

3.5 GEOLOGY AND SOILS

3.5.1 Introduction

This section of the Draft SEIR focuses on the potential for local and regional geological faults and soil conditions to impact the Pasadena Rose Bowl's renovation and operation. The Initial Study determined that potential impacts could result with respect to rupture of a known earthquake fault, strong seismic shaking, seismic-related ground failure, landslides, substantial soil erosion or the loss of topsoil, location of the project on expansive soil, or location of the project on a geologic unit or soil that is unstable or potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction, or collapse. The Initial Study determined that no impact would result with respect to location on soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems, because the proposed project would not use any alternative or septic systems. Thus, no further analysis of this issue area is required in this Draft SEIR.

Data sources used for this section include the City of Pasadena General Plan Safety Element, previous seismic evaluation documentation prepared for the Rose Bowl, and other Pasadena data sources. Baseline conditions have not changed since preparation of the original FEIR.

3.5.2 Environmental Setting

The geological conditions of the project site set forth in the FEIR would remain the same for the Draft SEIR. The City of Pasadena is on the northern rim of the Los Angeles Basin near a major "bend" in the San Andreas Fault. The underlying soils in the project area are slightly expansive, very slightly corrosive to uncoated steel or concrete, moderate to low in strength, with medium to low compressibility, and are slightly susceptible to seepage.

Further factors that are relevant to the impact analysis include:

- The project site is in an area potentially subject to liquefaction caused by groundshaking or seismic-related ground failures.
- The project site is in an area potentially subject to seismically induced settlement caused by groundshaking or seismic-related ground failures.
- The project site is on relatively level canyon floor terrain and, thus, is not subject to landslides; however, because the project site is in the Arroyo Seco, surrounding canyon slopes could be subject to landslides.
- The project site is outside of the 100-year floodplain as defined by the Federal Insurance Administration; however, according to the Los Angeles County Seismic Safety Element (1990), as well as the City of Pasadena Safety Element of the General Plan (2002), the project site is downslope of a large enclosed body of water, Devil's Gate Reservoir, that could adversely affect the site in the event of earthquake-induced failures or seiches (wave oscillations in an enclosed or semi-enclosed body of water).

3.5.3 Regulatory Framework

As stated in the FEIR, there are no federal regulations that pertain to the project. The *California Building Code (CBC)*, *Alquist-Priolo Earthquake Fault Zoning Act*, *Seismic Hazard Zones Mapping Act*, and *Surface Mining and Reclamation Act* are the state regulations analyzed in the FEIR, and the revised project would not change the project's consistency with these regulations, nor would it change the consistency analysis of the project with SCAG and the City of Pasadena General Plan goals and policies as identified in the FEIR on pages 3.5-12 through 3.5-15.

3.5.4 Methodology

The analysis of potential geology, soils, and seismicity impacts is based upon the City of Pasadena General Plan Safety Element, previous seismic evaluation documentation prepared for the Rose Bowl, and other Pasadena data sources, which were reviewed and summarized to establish existing conditions. In determining the level of significance, the analysis assumes that construction and operation of the proposed project would comply with relevant federal and state laws and regulations, as well as city General Plan policies and ordinances. The baseline for the analysis in this section is existing conditions.

3.5.5 Thresholds of Significance

The FEIR indicated that a significant impact on the environment would occur if a project would:

- Result in substantial soil erosion or the loss of topsoil
- Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction or collapse
- Be located on expansive soil, as defined in Table 18-1-B of the *Uniform Building Code (1994)*, creating substantial risks to life or property
- Expose people or structures to potentially substantial adverse effects, including the risk of loss, injury, or death involving the following:
 - > 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 ground shaking
 - > Seismic-related ground failure, including liquefaction
 - > Landslides

3.5.6 Revised Project Impacts and Mitigation Measures

Threshold	Would the revised project 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?
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Impact 3.5-1 **The revised project would not be located on a geologic unit or soil that is unstable or that would become unstable as a result of the project and result in on- or off-site landslide, lateral spreading, subsidence, liquefaction, or collapse. This is a *less-than-significant* impact.**

According to the City of Pasadena Safety Element of the General Plan (2002) and the state of California Seismic Hazards Zone Map for the Pasadena Quadrangle (1999), the project site is in an area potentially subject to liquefaction caused by groundshaking or seismic-related ground failures. In addition, the canyon slopes surrounding the project site are in areas subject to potential slope instability caused by groundshaking or seismic-related ground failures. Landslide hazards associated with these canyon slopes are classified by the City of Pasadena General Plan Safety Element as “Moderate” because of the steepness of the slopes and proximity to drainage swales. Thus, soil slips and slumps on the steep slopes and in the drainage swales, small debris flows, and small slides or rockfalls could occur in these surrounding canyon slope areas; however, the potential for large, deep-seated landslides in these areas surrounding the project site is considered low. The revised project would not alter the conclusions in the FEIR with regard to this threshold. The impact would remain *less than significant*.

Threshold	Would the revised project be located on expansive soil, as defined in Table 18-1-B of the <i>Uniform Building Code</i> (1994), creating substantial risks to life or property?
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Impact 3.5-2 **The revised project would not be located on expansive soil. Implementation of mitigation measure MM 3.5-21 would ensure this impact would remain *less than significant*.**

The existence of substantial areas of expansive, compressible, and corrosive soils has not been documented in the project area. Slide-prone soils are not common on the project site. Nevertheless, the creation of building pads or access road bases using unsuitable or unstable soils for fill has the potential to create future problems of foundation settlement and road or utility line disruption if the soils are not specifically engineered for stability.

Mitigation measure MM 3.5-21 (~~see below~~) would require site-specific soil suitability analysis and stabilization procedures, as well as design criteria for foundations during the design phase for each site where the existence of unsuitable soil conditions is known or suspected. This mitigation would be included in construction drawings and specifications prior to approval of final project plans and issuance of building permits, and would ensure that the impact of weak soils would be *less than significant*.

MM 3.5-1 Site-specific soil suitability analysis and stabilization procedures, and design criteria for foundations and road bases (described in the current Pasadena Building Code Chapters 16, 18, and A33) shall

be required, as recommended by a California-registered soil engineer, during the design phase for each site where the existence of unsuitable soil conditions is known or suspected. During the design phase, where the existence of unsuitable soil conditions is known or suspected, the Developer's registered soil engineering consultant shall provide documentation to the City that:

- *Site-specific soil suitability and stability analyses have been conducted in the area of the proposed foundations and road bases to establish the design criteria for appropriate foundation or road base type and support*
- *The recommended criteria have been incorporated in the design of foundation*

During grading, the registered soils professional shall be on the site to do the following:

- *Observe areas of potential soil unsuitability or instability*
- *Supervise the implementation of soil remediation or reconstruction programs*
- *Verify final soil conditions prior to setting the foundations*

The registered soils engineering consultant shall prepare an "as built" map/report, to be filed with the City, showing details of the site soils, the location of foundations, retaining walls, sub-drains, clean-outs, etc., and the results of suitability/stability analyses and compaction tests.

Threshold	<p>Would the revised project expose people or structures to potentially substantial adverse effects, including the risk of loss, injury, or death involving the following:</p> <ul style="list-style-type: none"> ■ 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 ground shaking? ■ Seismic-related ground failure, including liquefaction? ■ Landslides?
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Impact 3.5-3 **The revised project could expose people or structures to potentially substantial adverse effects from seismic activity or landslides. This is a potentially significant impact. Compliance with applicable codes and regulations and implementation of mitigation measures MM 3.5-1 and MM 3.5-2 would reduce this impact to *less than significant*.**

As mentioned in the FEIR, the City of Pasadena is subject to varying degrees of hazard from local geologic conditions, such as settlement, landslides, erosion, and seismic ground shaking. The Rose Bowl Stadium project site is located in Seismic Zone 4, which means the site is located in an area of California with the highest potential for seismic activity. However, the construction of new improvements under and outside the existing footprint of the stadium as well as reinforcement of the exterior structure would be beneficial to the future site.

Engineering and building codes in California provide strict regulations with regard to seismic safety. The revised project would, the same as the original project, comply with all appropriate standards and regulations. As stated in the FEIR, groundshaking hazards in the project area are classified by the

California Geological Survey as “High to Moderate” because of the loose density of underlying sediments and the shallow groundwater. Option B would include the widening of up to twenty-eight existing tunnels and construction of an internal concourse within the stadium. As mentioned above, this option could potentially disturb the underlying soil, resulting in possible liquefaction or other potentially hazardous conditions. Mitigation measure MM 3.5-1 would require incorporation of site-specific ground motion criteria, and mitigation measure MM 3.5-2 would require site-specific soil suitability analysis and stabilization procedures for all sites where unsuitable soil conditions are known or suspected. These measures would ensure the safety of people and the structure from seismically induced hazards. The project's proposed seismic work of the stadium involves the construction of new improvements under and outside the existing footprint of the stadium as well as the reinforcement of the exterior structure of the stadium. These proposed rehabilitation measures would provide adequate assurance against structural collapse. Such seismic retrofit procedures would decrease earthquake damage and life-safety hazards to employees and visitors presented by the current stadium structure and would represent a beneficial impact.

Through the implementation of the proposed mitigation measures and compliance with the Building Code, the revised Rose Bowl renovation project would improve the seismic stability of the stadium and result in a *beneficial* impact with regard to seismically induced hazards.

MM 3.5-4 2 *The Applicant shall incorporate site-specific ground motion criteria, as described in the current Pasadena Building Code Chapters 16, 18, and A33, and reviewed by the city's California-registered geotechnical and/or structural engineer, in the design of trenches, slopes, foundations, and structures for the project. Implementation of this measure is required by the Building Code and includes the following provisions:*

- *The minimum seismic-resistant design standards for all proposed facilities shall conform to the California Building Code Seismic Zone 4 Standards*
- *Additional seismic-resistant earthwork and construction design criteria shall be incorporated in the project as necessary, based on the site-specific recommendations of a California Certified Engineering Geologist in cooperation with California-registered geotechnical and structural engineering professionals*
- *During site preparation, the registered geotechnical professional shall be on the site to supervise implementation of the recommended criteria*
- *The California Certified Engineering Geologist consultant shall prepare an “as built” map/report, to be filed with the City, showing details of the site geology, the location and type of seismic-restraint facilities, and documenting the following requirements, as appropriate*
 - > *Engineering analyses shall demonstrate satisfactory performance of compacted fill or natural unconsolidated sediments where either forms part or all of the support for any structures, especially where the possible occurrence of liquefiable soils exists*
 - > *Access roads, foundations, and underground utilities in fill or alluvium shall be designed to accommodate settlement or compaction estimated by the site-specific geotechnical investigations of the geotechnical consultant*

~~MM 3.5-2 Site-specific soil suitability analysis and stabilization procedures, and design criteria for foundations and road bases (described in the current Pasadena Building Code Chapters 16, 18, and A33) shall be required, as recommended by a California registered soil engineer, during the design phase for each site where the existence of unsuitable soil conditions is known or suspected. During the design phase, where the existence of unsuitable soil conditions is known or suspected, the Developer's registered soil engineering consultant shall provide documentation to the City that:~~

~~■ Site-specific soil suitability and stability analyses have been conducted in the area of the proposed foundations and road bases to establish the design criteria for appropriate foundation or road base type and support~~

~~■ The recommended criteria have been incorporated in the design of foundation~~

~~During grading, the registered soils professional shall be on the site to do the following:~~

~~■ Observe areas of potential soil unsuitability or instability~~

~~■ Supervise the implementation of soil remediation or reconstruction programs~~

~~■ Verify final soil conditions prior to setting the foundations~~

~~The registered soils engineering consultant shall prepare an "as built" map/report, to be filed with the City, showing details of the site soils, the location of foundations, retaining walls, sub drains, clean-outs, etc., and the results of suitability/stability analyses and compaction tests.~~

Threshold	Would the revised project result in substantial soil erosion or the loss of topsoil?
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Impact 3.5-4 **The revised project would not result in substantial soil erosion or the loss of topsoil. Implementation of mitigation measure MM 3.5-3 and compliance with all NPDES best management practices and requirements would ensure this impact remains *less than significant*.**

The revised project includes grading and excavation operations. External grading would be less than under the original project because there would be no east-side structure constructed. However, additional excavation would be required for Option B, which includes an internal concourse that would require internal excavation, as well as minimal excavation and grading for the new concession buildings around the perimeter fence line. Because the project would involve grading of an area greater than one acre, it is required to apply for a National Pollutant Discharge Elimination System (NPDES) permit from the Regional Water Quality Control Board. The NPDES permit would be required to cover infrastructure installation. Displacement of soil would be controlled by the City's grading ordinances (CBC Chapters 18 and A33 as adopted in Chapter 14.04.010 of the *Pasadena Building Code*) relating to grading and excavation. Soil erosion after construction would be controlled by implementation of an approved landscape and irrigation plan. The revised project would be required to adhere to all requirements of the NPDES program, and no new impacts would result from the revised project compared to the original project.

The following mitigation measure shall be implemented to ensure this impact remains less than significant.

MM 3.5-3 The following actions shall be taken:

- *To the extent practicable, project site grading shall be scheduled for the dry season (April through September)*
- *In addition, NPDES permit requirements shall be fulfilled prior to issuance of building permits*
- *The Applicant shall submit a soil erosion and sedimentation control plan for the project to the City of Pasadena prior to grading, subject to the following recommendations:*
 - > *The Erosion and Sediment Transport Control Plan (as part of the overall SWPPP) shall be submitted, reviewed, implemented, and inspected as part of the approval process for the grading plans*
 - > *The Plan shall be designed by the Applicant's erosion control consultant, using concepts similar to those formulated by the state of California, as appropriate, based on the specific erosion and sediment transport control needs of the site where grading, excavation, and construction is to occur. Those concepts include some that apply generally to the entire project area and some that would be appropriate only for specific sites. The possible methods are not necessarily limited to the following items:*
 - *Confine grading and activities related to grading (demolition, excavation, construction, preparation and use of equipment and material storage areas and staging areas) to the dry season, whenever possible*
 - *Locate staging areas outside streams and drainage ways*
 - *Keep the lengths and gradients of constructed slopes (cut or fill) as low as possible*
 - *Discharge grading and construction runoff into small drainages at frequent intervals to avoid buildup of large potentially erosive flows*
 - *Prevent runoff from flowing over unprotected slopes*
 - *Keep disturbed areas (areas of grading and related activities) to the minimum necessary for demolition or construction of the project*
 - *Keep runoff away from disturbed areas during grading and related activities*
 - *Stabilize disturbed areas as quickly as possible, either by vegetative or mechanical methods*
 - *Direct runoff over vegetated areas prior to discharge into public storm drainage systems, whenever possible*
 - *Trap sediment before it leaves the site with such techniques as check dams, sediment ponds, or siltation fences*
 - *Use interceptor ditches, drainage swales, or detention basins to prevent storm runoff from transporting sediment into drainage ways and to prevent sediment-laden runoff from leaving any disturbed areas*
 - *Install silt fences to prevent sedimentation in areas adjacent to grading and down gradients into drainage ways. Design fences using the Universal Soil Loss Equation to calculate their proper storage capacity. The contractor shall implement installation by prior to mass grading and other soil disturbing construction activities on site*
 - *The contractor shall be responsible for the removal and disposal of all project-related sedimentation in off-site retention ponds*

- *Use landscaping and grading methods that lower the potential for down-stream sedimentation. Modified drainage patterns, longer flow paths, encouraging infiltration into the ground, and slower stormwater conveyance velocities are examples of effective methods*
- *Control landscaping activities carefully with regard to the application of fertilizers, herbicides, pesticides, or other hazardous substances. Provide proper instruction to all landscaping personnel on the construction team*
- *During the installation of the erosion and sediment transport control structures, the erosion control professional shall be on the site to supervise the implementation of the designs, and the maintenance of the facilities throughout the demolition, grading, and construction period*

Compliance with applicable regulations and implementation of this mitigation measure would ensure that this impact would remain *less than significant*.

3.5.7 Cumulative Impacts

A cumulative impact analysis is only provided for those thresholds that result in a less-than-significant or significant and unavoidable impact. A cumulative impact analysis is not provided for those thresholds where there are no project-related impacts.

The geographic context for cumulative impacts is probable/future development within the City, as this is the development that the City will be in charge of regulating in regards to geologic conditions. Therefore, the cumulative analysis is based on full build-out of the City's general plan and the related projects list contained in Table 2-2 in Chapter 2 (Description of the Revised Project).

Cumulatively, the City of Pasadena is subject to varying degrees of hazard from local geologic conditions, such as settlement, landslides, erosion, and seismic ground shaking. The most recognizable regional impact is earthquake damage caused by large earthquakes on the major active fault systems in the area. The *Pasadena Building Code* is intended to reduce the risk of structural collapse and loss of life in new and retrofitted buildings in the City, but major damage and harm to humans could occur on a broader regional basis because cumulative development may attract residents and businesses to less seismically stable areas. Because new projects constructed on a cumulative basis throughout the region would be built to current, safer seismic standards than were existing older structures, fewer people would be expected to be injured or killed if they were in newer structures, and less property damage would be expected as a result of cumulative development. In addition, the *California Building Code* sets forth strict standards and regulations for all development in the state to minimize the risk from seismic and other geologic hazards. Because of these regulations, the cumulative effect of development would not be significant. The proposed project's impact is less than significant with adherence to applicable standards. The cumulative impact would, therefore, be less than significant.

3.5.8 Conclusion

The geology and soil impacts of the revised project would not result in new or significant impacts or a substantial increase in the severity of previously identified significant impacts. The revised project would result in new development that would improve and reinforce the existing structure and comply with current safety codes. The existing mitigation measures identified above would be implemented, and no new or different mitigation measures are required.

