Other structures in Cypress are vulnerable to earthquake damage. The danger associated with earthquake damage increases with the number of individuals that congregate within a specific area. As such, structural damage at the Los Alamitos Race Track could result in injury to large numbers of people during the racing season (mid-April through mid-December). Additionally, according to the Cypress Disaster Plan, many sidewalks in the community are bordered by six-foot high concrete walls, presenting a potential hazard to pedestrians if the walls were to collapse due to groundshaking.

SEISMIC RESPONSE

The City of Cypress Disaster Plan serves as the community's Emergency Operations Plan (EOP), outlining the City's actions during emergency situations such as seismic events. The Plan specifies operations during an emergency, provides organization and assigns responsibilities, coordinates instructions, provides an explanation of how the plan is to be administered, contains procedures identifying responsible personnel, and includes methods to request aid/support from other local communities. The EOP involves a number of agencies including the police department, fire department, medical facilities, public health officials, coroner, and care and shelter operations. The City's emergency evacuation routes are shown on Exhibit 4.6-4, *Emergency Evacuation Routes*.

All emergency evacuation activities are coordinated by the Evacuation Coordinator. The Police Chief serves as the Evacuation Coordinator for the City of Cypress. The Police Chief would issue evacuation orders based on information gathered from emergency experts. Evacuation operations would be conducted by law enforcement agencies, highway/road/street departments, and public and private transportation providers.

LANDSLIDES

The City of Cypress lacks any significant topographical features. According to the Division of Mines and Geology, *Seismic Evaluation* (1998), no landslides have been recorded within the City boundaries and none are anticipated based on the flat terrain of the area.

4.6.2 STANDARDS OF SIGNIFICANCE

SIGNIFICANCE CRITERIA

In accordance with CEQA, the effects of a project are evaluated to determine if they will result in a significant adverse impact on the environment. An EIR is required to focus on these effects and offer mitigation measures to reduce or avoid any significant impacts that are identified. The criteria, or standards, used to determine the significance of impacts may vary depending on the nature of the project. Geology and Soils impacts resulting from the implementation of the proposed General Plan Update could be considered significant if they cause any of the following results:

- 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;

Insert Exhibit 4.6-4, Emergency Evacuation Routes

- Strong seismic ground shaking;
- 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 landslides, lateral spreading, subsidence, liquefaction or collapse;
- Be located on expansive soil, as defined in Table 18- 1-B of the Uniform Building Code, creating substantial risk to life or property; and/or
- 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 (refer to Section 7.0, *Effects Found Not To Be Significant*).

Based on these standards, the effects of the proposed project have been categorized as either a “less than significant impact” or a “potentially significant impact.” Mitigation measures are recommended for potentially significant impacts. If a potentially significant impact cannot be reduced to a less than significant level through the application of mitigation, it is categorized as a significant and unavoidable impact.

4.6.3 IMPACTS AND MITIGATION MEASURES

FAULT RUPTURE

- **BUILDOUT OF THE CITY OF CYPRESS IN ACCORDANCE WITH THE PROPOSED GENERAL PLAN UPDATE MAY RESULT IN GEOLOGIC OR SEISMIC HAZARDS WITH RESPECT TO RUPTURE OF A KNOWN EARTHQUAKE FAULT.**

Level of Significance Before Policies/Mitigation: Less Than Significant Impact.

Impact Analysis: The City of Cypress is not situated directly above any active or potentially active faults. However, five faults are located within close proximity to the City: Newport-Inglewood Fault, Norwalk Fault, El Modena Fault, Whittier-Elsinore Fault, and Elysian Park Fault. Although located further from the City than these five faults, the San Andreas and San Jacinto faults are considered capable of delivering much larger magnitude earthquakes to the City of Cypress.

Although no faults are located directly beneath the City, the entire Southern California region is considered seismically active. However, buildout of the City according to the proposed General Plan Update would not result in any impacts related to fault rupture beyond those that may presently exist within the City. Additionally, the proposed Safety Element identifies seismicity as a key safety issue and contains specific goals and policies to reduce seismic hazards within the City. Implementation of the proposed General Plan Update would therefore result in less than significant impacts.

Policies in the Proposed General Plan Update: The Safety Element includes the following policies:

- SAF-2.1 Identify and evaluate existing structures for structural safety. Encourage building owners to undertake seismic retrofit improvements.
- SAF-2.2 Implement the Uniform Building Code’s seismic standards for construction of new buildings and maintain seismic safety of existing structures.

SAF-2.3 Require the review of soils and geologic conditions, and if necessary on-site borings, to determine liquefaction susceptibility of a proposed project site.

SAF-2.4 Study the potential for liquefaction within the City and adopt policies that minimize the potential damage of structures an injury of citizens.

City Conditions of Approval: Future development projects shall be subject to the following condition of approval:

COA-GEO1 Applicant/developer shall comply with applicable provisions of the Uniform Building, Plumbing and Mechanical Codes, Electrical Code, California Administrative Code, Title 24, and the Code of the City of Cypress.

Mitigation Measures: No mitigation measures beyond the policies identified in the proposed General Plan Update or standard City conditions of approval are required.

Level of Significance After Policies/Mitigation: Less Than Significant Impact.

LANDSLIDES

○ THE PROPOSED GENERAL PLAN UPDATE FOR THE CITY OF CYPRESS MAY RESULT IN GEOLOGIC OR SEISMIC HAZARDS WITH RESPECT TO LANDSLIDES OR SOIL STRENGTH.

Level of Significance Before Policies/Mitigation: Less Than Significant Impact.

Impact Analysis: According to the Division of Mines and Geology, *Seismic Evaluation* (1998), no landslides have historically been recorded within the City of Cypress boundaries. No future landslides are anticipated based on the flat terrain of the City and surrounding areas. The City lacks any significant topographical features. As such, impacts related to landslides are not anticipated to result from the proposed General Plan Update.

The City of Cypress contains four soil types: the San Emigdio Series, the Metz Series, the Hueneme Series, and the Bolsa Series. Each of these soil types is considered suitable for urban development. As such, implementation of the proposed General Plan Update would not result in any impacts related to soils lacking adequate support for septic tanks or alternative wastewater disposal systems.

Thus, buildout of the City according to the proposed General Plan Update would not result in any significant impacts related to landslides or soil strength.

Policies in the Proposed General Plan Update: No policies within the proposed General Plan Update pertain to potential impacts resulting from landslides or soil strength.

City Conditions of Approval: Future development projects shall be subject to the following condition of approval:

COA-GEO2 A soil investigation report shall be submitted with the plans for plan check. Report shall include soil bearing capacity, seismic study, in compliance with the Seismic Hazard Mapping Act of the State of California, grading, paving, sulfate test and other pertinent information under good engineering practice.

Mitigation Measures: No mitigation measures beyond the standard City conditions of approval are required.

Level of Significance After Policies/Mitigation: Less Than Significant Impact.

SOIL EROSION

- **BUILDOUT OF THE PROPOSED GENERAL PLAN UPDATE MAY RESULT IN IMPACTS RELATED TO SOIL EROSION OR THE LOSS OF TOPSOIL.**

Level of Significance Before Policies/Mitigation: Less Than Significant Impact.

Impact Analysis: The City of Cypress is relatively flat resulting in a low potential for soil erosion. However, the minimal agricultural activities in the City result in the displacement of soil and contribute to the potential for soil erosion and loss of topsoil due to wind and water. Specific impacts resulting from buildout of the proposed General Plan Update related to soil erosion or loss of topsoil would be less than significant.

Policies in the Proposed General Plan Update: No policies within the proposed General Plan Update pertain to potential impacts resulting from soil erosion or loss of topsoil.

Mitigation Measures: Although potential impacts related to soil erosion would be less than significant, the following mitigation measures are recommended to further reduce these impacts.

- 4.6.1 For any construction or development projects involving grading activities; as soon as possible following the completion of grading, exposed soils shall be seeded or vegetated with a City approved seed mix and/or native vegetation to ensure soil stabilization.
- 4.6.2 The City of Cypress shall maintain and update the standards and regulations within the City's Municipal Code that minimize soil disturbance and erosion. Future development projects shall be required to adhere to such standards.

Level of Significance After Policies/Mitigation: Less Than Significant Impact.

SEISMIC GROUND SHAKING

- **THE CITY OF CYPRESS MAY BE SUBJECT TO HIGH LEVELS OF GROUND SHAKING DURING A SEISMIC EVENT. THIS MAY RESULT IN SUBSTANTIAL DAMAGE TO SOME BUILDINGS WITHIN THE COMMUNITY.**

Level of Significance Before Policies/Mitigation: Potentially Significant Impact.

Impact Analysis: Strong seismic ground shaking could result in substantial damage to some buildings within the City of Cypress. Some structures are considered particularly susceptible to earthquake damage, including; tilt-up structures, unreinforced masonry buildings, older buildings, buildings over four stories, and mobile homes. Concrete tilt-ups built prior to 1974 may be particularly susceptible to damage. The number of tilt-up structures within the City of Cypress is unknown; however, it is believed that some may exist in the Business Park. Additionally, the City of Cypress Building Department has identified one unreinforced masonry structure within the City boundaries. Two mobile home parks exist within the City, accommodating a total of approximately 373 mobile homes.

Additional hazards within the City exist as six-foot high concrete walls, which could collapse due to groundshaking border many sidewalks. The Los Alamitos Race Track could present an additional hazard, as large numbers of individuals congregate at the facility, potentially placing a large number of people in danger of structural damage to the race track facilities that could result from ground shaking.

However, the proposed Safety Element identifies seismic hazards as a Key Safety Issue. Specific goals and policies have been included in the proposed Safety Element to minimize potential seismic hazards in the City.

Policies in the Proposed General Plan Update: The Safety Element contains the following policies:

- SAF-2.1 Identify and evaluate existing structures for structural safety. Encourage building owners to undertake seismic retrofit improvements.
- SAF-2.2 Implement the Uniform Building Code’s seismic standards for construction of new buildings and maintain seismic safety of existing structures.

Mitigation Measures: No mitigation measures beyond the policies identified in the proposed General Plan Update are required.

Level of Significance After Policies/Mitigation: Less Than Significant Impact.

LIQUEFACTION

- **THE CITY OF CYPRESS IS UNDERLAIN BY SOILS THAT CONTAIN ALLUVIUM DEPOSITS THAT MAY BECOME UNSTABLE DURING INTENSE GROUNDSHAKING, RESULTING IN POTENTIAL LIQUEFACTION.**

Level of Significance Before Policies/Mitigation: Potentially Significant Impact.

Impact Analysis: Liquefaction is a secondary hazard associated with intense ground shaking. When the earth accelerates as a result of ground shaking, soils may destabilize. If sufficient water is present in the soil, soil and water could mix, resulting in ground failure. Liquefaction is generally associated with shallow ground water conditions and the presence of loose and sandy soils, or alluvial deposits, as in the case of the City of Cypress. The Cypress Disaster Plan, and the Orange County Safety Element state that Cypress contains granular sandy soils with high water content.

The proposed General Plan Update addresses seismic hazards as a Key Safety Issue in the Safety Element. Specific goals and policies have been included in the proposed Safety Element to minimize potential seismic hazards in the City, including those associated with liquefaction.

Policies in the Proposed General Plan Update: The Safety Element contains the following policies:

- SAF-2.3 Require the review of soils and geologic conditions, and if necessary on-site borings, to determine liquefaction susceptibility of a proposed project site.
- SAF-2.4 Study the potential for liquefaction within the City and adopt policies that minimize the potential damage of structures and injury of citizens.

Mitigation Measures: No mitigation measures beyond the policies identified in the proposed General Plan Update are required.

Level of Significance After Policies/Mitigation: Less Than Significant Impact.

EXPANSIVE SOIL AND SOIL STRENGTH

○ **BUILD-OUT OF THE PROPOSED GENERAL PLAN UPDATE MAY RESULT IN IMPACTS RELATED TO EXPANSIVE SOILS OR SOIL STRENGTH.**

Level of Significance Before Policies/Mitigation: Less Than Significant Impact.

Impact Analysis: As stated in Section 4.6.1, the City of Cypress contains four different soil types. All four types are considered suitable for urban development. Additionally, the City is largely built-out, and the proposed General Plan Update does not contain any new or additional policies proposing large-scale development or expansion of the City. Further, the proposed General Plan Update does not contain any specific development projects. No impacts related to unstable geologic units, expansive soil types, or soil strength would occur.

Policies in the Proposed General Plan Update: No policies within the proposed General Plan Update apply to potential impacts resulting from unstable geologic units or expansive soils.

Mitigation Measures: Although all soil type and strength impacts would be considered less than significant, the following mitigation measure is recommended to further reduce any impacts.

4.6.3 Development proposals within identified soil or seismic hazard areas shall include design features directed at mitigating such hazards, as confirmed during building design and plan checking stages of review. These mitigating features shall be confirmed during building design and plan checking stages of project review.

Level of Significance After Policies/Mitigation: Less Than Significant Impact.

4.6.4 UNAVOIDABLE SIGNIFICANT IMPACTS

All geologic and seismic impacts associated with implementation of the proposed General Plan Update would be less than significant by adherence to/compliance with policies in the proposed General Plan Update and standard City conditions of approval, and with the imposition of mitigation measures. No unavoidable significant geologic or seismic impacts would occur as a result of buildout of the proposed General Plan Update.