

## 4.L GEOLOGY, SOILS, AND SEISMICITY

### 4.L.1 INTRODUCTION

This section addresses potential environmental effects of the proposed TOD Plan for Downtown Inglewood and Fairview Heights related to geology, soils, and seismicity. The impacts examined include risks related to geologic hazards such as earthquakes, landslides, liquefaction, expansive soils, and impacts on the environment related to soil erosion and sedimentation.

#### DEFINITIONS

- **Earthquake** is the result of a sudden release of energy in the earth's crust that creates seismic waves. Earthquakes are classified by their magnitude, which is a measure of the amount of energy released during an event. The seismicity or seismic activity of an area refers to the frequency, type, and size of earthquakes experienced over a period of time.
- **Erosion** refers to the loosening and transportation of rock and soil debris by wind, rain, or running water.
- **Expansive soils** are soils containing water-absorbing minerals that expand as they take in water. These soils can damage buildings due to the force they exert as they expand.
- **Fault** refers to a fracture in the earth's crust forming a boundary between rock masses that have shifted.
- **Fault, active** is defined by the State Mining and Geology Board as one which has "had surface displacement within Holocene time (about the last 11,000 years)."
- **Fill** refers to earth or any other substance or material, including pilings placed for the purposes of erecting structures thereon.
- **Fill Material** refers to any material placed in an area to increase surface elevation.
- **Ground Failure** includes mudslides, landslides, liquefaction, or the compaction of soils due to groundshaking from an earthquake.
- **Liquefaction** is the phenomenon in which saturated granular soils temporarily lose their shear strength during periods of earthquake-induced strong groundshaking. The susceptibility of a site to liquefaction is a function of depth to density, water content of granular sediments, and the magnitude and frequency of earthquakes in the surrounding region. Saturated, unconsolidated silt, sand, and silty sand within 50 feet of the ground surface are most susceptible to liquefaction. Liquefaction-related phenomenon may include lateral spreading, ground oscillation, loss of load bearing strength, subsidence, and buoyancy effects.
- **Richter Scale** is a scale used to quantify the energy released by an earthquake. The Richter scale is logarithmic, which means that an earthquake registering 5.0 on the Richter scale has a shaking amplitude 10 times that of an earthquake that registered 4.0, and thus corresponds to a release of energy 31.6 times that released by the lesser earthquake.

## 4.L.2 APPLICABLE PLANS, POLICIES, AND REGULATIONS

Implementation of the proposed TOD Plan for Downtown Inglewood and Fairview Heights is subject to a range of federal, state, regional, and local plans, policies, and regulations, which are described below.

### FEDERAL PLANS, POLICIES, AND REGULATIONS

#### Earthquake Hazards Reduction Act

The Earthquake Hazards Reduction Act was enacted in 1997 to “reduce the risks to life and property from future earthquakes in the United States through the establishment and maintenance of an effective earthquake hazards and reduction program.” To accomplish this, the Act established the National Earthquake Hazards Reduction Program that provides characterization, and prediction of hazards and vulnerabilities; improvement of building codes and land use practices; risk reduction through post-earthquake investigations and education; development and improvement of design and construction techniques; improvement of mitigation capacity; and accelerated application of research results. This Act designated the Federal Emergency Management Agency (FEMA) as the lead agency of the program and assigns it several planning, coordinating, and reporting responsibilities. Programs under this Act provide building code requirements such as emergency evacuation responsibilities and seismic code standards such as those to which developments under the proposed TOD Plan would be required to adhere.

### STATE PLANS, POLICIES, AND REGULATIONS

#### Alquist-Priolo Earthquake Fault Zoning Act

The Alquist-Priolo Earthquake Fault Zoning Act was passed in 1972 to mitigate the hazard of surface fault rupture to structures used for human occupancy. The main purpose of the Act is to prevent the construction of buildings for human occupancy on top of the traces of active faults. It was passed into law following the February 1971 magnitude 6.5 San Fernando (Sylmar) Earthquake that resulted in over 500 million dollars in property damage and 65 deaths. Although the Act addresses the hazards associated with surface fault rupture, it does not address other earthquake-related hazards, such as seismically induced groundshaking, liquefaction, or landslides.

This Act requires the State Geologist to establish regulatory zones, now referred to as Earthquake Fault Zones, around the mapped surface traces of active faults, and to publish appropriate maps that depict these zones. Earthquake Fault Zone maps are publicly available and distributed to all affected cities, counties, and state agencies for their use in planning and controlling new or renewed construction. The Act requires local agencies to regulate development within Earthquake Fault Zones. Before a development project can be permitted within an Earthquake Fault Zone, a geologic investigation is required to demonstrate that proposed buildings would not be constructed across active faults. A site-specific evaluation and written report must be prepared by a licensed geologist. If

an active fault is found, a structure for human occupancy cannot be placed over the trace of the fault and must be set back a minimum of 50 feet from the fault.

### **Seismic Hazards Mapping Act**

The Seismic Hazards Mapping Act, which was passed by the California legislature in 1990, addresses earthquake hazards related to liquefaction and seismically induced landslides. Under the Act, seismic hazard zones are mapped by the State Geologist in order to assist local governments in land use planning. The Act states “it is necessary to identify and map seismic hazard zones in order for cities and counties to adequately prepare the safety element of their general plans and to encourage land use management policies and regulations to reduce and mitigate those hazards to protect public health and safety.” Section 2697(a) of the Act states that “cities and counties shall require, prior to the approval of a project located in a seismic hazard zone, a geotechnical report defining and delineating any seismic hazard.”

### **California Building Code**

The California Building Code (CBC) is included in Title 24 of the California Code of Regulations. The CBC incorporates the International Building Code, a model building code adopted across the United States. Current State law requires every city, county, and other local public agency enforcing building regulations to adopt the provisions of the CBC within 180 days of its publication. The publication date of the CBC is established by the California Building Standards Commission. The most recent building standard adopted by the legislature and used throughout the state is the 2013 version of the CBC, which took effect on January 1, 2014. The current CBC was adopted by the City of Inglewood and is included as Chapter 11 of the City’s Municipal Code. These codes provide standards to protect property and public safety. They regulate the design and construction of excavations, foundations, building frames, retaining walls, and other building elements, and thereby mitigate the effects of seismic shaking and adverse soil conditions. The codes also regulate grading activities, including drainage and erosion control.

### **California Construction General Permit**

The State of California adopted a Statewide National Pollutant Discharge Elimination System (NPDES) Permit for General Construction Activity (Construction General Permit) on September 2, 2009 (Order No. 2009-0009-DWQ, as amended by 2010-0014-DWQ and 2012-0006-DWQ). The last Construction General Permit amendment became effective on February 16, 2012. The Construction General Permit regulates construction site storm water management. Dischargers whose projects disturb one or more acres of soil, or whose projects disturb less than one acre but are part of a larger common plan of development that in total disturbs one or more acres, are required to obtain coverage under the general permit for discharges of storm water associated with construction activity.

To obtain coverage under this permit, project operators must electronically file Permit Registration Documents, which include a Notice of Intent, a Storm Water Pollution Prevention Plan (SWPPP), and other compliance-related documents, including a risk-level assessment for construction sites, an active stormwater effluent monitoring and reporting program during construction, rain event action plans,

and numeric action levels (NALs) for pH and turbidity, as well as requirements for qualified professionals to prepare and implement the plan.

The Construction General Permit requires the SWPPP to identify best management practices (BMPs) that will be implemented to reduce soil erosion. Types of BMPs include preservation of vegetation and sediment control (e.g., fiber rolls).

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## LOCAL PLANS, POLICIES, AND REGULATIONS

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### City of Inglewood General Plan Safety Element

Relevant policies of the City' General Plan Safety Element include the following:

- I. Provide Measures to reduce seismic impacts.
  - Ensure that all potentially hazardous buildings are reinforced or demolished.
  - Restrict new structures for human occupancy from being constructed across active faults.
  - Require geological and soils engineering investigations in high risk fault areas.
2. Promote public safety as it relates to the various modes of transportation.

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### City of Inglewood Municipal Codes

*Municipal Code Section II-2 through II-5. Uniform Building Code.*

The Inglewood Municipal Code incorporates the California Building Code in Chapter II, Sections II-2 through II-5. These ordinances reference applicable standards and documentation requirements found in the California Building Code that address seismic safety.

*Municipal Code Section II-130. Earthquake Hazard Reduction in Existing Buildings.*

This section of the City's Municipal Code promotes public safety and welfare by reducing the risk of death or injury that may result from the effects of earthquakes on unreinforced masonry-bearing-wall buildings constructed prior to 1934 or any unreinforced masonry building located in the City of Inglewood. This municipal code sets forth the minimum standards for structural seismic resistance established primarily to reduce the risk of life loss or injury, and provides systematic procedures and standards or identification and classification of unreinforced masonry-bearing-wall buildings based on their present use. Priorities, time periods and standards are also established under which these buildings are required to be structurally analyzed and anchored. Where the analysis finds deficiencies, this code requires the building to be strengthened or demolished. In addition, qualified historical buildings are required to comply with the State Historical Building Code per Part 8, Title 4 of the California Administrative Code.

### 4.L.3 ENVIRONMENTAL SETTING

#### REGIONAL GEOLOGY

The City of Inglewood is located at the southern edge of the Transverse Ranges geomorphic province, which includes the San Gabriel and San Bernardino mountains to the northeast, and the Santa Monica Mountains to the north. The City is also located near the northern boundary of the Peninsular Ranges geomorphic province, which includes the San Jacinto and Santa Rosa mountains and Newport-Inglewood Fault and the Whittier-Elsinore Fault to the east and southeast (City, 2006).

Most of the City is underlain by thick (10,000 to 12,000 foot) Tertiary and Quaternary marine and continental sedimentary rocks. The Tertiary rocks, consisting primarily of sandstone, silt-stone, and shale, are almost entirely of marine origin and range in age from Eocene to Pliocene. The Quaternary rocks consist of shallow marine sandstone and siltstone as well as continental siltstone, mudstone, and gravel (City, 2006).

#### FAULTS

The City of Inglewood contains both active and potentially active faults, several of which traverse the TOD Plan areas. The Newport-Inglewood fault zone crosses the Downtown planning area, and is a zone of discontinuous folds and faults that stretch across the Los Angeles basin in a northwest-southeast direction from Beverly Hills to Newport Beach (City, 2006 and CDMG, 1986). The Potrero Fault, which is a major local component of the Newport-Inglewood fault, traverses the Fairview Heights planning area in a northwest-southeast direction (City, 2006 and CDMG, 1986). In addition, the Transverse faults consist of five northeast-southwest trending faults that include the Fairview, Centinela, Cemetery, Manchester, and Century faults. Three of these (Centinela, Cemetery, and Manchester) traverse through the TOD planning areas (City, 1995).

In addition, several other active or potentially active faults are located in or nearby the City, as listed below.

- The San Andreas system runs parallel to the Newport-Inglewood fault to the east.
- The Townsite fault extends from its intersection with the Centinela Fault in the Centinela Creek, towards the southeast across the Hollywood Park racetrack to Century Boulevard.
- The Charnock and Overland faults trends northwest-southeast and lies just west of the City boundary (City, 2006 and CDMG, 1986).

Surface rupture or displacement occurs as a fault breaks the ground surface during a seismic event. Generally, this hazard is anticipated to occur along pre-existing faults. There has been no history of any major surface rupture on any of these fault zones (City, 2010).

#### GROUNDSHAKING AND SOILS

All of southern California is seismically active. Additionally, as a result of the existing faults within the City and the region, the TOD Plan areas are seismically active. Groundshaking is a major cause of

structural damage from earthquakes. The amount of motion expected at a building site can vary from none to forceful depending upon the distance to the fault, the magnitude of the earthquake, and the local geology. Greater movement can be expected at sites located on poorly consolidated material such as alluvium located near the source of the earthquake epicenter or in response to an earthquake of great magnitude.

The City of Inglewood and the TOD Plan areas are underlain by two different types of alluvium soils, undifferentiated late Pleistocene alluvium (Qoa) that is composed of well consolidated and cemented gravel, sand, silt, and clay; and late Holocene alluvium (Qya<sub>2</sub>) that is composed of unconsolidated and uncemented gravel, sand, silt, and clay. Both of these soil types generally provide poor resistance to groundshaking (City, 1995).

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## LIQUEFACTION

Liquefaction occurs when vibrations or water pressure within a mass of soil cause the soil particles to lose contact with one another. As a result, the soil behaves like a liquid, has an inability to support weight, and can flow down very gentle slopes. This condition is usually temporary and is most often caused by an earthquake vibrating water-saturated fill or unconsolidated soil. Soils that are most susceptible to liquefaction are clean, loose, saturated, and uniformly graded fine-grained sands that lie below the groundwater table within approximately 50 feet below ground surface. Lateral spreading refers to spreading of soils in a rapid fluid-like flow movement similar to water.

Groundwater levels within the City vary greatly due to the existence of the faults, which act as a barrier to water movement (City, 1995). Within the TOD Plan areas, both the Newport-Inglewood fault and Potrero fault act as barriers to water movement and result in differences in groundwater levels (City 1995). Groundwater levels near the TOD Plan areas range from 40 to 173 feet below the ground surface (DPW, 2016).

A small portion of both TOD Plan areas, which was formerly Centinela Creek, is identified as a liquefaction area on the Inglewood Quadrangle (CDMG, 1999 and City, 2006). Due to the range in groundwater and previous creek soils in this area, it could be susceptible to liquefaction.

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## GROUND SETTLEMENT

Loading settlement is associated with weak, sandy, clay unconsolidated soils near the ground surface and is generally induced by the weight of buildings or compaction of soils during earthquake shaking. The only area in the City and TOD Plan areas known to have the potential for such settlement is along the course of the former Centinela Creek, which is due to the unconsolidated native soils and poorly compacted fill placed along the creek bed in the early decades of the century. Structures built in this area either require construction on pilings or require soil compaction to depths of twenty or thirty feet as determined by individual site soil testing (City, 2006).

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## SUBSIDENCE

Subsidence is a general lowering of the ground surface over a large area that results from extraction of groundwater or oil. Groundwater levels near the TOD Plan areas range from 40 to 173 feet below the ground (DPW, 2016). The City obtained 36 percent of its water supply (3,623 acre-feet) in 2010 from groundwater pumping from the West Coast Groundwater Basin. The amount of water the City can pump from the Basin is limited by a 1961 Order of the Los Angeles Superior Court (the West Coast Basin Judgment or adjudication) to 4,450 acre-feet per year. Generally, the City is entitled to pump up to its maximum allowable extraction right along with any carryover or unused water rights from the previous year and any net leases or exchanges of water rights per agreements with other parties owning those rights (UWMP, 2010). Additional sources of water supply in the City are obtained from imported water and recycled water as described in Section 4.N, Utilities, Service Systems and Water Supply.

Historically, the City of Inglewood was an area of oil production. However, there is only one remaining active oil well site, which is the Brea Oil Company site at Eucalyptus Avenue and Hyde Park Boulevard, which is on the northern boundary of the Downtown Inglewood planning area.

There is no historic evidence of subsidence in the City of Inglewood (City, 1995).

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## EXPANSIVE SOILS

Expansive soils contain certain types of clay minerals that shrink or swell as the moisture content changes; the shrinking or swelling can shift, crack, or break structures built on such soils. Arid or semiarid areas with seasonal changes of soil moisture experience a much higher frequency of problems from expansive soils than areas with higher rainfall and more constant soil moisture. Inglewood is in a semiarid region with marked seasonal changes in precipitation: most rain falls in winter, and there is a long dry season in summer and autumn. Therefore, the City's climate is such that a relatively high incidence of soil expansion is expected where soils contain the requisite clay minerals.

The TOD Plan areas are underlain by two different types of alluvium soils, undifferentiated late Pleistocene alluvium (Qoa) that is composed of well consolidated and cemented gravel, sand, silt, and clay; and late Holocene alluvium (Qya<sub>1</sub>) that is composed of unconsolidated and uncemented gravel, sand, silt, and clay. These alluvial sediments are composed granular materials (gravel and sand) and fine-grained materials (silts and clays). Fine-grained soils, such as silts and clays, may contain variable amounts of expansive clay minerals that can shrink or swell substantially as a result of changes in moisture content. Consequently, the expansion characteristics of soils within the TOD Plan areas are highly variable.

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## LANDSLIDES

Landslides are the downhill movement of masses of earth and rock, and are often associated with earthquakes; but other factors, such as the slope, moisture content of the soil, composition of the subsurface geology, heavy rains, and improper grading can influence the occurrence of landslides.

The TOD Plan areas are relatively flat and developed. Sloping areas, such as along the north side of Florence Avenue adjacent to the Downtown Inglewood Metro station are not subject to landslides. According to the California Seismic Hazards Zones Inglewood Quadrangle, the TOD Plan areas do not contain and are not located near any active or historic landslide areas.

#### 4.L.4 SIGNIFICANCE CRITERIA

Criteria outlined in CEQA Guidelines were used to determine the level of significance of geologic, soils, and seismic impacts. Appendix G of state CEQA Guidelines indicates that a project would have a significant effect if it were to:

- 4.L-1 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;
  - Strong seismic groundshaking;
  - Seismic-related ground failure (including liquefaction); and/or
  - Landslides.
- 4.L-2 Result in substantial soil erosion or loss of topsoil;
- 4.L-3 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;
- 4.L-4 Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code, creating substantial risks to life or property; or
- 4.L-5 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.

#### 4.L.5 PROJECT IMPACTS AND MITIGATION MEASURES

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| <b>Threshold 4.L-1:</b> | <b>Expose people or structures to risk of loss, injury, or life involving rupture of a known earthquake fault, strong seismic groundshaking, seismic-related ground failure, and/or landslides.</b>  |
| <b>Impact 4.L-1.1:</b>  | <b>Implementation of the proposed TOD Plan for Downtown Inglewood and Fairview Heights would not expose people or structures to risk of loss, injury, or life involving rupture of a known earthquake fault. The resulting impact would be <i>less than significant</i>.</b> |

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### *Methodology*

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The analysis of impacts related to potential for fault rupture is based on a review of existing literature and previous studies within the City of Inglewood. The analysis considers the risk of loss, injury, or life involving rupture of a known earthquake fault that would result from the proposed TOD Plan increasing the number of people and buildings within Downtown Inglewood and Fairview Heights. In determining whether a significant impact would result from the proposed project, the analysis includes consideration of state law, including the Alquist-Priolo Earthquake Fault Zoning Act, which prohibits construction of structures for human occupancy astride an active fault, as well as the California Building Code, which sets standards for buildings to withstand seismic events. In general, existing state law and building codes provide for an adequate level of safety such that: buildings build to code withstand groundshaking forces of a minor earthquake without damage, of a moderate earthquake without structural damage, and of a major earthquake without collapse of the structure. In addition, critical facilities and structures (e.g. hospitals, emergency operations centers) built to code would remain standing and functional following an earthquake. Any building designed for human occupancy that would not meet applicable seismic design standards would be considered to create a significant impact.

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### *Impact Assessment*

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As described above, the City of Inglewood contains both active and potentially active faults, several of which traverse the TOD Plan areas. Therefore, build out of the TOD Plan would increase the number of residents, employees, visitors, and structures exposed to potential of fault rupture in an earthquake.

Since the only preventive measure to avoid a surface rupture is to avoid locating structures astride a fault, faults are identified with the purpose of delineating hazardous areas where construction should be avoided. The Alquist-Priolo Earthquake Fault Zoning Act requires that geologic investigations be prepared for development sites within Earthquake Fault Zones to demonstrate that the sites are not threatened by surface rupture from future faulting. In addition, if an active fault is found, all structures for human occupancy must be set back a minimum of 50 feet from the fault. Compliance with the Act, which will be required of all new development within the TOD Plan areas, will avoid hazards due to fault rupture<sup>1</sup>. Future development pursuant to the TOD Plan would be required to comply with the Alquist-Priolo Earthquake Fault Zoning Act and the CBC, which has been adopted into the City's Municipal Code. Compliance with these existing regulations would reduce potential impacts related to fault rupture to a less than significant level.

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### *Significance Conclusion for Impact 4.L-1.1*

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Implementation of proposed TOD Plan for Downtown Inglewood and Fairview Heights would result in less than significant impacts related to the exposure of people or structures to risk of loss, injury, or life involving rupture of a known earthquake fault.

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<sup>1</sup> Existing development within the TOD Plan areas also meets this standard.

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| <b>Threshold 4.L-1:</b> | <b>Expose people or structures to risk of loss, injury, or life involving rupture of a known earthquake fault, strong seismic groundshaking, seismic-related ground failure, and/or landslides.</b>  |
| <b>Impact 4.L-1.2:</b>  | <b>Implementation of the proposed TOD Plan for Downtown Inglewood and Fairview Heights would expose people and structures to strong seismic groundshaking. However, compliance with existing building code requirements will result in <i>less than significant</i> impacts related to risk of loss, injury, or life involving strong seismic groundshaking.</b> |

### *Methodology*

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The analysis of impacts related to risk of loss, injury, or life as the result of strong seismic groundshaking is based on a review of existing literature and previous studies within the City of Inglewood. The analysis considers the risk of loss, injury, or life due to strong seismic groundshaking that would result from the proposed TOD Plan increasing the number of people and buildings within Downtown Inglewood and Fairview Heights. Potential hazards to existing development within the TOD areas is an existing condition, and is therefore not considered to be an impact of the proposed TOD Plan. In determining whether a significant impact would result from the proposed project, the analysis includes consideration of CBC requirements for new construction aimed at minimizing earthquake hazards to life and property.

### *Impact Assessment*

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As described above, Inglewood is located within a seismically active region and several faults traverse the TOD Plan areas. Implementation of the proposed project would add residents, employees, and new structures for human occupancy within the TOD Plan areas. Therefore, project implementation would result in an increased number of people and structures subject to hazards from strong groundshaking. However, seismic groundshaking is a risk throughout Southern California, and seismic risks within the TOD Plan areas are typical of those throughout the region. In addition, because the proposed TOD plan would result in demolition and replacement of older residential, retail, office, institutional, and industrial buildings with new structures designed to meet current seismic standards, the proposed TOD Plan would reduce the seismic groundshaking risk from these existing structures, and result in improved safety.

Overall, the TOD Plan provides for new structures for human occupancy to be constructed pursuant to the applicable seismic regulations at the time of construction. The CBC, as currently adopted in the City's municipal code, includes provisions to reduce impacts caused by potential major structural failures or loss of life resulting from earthquakes or other geologic hazards. For example, the CBC requires that a California Certified Engineering Geologist or California-licensed civil engineer prepare a site-specific engineering analysis that demonstrates the satisfactory performance proposed structures, and contains requirements for design and construction of structures to resist loads and peak ground accelerations that could result from earthquakes. In addition, the City (through implementation of the CBC) requires that a site-specific soil engineering report be prepared to include appropriate subsurface exploration, laboratory testing and engineering analysis necessary to provide

specific foundation, floor slab, and grading recommendations that include considerations for type of occupancy, and building structural system, and height that and are required to be incorporated into grading plans and specifications as a condition of project approval.

New developments pursuant to the TOD Plan would be required to conform to the seismic design parameters of the CBC, which are reviewed by the City for appropriate inclusion, as part of the building plan check and development review process. Because the TOD Plan areas are located in a seismically active region, some risk related to seismic groundshaking would remain, even with compliance with all applicable regulatory standards. However, compliance with the requirements of the CBC and City municipal code for structural safety would reduce hazards from strong seismic groundshaking to a less than significant level.

#### *Significance Conclusion for Impact 4.L-1.2*

Implementation of the proposed TOD Plan for Downtown Inglewood and Fairview Heights would result in less than significant impacts related to the exposure of people or structures to risk of loss, injury, or life involving strong seismic groundshaking.

**Threshold 4.L-1:** Expose people or structures to risk of loss, injury, or life involving rupture of a known earthquake fault, strong seismic groundshaking, seismic-related ground failure, and/or landslides.

**Impact 4.L-1.3:** Implementation of the proposed TOD Plan for Downtown Inglewood and Fairview Heights would not expose people or structures to risk of loss, injury, or life involving seismic-related ground failure, including liquefaction, except along the course of the former Centinela Creek. The resulting impact would be *less than significant*.

#### *Methodology*

The analysis of impacts related to risk of loss, injury, or life as the result of seismic-related ground failure, including liquefaction, is based on a review of existing literature and previous studies within the City of Inglewood. The analysis considers the risk of loss, injury, or life due to seismic-related ground failure that would result from the proposed TOD Plan increasing the number of people and buildings within Downtown Inglewood and Fairview Heights. Potential hazards to existing development within the TOD areas is an existing condition, and is therefore not considered to be an impact of the proposed TOD Plan. In determining whether a significant impact would result from the proposed project, the analysis includes consideration of CBC requirements for new construction aimed at minimizing seismic-related ground failure, including liquefaction, to life and property.

#### *Impact Assessment*

As described above, a small portion of both TOD Plan areas that was formerly Centinela Creek is identified as a liquefaction area on the Inglewood Quadrangle (CDMG, 1999 and City, 2006). Due to the range in groundwater and previous creek soils in this area, it could be susceptible to liquefaction.

In addition, the potential for ground failure or settlement is limited to the same area along the course of the former Centinela Creek. This area is susceptible to settlement due to the unconsolidated native soils and the poorly compacted fill that was placed along the creek bed in the early decades of the 20<sup>th</sup> century. Structures built in this area either require construction on pilings or require soil compaction to depths of twenty or thirty feet as determined by individual site soil testing (City, 2006).

Implementation of the proposed TOD Plan would result in redevelopment and new development within the areas that could be susceptible to liquefaction and/or ground failure and settlement. However, as described above, the CBC, as adopted in the City's municipal code, includes provisions to reduce seismic and soils related impacts. For example, the CBC requires that a California Certified Engineering Geologist or California-licensed civil engineer prepare a site-specific soil engineering report to (1) include appropriate subsurface exploration, laboratory testing and engineering analysis and (2) provide specific foundation, floor slab, and grading recommendations to reduce potential impacts related to ground instability. The CBC requires that these recommendations be incorporated into grading plans and specifications as a condition of site-specific development approval.

New developments pursuant to the proposed TOD Plan would be required to conform to the provisions of the CBC, which are reviewed by the City for appropriate inclusion, as part of the building plan check and development review process. Compliance with the requirements of the CBC and City municipal code for structural safety would reduce hazards from ground failure, settlement, and liquefaction to a less than significant level. Thus, impacts related to seismic ground failure, including liquefaction would be less than significant.

#### *Significance Conclusion for Impact 4.L-1.3*

Implementation of the proposed TOD Plan for Downtown Inglewood and Fairview Heights would result in less than significant impacts related to the exposure of people or structures to risk of loss, injury, or life involving seismic related ground failure, including liquefaction.

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| <b>Threshold 4.L-1:</b> | <b>Expose people or structures to risk of loss, injury, or life involving rupture of a known earthquake fault, strong seismic groundshaking, seismic-related ground failure, and/or landslides.</b>                           |
| <b>Impact 4.L-1.4:</b>  | <b>Implementation of the proposed TOD Plan for Downtown Inglewood and Fairview Heights would not expose people or structures to risk of loss, injury, or life involving landslides. The result would be <i>no impact</i>.</b> |

#### *Methodology*

The analysis of impacts related to risk of loss, injury, or life as the result of landslides is based on a review of existing literature and previous studies within the City of Inglewood. The analysis considers the risk of loss, injury, or life due to landslides that would result from the proposed TOD Plan permitting development adjacent to existing slopes and thereby increasing the number of people and buildings within Downtown Inglewood and Fairview Heights potentially subject to landslide hazards. Potential hazards to existing development within the TOD areas is an existing condition, and is

therefore not considered to be an impact of the proposed TOD Plan. In determining whether a significant impact would result from the proposed project, the analysis includes consideration of CBC requirements for new construction aimed at minimizing landslide hazards to life and property.

### *Impact Assessment*

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As described above, the TOD Plan areas are relatively flat except in a very limited area, developed, and, not subject to landslides. According to the California Seismic Hazards Zones Inglewood Quadrangle, the TOD Plan areas do not include and are not located near any active landslide areas. In addition, buildout of the proposed TOD Plan would not generate manufactured slopes in excess of three feet in height. As a result, implementation of the proposed TOD Plan would not expose people or structures to substantial adverse effects involving landslides, and impacts related to landslides would not occur.

### *Significance Conclusion for Impact 4.L-1.4*

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Implementation of the proposed TOD Plan for Downtown Inglewood and Fairview Heights would not expose people or structures to risk of loss, injury, or life involving landslides. Impacts related to landslides would not occur.

**Threshold 4.L-2: Substantial soil erosion or loss of topsoil.**

**Impact 4.L-2: Implementation of the proposed TOD Plan for Downtown Inglewood and Fairview Heights could result in substantial soil erosion or loss of topsoil. However, compliance with existing regulations would reduce this impact to *less than significant*.**

### *Methodology*

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The analysis of impacts related to soil erosion and loss of topsoil is based on a review of existing literature and previous studies within the City of Inglewood. The analysis considers the types of (primarily construction) activities that would be permitted by the proposed TOD Plan that could result in soil erosion or loss of topsoil, such as clearing, grading, and site landscaping.

Potential erosion hazards related to the few existing vacant parcels and slopes within the TOD areas is an existing condition, and is therefore not considered to be an impact of the proposed TOD Plan. In determining whether a significant impact would result from the proposed project, the analysis includes consideration of current state and local requirements aimed at minimizing erosion hazards.

### *Impact Assessment*

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The TOD Plan areas are developed and largely covered by impervious surfaces and landscaping. However, construction activities that disturb soil have the potential to contribute to soil erosion and the loss of top soil. Construction of development projects under the proposed TOD Plan would require demolition of some existing structures and removal of existing parking areas and landscaping, along

with development of new uses. These activities would expose and loosen soils, which has the potential to result in erosion and the loss of topsoil. Because the TOD Plan areas are flat and do not contain substantial slopes, the majority of soil disturbance for developments would generally be related to excavation and backfill for installation of building foundations and underground utilities, as well as site grading to provide proper drainage.

The existing NPDES Construction General Permit requires development and implementation of a Stormwater Pollution Prevention Plan (SWPPP) by a Qualified SWPPP Developer for construction sites that would disturb over one-acre of ground surface. The Qualified SWPPP Developer-prepared SWPPP is required to address site-specific conditions related to construction. The SWPPP would identify the sources of potential sedimentation during construction, describe the implementation and maintenance of erosion control and sediment control best management practices (BMPs) to reduce or eliminate the transport of sediments. Common types of construction BMPs are described in Section 4.L, Hydrology and Water Quality. In addition, a Qualified SWPPP Practitioner is required to ensure compliance with the SWPPP through regular monitoring and visual inspections during construction activities. The SWPPPs would be amended and BMPs revised, as determined necessary through field inspections, to protect against substantial soil erosion or the loss of topsoil. With compliance with the Construction General Permit and a SWPPP prepared by a Qualified SWPPP Developer and implemented by a Qualified SWPPP Practitioner, construction-related impacts from erosion and siltation from implementation of the proposed TOD Plan would be less than significant.

#### *Significance Conclusion for Impact 4.L-2*

Implementation of the proposed TOD Plan for Downtown Inglewood and Fairview Heights along with compliance with the NPDES Construction General Permit would reduce potential impacts related to soil erosion to a less than significant level.

**Threshold 4.L-3:** Location on an unstable geologic or soil unit that could result in an on- or off-site landslide, lateral spreading, subsidence, liquefaction, or collapse.

**Impact 4.L-3:** Implementation of the proposed TOD Plan for Downtown Inglewood and Fairview Heights would not be located on an unstable geologic or soil unit that could result in an on- or off-site landslide, lateral spreading, subsidence, liquefaction, or collapse. The resulting impact would be *less than significant*.

#### *Methodology*

The analysis of impacts related to risk of loss, injury, or life as the result of on- or off-site landslide, lateral spreading, subsidence, liquefaction, or collapse is based on a review of existing literature and previous studies within the City of Inglewood. The analysis considers the risk of loss, injury, or life due to on- or off-site landslide, lateral spreading, subsidence, liquefaction, or collapse that would result from the proposed TOD Plan increasing the number of people and buildings within Downtown Inglewood and Fairview Heights. Potential hazards to existing development within the TOD plan

areas is an existing condition, and is therefore not considered to be an impact of the proposed TOD Plan. In determining whether a significant impact would result from the proposed project, the analysis includes consideration of CBC requirements for new construction aimed at minimizing earthquake hazards to life and property.

### *Impact Assessment*

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As described previously, the TOD Plan areas do not include and are not located near any active landslide areas. In addition, buildout of the proposed TOD Plan would not generate any but small (<3'-6') manufactured slopes. As a result, proposed development pursuant to the TOD Plan would not be located on an unstable geologic or soil unit that could result in substantial adverse effects involving landslides, and impacts related to landslides would not occur.

There is no historic evidence of subsidence in Inglewood (City, 1995), and the City is limited to an annual allocation of groundwater pumping, which prevents over pumping and the potential or subsidence. In addition, the proposed TOD Plan does not involve extraction of oil or increased groundwater pumping from the adjudicated basin. Additional sources of water that may be needed by the City in the future would come from either imported or recycled sources (as described in Section 4.N, Utilities, Service Systems and Water Supply). As a result, impacts related to subsidence would not occur.

As described previously, the small portion of the TOD Plan areas that was formerly Centinela Creek could be susceptible to liquefaction and the potential for ground failure (including lateral spreading, collapse, or settlement) due to the unconsolidated native soils and the poorly compacted fill that was placed along the creek bed in the early decades of the century. Structures built in this area either require construction on pilings or require soil compaction to depths of twenty or thirty feet as determined by individual site soil testing (City, 2006).

Implementation of the proposed TOD Plan would result in redevelopment and new development within limited areas that could be susceptible to liquefaction, lateral spreading, collapse, or settlement. However, the CBC as adopted in the City's municipal code, includes provisions to minimize seismic and soils-related hazards. The CBC requires that a California Certified Engineering Geologist or California-licensed civil engineer prepare a site-specific soil engineering report based on appropriate subsurface exploration, laboratory testing and engineering analysis necessary that sets forth site-specific foundation, floor slab, and grading recommendations. Implementation of these recommendations would reduce potential impacts related to ground instability, such as liquefaction, lateral spreading, collapse, and settlement, and are required to be incorporated into all grading plans and buildings specifications as conditions of project approval.

Developments pursuant to the proposed TOD Plan would be required to conform to the provisions of the CBC, which are reviewed by the City for appropriate inclusion, as part of the building plan check and development review process. Compliance with the requirements of the CBC and City municipal code would reduce potential impacts related to liquefaction, lateral spreading, collapse, and settlement to a less than significant level.

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### *Significance Conclusion for Impact 4.L-3*

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Implementation of the proposed TOD Plan for Downtown Inglewood and Fairview Heights along with compliance with the requirements of the CBC and City municipal code would reduce potential impacts related to liquefaction, lateral spreading, collapse, and settlement to a less-than-significant level.

**Threshold 4.L-4:** Location on expansive soil creating substantial risks to life or property.

**Impact 4.L-4:** Implementation of the proposed TOD Plan for Downtown Inglewood and Fairview Heights could place new development on expansive soils, but would not create substantial risks to life or property. The resulting impact would be *less than significant*.

### *Methodology*

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The analysis of impacts related to risk of loss as the result of development on expansive soils is based on a review of existing literature and previous studies within the City of Inglewood. The analysis considers the risk of loss in relation to development on expansive soils that would result from development permitted by the proposed TOD Plan. Potential hazards to existing development within the TOD areas is an existing condition, and is therefore not considered to be an impact of the proposed TOD Plan. In determining whether a significant impact would result from the proposed project, the analysis includes consideration of CBC requirements for new construction aimed at minimizing hazards related to development in areas with expansive soils.

### *Impact Assessment*

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The TOD Plan areas include alluvial sediments that could be expansive, and implementation of the proposed Plan would result in construction of buildings within areas that could be underlain by expansive soils. However, as described above, the CBC as adopted in the City's municipal code, includes provisions to minimize soils-related hazards. This includes requirements that a California Certified Engineering Geologist or California-licensed civil engineer prepare a site-specific soil engineering report based on appropriate subsurface exploration, laboratory testing and engineering analysis that sets forth specific foundation, floor slab, and grading recommendations to reduce potential impacts related to potential expansion and shrinkage of soils. The CBC requires these recommendations to be incorporated into grading plans and buildings specifications, which the City will do as conditions of site-specific development approvals.

All proposed developments pursuant to the TOD Plan would be required to conform to the provisions of the CBC, which are reviewed by the City for appropriate inclusion, as part of the building plan check and development review process. Compliance with the requirements of the CBC and City municipal code would reduce potential impacts related to expansive soils to a less than significant level.

*Significance Conclusion for Impact 4.L-4*

Implementation of the proposed TOD Plan for Downtown Inglewood and Fairview Heights would result in less than significant impacts related to the exposure of people or structures to substantial risks to life or property from expansive soils.

**Threshold 4.L-5: Soils incapable of supporting use of septic tanks or alternative wastewater disposal systems.**

**Impact 4.L-5: Implementation of the proposed TOD Plan for Downtown Inglewood and Fairview Heights would require all new development to connect to municipal sewage systems, and no septic tanks or alternative wastewater disposal systems would be used. As a result, there would be *no impact*.**

*Methodology*

Because all development pursuant to the proposed TOD Plan will be connected to municipal sewage systems, no impact would result, and no analysis related to the potential use of septic tanks or alternative wastewater disposal systems was necessary.

*Impact Assessment*

The City of Inglewood, including the TOD Plan areas is served by a comprehensive network of sewer lines that are owned and maintained by the City's Public Works Department. All development that would occur under the proposed TOD Plan would be connected to and served by the municipal system. No septic tanks or alternative wastewater systems would be used within the TOD Plan areas, and no impacts related to whether soils are capable of supporting such systems would result.

*Significance Conclusion for Impact 4.L-5*

No impacts related to soils being incapable of supporting septic tanks or alternative wastewater disposal systems would occur.

**4.L.6 REFERENCES – GEOLOGY, SOILS, AND SEISMICITY**

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