SECTION 4.6
Geology, Soils, and Seismicity

This section evaluates the potential for construction and operation of the proposed Railyards Specific Plan Update, KP Medical Center, MLS Stadium and Stormwater Outfall to result in adverse impacts associated with geologic and soil constraints, such as settlement and slope instability, seismic hazards, and the loss of mineral resources.

There were no public comments related to seismicity, soils, or geology received in response to the Notice of Preparation.

The analysis in this section is based on project-specific construction and operational features and investigations, geologic and geotechnical maps and reports related to the RSP Area and vicinity, data provided in the City of Sacramento 2035 General Plan and City of Sacramento 2035 General Plan Master Environmental Impact Report; and reports published by the United States Department of Agriculture Natural Resources Conservation Service (NRCS), United States Geological Survey (USGS), National Earthquake Hazards Reduction Program, California Geological Survey (CGS), and Association of Bay Area Governments (ABAG).

Issues Addressed in the 2007 RSP EIR

Section 6.4 of the 2007 RSP EIR, Seismicity, Soils, and Geology, addressed regional geology, site geology, soil types, stratigraphy, seismic conditions, liquefaction, settlement, and lateral spreading. Mineral resources were dismissed from further consideration on page 6-4 of the 2007 Draft EIR. Those same issues are still applicable to RSPU and other proposed projects in the RSP Area, and are discussed in this section.

4.6.1 Environmental Setting

The seismicity, soils, and geology setting is described on pages 6.4-1 through 6.4-9 of the 2007 RSP Draft EIR. The environmental setting related to geology, soils, and seismicity has not materially changed since certification of the 2007 RSP EIR, and the following discussion is based on the 2007 RSP EIR setting, updated as appropriate to reflect current conditions.

Regional Geology

The Sacramento area is in the Great Valley geomorphic province, a relatively flat alluvial plain composed of a deep sequence of sediments in a bedrock trough. The Great Valley is bounded on the west by the California Coast Ranges and on the east by the Sierra Nevada Mountains. Erosion

of the Coast Ranges and the Sierras has produced the sediments deposited in the Great Valley. Deposition in the Great Valley mainly was marine until the beginning of the Pliocene epoch (approximately 5.3 million years ago) when the Great Valley's seas were drained through the Carquinez Strait and were replaced by freshwater rivers and lakes. Today, the Great Valley is drained by the Sacramento River from the north and the San Joaquin River from the south. Geographically and topographically, the Valley has been shaped by the Sacramento River and its tributaries (including the American River). The Sacramento and San Joaquin Rivers meet approximately 35 miles south of Sacramento and discharge through the Sacramento – San Joaquin Delta into San Francisco Bay and the Pacific Ocean.

As discussed in the 2007 RSP EIR, the basement rock underlying the Great Valley, including the RSP Area, is a complex of metamorphosed Paleozoic (at least 245 million years old) and Mesozoic (at least 66 million years old) sediments, volcanics, and granites extending west from the Sierra Nevada Mountains. Overlying the basement rock is a sequence of siltstone, claystone, and sandstone about 60,000 feet thick and predominantly of marine origin. Overlying the sedimentary rock layer is approximately 3,000 feet of fluvial-deposited sediments eroded from the mountains to the north and east. In the City of Sacramento, the two uppermost sequences of these fluvial sediments are named the Victor and Laguna Formations.[1]

The Victor Formation forms the natural ground surface and consists of channel sands and gravels, and overbank deposits of silt and clay extending to as much as 100 feet below the ground surface. The Victor formation overlies the Laguna formation, which is up to 200 to 300 feet thick and consists of silt, clay, and sand with lenses (layers) of gravel.

Site Geology

Topography

The RSP Area is located on alluvial deposits of the Sacramento and American Rivers. Ground surface elevations in the RSP Area are between approximately 13 feet and 40 feet above mean sea level (+13 to +40 feet msl). Large portions of the RSP Area are relatively flat at about 25 to 30 feet msl. There are various temporary depressions and temporary soil stockpiles resulting from remedial action excavations. The interior plazas of the Central Shops area, located at the center of the RSP west of 7th Street, are primarily paved, with surrounding portions covered by remediated soils.

Surface and Subsurface Materials

Prior to human development, the dominant geomorphic feature at the RSP Area was China Lake (also known as Sutter Slough, Sutter Lake, and China Slough), which was filled in 1910. The RSP Area previously contained another lake (Willow Lake) on the north end of the property. The two lakes and associated marshland covered a portion of the RSP Area. Dredging and filling of

[1] California Geological Survey, 1966, *Geology of Northern California*, Bulletin 190, pages 217 through 219.

the RSP Area continued until 1913 when the entire area was filled. Fill material consists of river sand, coarse gravel, cobbles and granite brought from Rocklin, California, as well as discarded railroad equipment and industrial waste. Near the surface and to a depth of 30 to 50 feet are deposits of silt and sand (commonly referred to as the upper sand unit), including fill placed over the area in the past 130 years. Underlying the upper sand unit is a layer of sandy gravel. The top of the gravel unit is between 60 and 80 feet below the ground surface.

Soil Types

The NRCS (formerly the Soil Conservation Service) remapped Sacramento County's soils most recently in 1993.[2] The soil behavior characteristics described by the NRCS include permeability, available water capacity, runoff, erosion, and shrink-swell potential.

- **Permeability -** the ability of a soil to transmit water or air. Permeability is considered in the design and construction of soil drainage systems, where the rate of water movement under saturated conditions affects behavior.

- **Available water capacity -** the quantity of water that the soil is capable of storing for use by plants.

- **Runoff -** the amount of water that runs off the surface of the land.

- **Erosion -** the susceptibility of a soil to water and/or wind erosion.

- **Shrink-swell potential -** the potential for volume change in a soil with a loss or gain in moisture. If the shrink-swell potential is rated moderate to high, damage to buildings, roads, and other structures can occur.

Soil characteristics affect suitability for accommodating uses such as shallow excavations, dwellings with basements, small buildings, roads and streets, and lawns and landscaping. Soil limitations can include slow or very slow permeability, limited ability to support a load, high shrink-swell potential, moderate depth to hardpan, low depth to rock, and frequent flooding. The level of limitation is classified as slight, moderate, or severe.

- **Slight** if soil properties and site features generally are favorable for the indicated use and limitations are minor and easily overcome.

- **Moderate** if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or reduce the limitations.

[2] U.S. Department of Agriculture Natural Resources Conservation Service, Soil Survey of Sacramento County California, Washington DC, April 1993, pages 83, 84, & 109, Sheets 5 & 6.

- **Severe** if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are necessary.

The NRCS mapped two soil units in the RSP Area: Orthents-Urban Land Complex, 0 to 2 percent slopes; and Urban Land, described further below.[3]

- **Orthents-Urban Land Complex, 0 to 2 percent slopes** is a soil unit on low flood plains filled to raise the land surface and reduce the flood hazard. It underlies about 90 percent of the RSP Area. The unit is 50 percent Orthents and 35 percent Urban Land (see below) with the remaining 15 percent consisting of small areas of soil types not associated with fill (unspecified, discontinuous exposures of the underlying alluvial soils).

  Orthents soil is very deep, poorly to well-drained and altered from its original characteristics. It is fill material derived from nearby soil and sediments of mixed origin. The texture, color, and thickness of the layers of fill in this soil vary from one area to another. Permeability is moderately slow to moderately rapid, depending on the grain size and cementation of the material. Available water capacity varies from low to high, also dependent on grain size and cementation. Runoff is slow, and the hazard of water erosion is slight.

  Urban land consists of areas covered by impervious surfaces such as roads, driveways, sidewalks, buildings, and parking lots. Soil material characteristics under the impervious surfaces are similar to those of Orthents soil. Primary development limitations include depth to a seasonally high water table limiting shallow excavations (such as utility trenches and below-grade parking or storage levels) and the hazards associated with compression from loading. Other limitations include inadequate drainage for deep-rooted trees and shrubs. In summer, irrigation is needed to maintain landscaping.

- **Urban Land** represents the remaining 10 percent of the RSP Area. This unit consists of areas covered up to 90 percent by impervious surfaces. The soil material under these impervious surfaces may have been altered during construction, and generally are similar to nearby soil units. In this case, the characteristics probably are similar to those associated with the adjacent Orthents (see above).

Seismic Conditions

California is in the circum-Pacific earthquake zone, which is the result of the process of plate tectonics, and is the most seismically active area in the United States. The theory of plate tectonics describes the earth's crust as at least a dozen large and small rigid slabs (plates) of solid rock that move relative to each other atop the hotter, more mobile rock of the earth's mantle. The

[3] U.S. Department of Agriculture Natural Resources Conservation Service, 2015. Soil Map. Available: http://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx, accessed November 18, 2015.

San Andreas Fault System is an elongated zone of fracturing about 40 miles wide at the junction of two such plates. The Pacific Plate, west of the zone, is moving north relative to the North American Plate, east of the zone. One of the results of this movement is the regional rock deformation that creates the general northwest-southeast trend of valleys and ridges in the Coast Ranges, as well as the shape of the Great Valley. Another result is the seismic activity that is common through California.

No known active faults occur in or adjacent to the City of Sacramento. During the past 150 years, there has been no documented movement on faults mapped in Sacramento County. Nonetheless, the region has experienced numerous instances of groundshaking originating from faults in the San Andreas Fault Zone, west of the County, and the Foothills Fault System, east of the County.[4]

The closest known potentially active fault mapped by the CGS is the Dunnigan Hills fault (possible Holocene activity, defined by the GGS as within the last 11,000 years and by the USGS as within the last 15,000 years), about 19 miles northwest of Sacramento (see **Figure 4.6-1**). The closest branches of the seismically active San Andreas Fault System (historic activity, which is within the last 200 years) are the Green Valley-Concord Faults (45 miles southwest). The main trace of the San Andreas Fault is approximately 80 miles to the southwest. Other major faults within 100 miles of the Sacramento are included in **Table 4.6-1**.

Peak Ground Acceleration

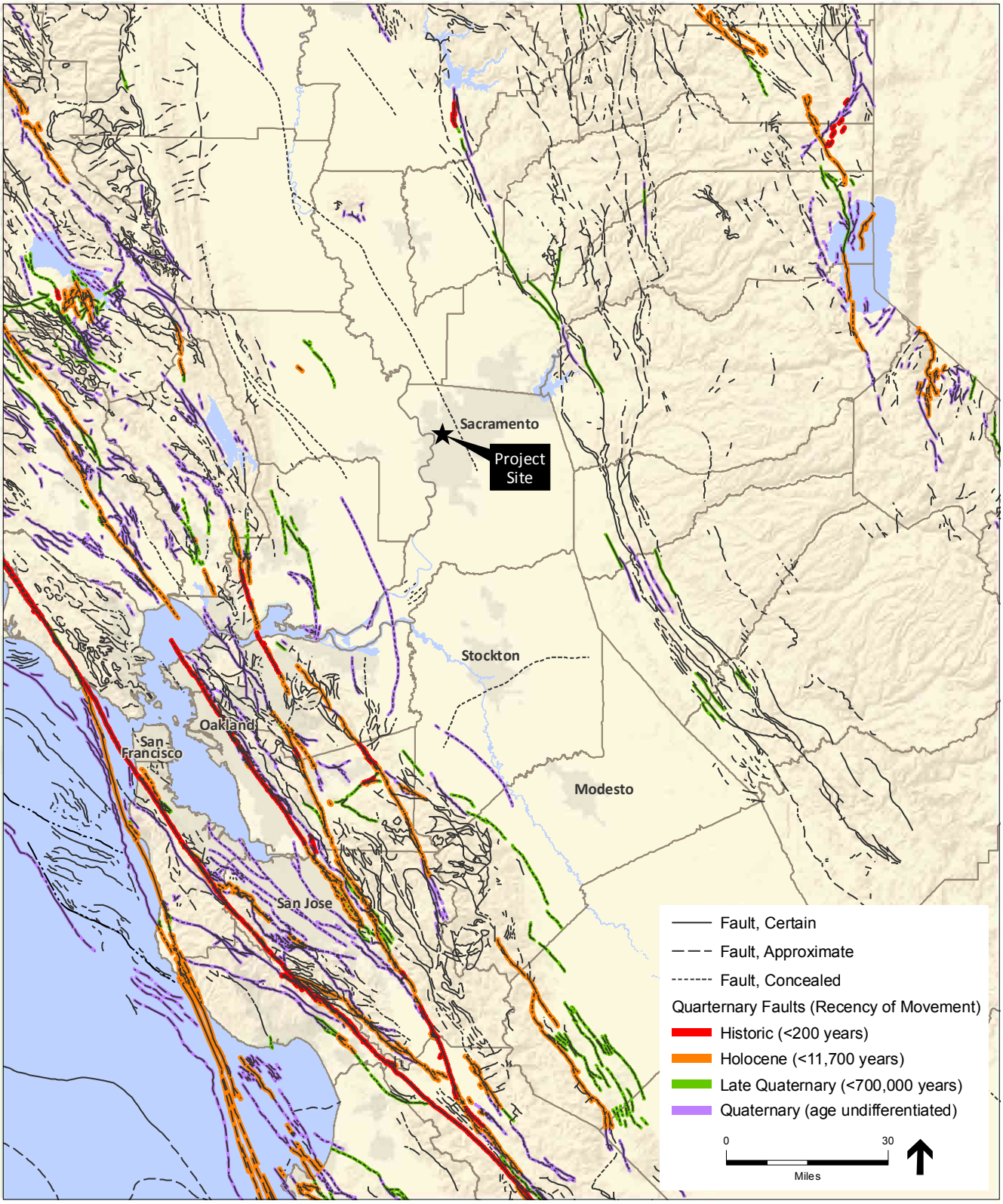
A common measure of ground motion at any particular location during an earthquake is the peak ground acceleration (PGA). The PGA for a given component of motion is the largest value of horizontal acceleration obtained from a seismograph. PGA is expressed as the percentage of the acceleration due to gravity (g), which is approximately 980 centimeters per second squared. In terms of automobile acceleration, one "g" of acceleration is equivalent to the motion of a car traveling 328 feet from rest in 4.5 seconds. For comparison purposes, the maximum PGA value recorded during the Loma Prieta earthquake in the vicinity of the epicenter, near Santa Cruz, was 0.64 g. Unlike measures of magnitude, which provide a single measure of earthquake energy, PGA varies from place to place and is dependent on the distance from the epicenter and the character of the underlying geology (e.g., hard bedrock, soft sediments, or artificial fills). During the maximum predicted earthquake, the anticipated PGA within the RSP Area is 0.198g.[5]

Modified Mercalli Intensity Scale

The Modified Mercalli Intensity Scale assigns an intensity value based on the observed effects of groundshaking produced by an earthquake. Unlike measures of earthquake magnitude and PGA, the Modified Mercalli Intensity Scale is qualitative in nature in that it is based on actual observed effects rather than measured values. Similar to PGA, Modified Mercalli values for an earthquake

4 City of Sacramento, 2015. *City of Sacramento 2035 General Plan Master Environmental Impact Report*. Certified March 3, 2015. Appendix C, p. 7-2.

5 California Department of Conservation, 2008. Ground Motion Interpolator. Available: http://www.quake.ca.gov/gmaps/PSHA/psha_interpolator.html. Accessed November 23, 2015.



SOURCE: ESRI, 2012; CGS, 2006; ESA, 2015

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Figure 4.6-1
Regional Faults

TABLE 4.6-1.
ACTIVE FAULTS WITHIN 100 MILES OF THE RSP AREA

Fault	Distance from Sacramento (miles)	Age[1]	Slip Rate (millimeters/year)[1]	Characteristic Earthquake (Moment Magnitude)[2]
West Valley Faults				
Dunnigan Hills	19	<15,000	Unknown	6.6
Foothill Fault System				
Bear Mountain	22	Unknown	Unknown	6.0
New Melones	40	Unknown	Unknown	6.0
San Andreas Fault System				
Vaca	28	<130,000	Unknown	6.1[2]
Greenville	43	<1,600,000	1.0 – 5.0	6.6
Concord	45	<150	1.0 – 5.0	6.2
Green Valley	42	<15,000	1.0 – 5.0	6.2
Healdsburg/Rogers Creek	56	<15,000	>5.0	7.1
Hayward	66	<150	>5.0	6.9 - 7.1
Calaveras	66	<15,000	>5.0	7.5
San Andreas	80	<150	>5.0	7.9

SOURCES:

1. U.S. Geological Survey, 2006. Quaternary fault and fold database for the United States, Available: http//earthquakes.usgs.gov/regional/qfaults/. Accessed November 20, 2015.
2. Wesnouski, S.G., 1986, Earthquakes, Quaternary Faults, and Seismic Hazard in California, Journal of Geophysical Research, Vol. 91, No. B12, TableA1.
3. California Geological Survey, 2010. 2010 Fault Activity Map of California. Available: http://www.quake.ca.gov/gmaps/FAM/faultactivitymap.html#. Accessed November 20, 2015.

at any one place can vary depending on the earthquake's magnitude, the distance from its epicenter, the focus of its energy, and the type of geologic material that underlies the location. The Modified Mercalli values for intensity range from I (earthquake not felt) to XII (damage nearly total), and intensities ranging from IV to X can cause moderate to significant structural damage. Because the Modified Mercalli scale is a measure of groundshaking effects, intensity values can be correlated to a range of average PGA values, as shown in **Table 4.6-2**.

A characteristic earthquake[6] on the entire San Andreas Fault (Mw 7.9 - Moment Magnitude)[7] is predicted to be the largest that would be felt in the RSP Area. Because of the distance between the San Andreas Fault and the RSP Area, the felt intensity would be about MMI VII. A similar intensity would be caused by a characteristic earthquake on the Dunnigan Hills fault (M_w 6.6)

6 Characteristic earthquakes are repeat earthquakes that have the same faulting mechanism, magnitude, rupture length, location, and, in some cases, the same epicenter and direction of rupture propagation as earlier shocks.

7 A logarithmic scale used by modern seismologists to measure the total amount of energy released by an earthquake. The formula used for the Moment Magnitude (MW) scale incorporates parameters associated with the rock types at the seismic source and the area of the fault surface involved in the earthquake to provide a more accurate measure of energy release than the Richter Magnitude Scale.

TABLE 4.6-2.
MODIFIED MERCALLI INTENSITY SCALE

Intensity Value	Intensity Description	Average Peak Ground Acceleration[a]
I	Not felt. Marginal and long period effects of large earthquakes.	< 0.0017 g
II	Felt by persons at rest, on upper floors, or favorably placed.	0.0017–0.014 g
III	Felt indoors. Hanging objects swing. Vibration like passing of light trucks. Duration estimated. May not be recognized as an earthquake.	0.0017–0.014 g
IV	Hanging objects swing. Vibration like passing of heavy trucks; or sensation of a jolt like a heavy ball striking the walls. Standing motor cars rock. Windows, dishes, doors rattle. Glasses clink. Crockery clashes. In the upper range of IV, wooden walls and frame creak.	0.014–0.039g
V (Light)	Felt outdoors. Sleepers wakened. Liquids disturbed, some spilled. Small unstable objects displaced or upset. Doors swing, close, open. Shutters, pictures move. Pendulum clocks stop, start, change rate.	0.035–0.092 g
VI (Moderate)	Felt by all. Many frightened and run outdoors. Persons walk unsteadily. Windows, dishes, glassware broken. Knickknacks, books, etc., off shelves. Pictures off walls. Furniture moved or overturned. Weak plaster, adobe buildings, and some poorly built unreinforced masonry buildings cracked. Small bells ring (church, school). Trees, bushes shaken (visibly, or heard to rustle).	0.092–0.18 g
VII (Strong)	Difficult to stand. Noticed by drivers of motor cars. Hanging objects quiver. Furniture broken. Damage to some poorly built unreinforced masonry buildings. Weak chimneys broken at roof line. Fall of plaster, loose bricks, stones, tiles, cornices (also unbraced parapets and architectural ornaments). Some cracks even in better built masonry buildings if not reinforced. Waves on ponds; water turbid with mud. Small slides and caving in along sand or gravel banks. Large bells ring. Concrete irrigation ditches damaged.	0.18–0.34 g
VIII (Very Strong)	Critical or extensive damage to some buildings, but well-designed buildings are largely undamaged. Steering of motor cars affected. Damage to unreinforced masonry buildings, including partial collapse. There is no damage to well-designed reinforced masonry buildings. Fall of stucco and some masonry walls. Twisting, fall of chimneys, factory stacks, monuments, towers, elevated tanks. Frame houses moved on foundations if not bolted down; loose panel walls thrown out. Decayed piling broken off. Branches broken from trees. Changes in flow or temperature of springs and wells. Cracks in wet ground and on steep slopes.	0.34–0.65 g
IX (Violent)	General panic. Damage to masonry buildings ranges from collapse to serious damage unless modern design. Wood frame structures, if not bolted, shifted off foundations. Frames racked. Serious damage to reservoirs. Underground pipes broken. Conspicuous cracks in ground. In alluvial areas sand and mud ejected, earthquake fountains, sand craters.	0.65–1.24 g
X (Very Violent)	Most masonry and frame structures destroyed with their foundations. Some well-built wooden structures and bridges destroyed. Serious damage to dams, dikes, embankments. Large landslides. Water thrown on banks of canals, rivers, lakes, etc. Sand and mud shifted horizontally on beaches and flat land. Rails bent slightly.	> 1.24 g
XI (Very Violent)	Rails bent greatly. Underground pipelines completely out of service.	> 1.24 g
XII (Very Violent)	Damage nearly total. Large rock masses displaced. Lines of sight and level distorted. Objects thrown into the air.	> 1.24 g

NOTES:

[a] Value is expressed as a fraction of the acceleration due to gravity (g). Gravity (g) is 9.8 meters per second squared. 1.0 g of acceleration is a rate of increase in speed equivalent to a car traveling 328 feet from rest in 4.5 seconds.

SOURCES:

1. Wald et al., 1999. Relationships between Peak Ground Acceleration, Peak Ground Velocity, and Modified Mercalli Intensity in California. Earthquake Spectra 15(3), 557-564.
2. Association of Bay Area Governments, 2003. Adapted from *Table - Modified Mercalli Intensity Scale* (MMI), Available: http://www.abag.ca.gov/bayarea/eqmaps/doc/mmi_plain.html. Accessed February 24, 2014.

because it is much closer to the RSP Area. The approximate relationships among earthquake magnitude (Moment Magnitude Scale), intensity (Modified Mercalli Intensity Scale), and peak ground acceleration (percent of gravity) are shown in **Table 4.6-2**.

Liquefaction

Liquefaction is a term that describes the loss of soil strength that can be caused by seismic forces acting on water-saturated, granular soil, leading to a "quicksand" condition resulting in various types of ground failure. Estimating the potential for liquefaction takes into account soil types, soil density, and groundwater table, and the duration and intensity of groundshaking. Liquefaction is most likely to occur within 50 feet below the ground surface in saturated uniformly fine-grained poorly consolidated sediments. The RSP Area is underlain with natural levee and channel deposits (alluvium) containing silt and sand on which fill of a variety of materials has been placed. The water table fluctuates with the seasons corresponding mainly to the Sacramento River stage elevations and duration. Water table elevations can be as low as 2 feet and as high as 18 feet msl, or more depending on river conditions. Under certain conditions, some of the natural and artificial deposits could be subject to liquefaction during seismic events. The RSP Area is not located in a currently established State of California Seismic Hazard Zone for liquefaction.

Settlement

Seismic settlement is the compaction of soil materials caused by groundshaking or the extraction of underground fluids (water, oil, gas). Settlement can be caused by liquefaction or densification of silts and loose sands (such as those that underlie the RSP Area, especially in the vicinity of the historic China Lake and Willow Lake) as a result of seismic loading. Such settlement may range from a few inches to several feet, and be controlled in part by bedrock surfaces (which prevent settlement) and old lake, slough, swamp, or stream beds which settle readily. Static settlement can occur through increased loading of the surface or subsurface materials, such as that imposed by foundations for structures. Dewatering for excavation and foundation construction can cause settlement of the drying subsurface materials if the water formed part of the support for the surface soils. Landfill areas undergo settlement primarily through decomposition of organic landfill material that occurs over a long period of time without additional loads. In general, settlement of organic landfill is an order of magnitude greater than settlement of most natural soil.

Lateral Spreading

Lateral spreading is the horizontal movement of soil toward an open face such as a stream bank, the open side of a fill embankment, the side of a levee, or the wall of an excavation. It can be caused by seismic vibration, runoff or irrigation saturation, or by the removal of side-support such as occurs in deep excavations. Artificial fill areas that have not been properly engineered or that

have steep, unstable banks, or unsupported walls are the most likely to be affected. Lateral spreading is likely to occur in areas of high groundwater.[8]

Mineral Resources

Minerals are naturally occurring chemical elements or compounds, or groups of elements or compounds that were not formed by organisms. Naturally occurring concentrations of minerals in the earth's crust are known as mineral deposits. Mineral resources are mineral deposits from which the economic extraction of a commodity (such as gold or copper) is currently potentially feasible. In addition to metallic minerals, materials used for construction (e.g., sand and aggregate), industrial and chemical processes (e.g., salt), and fuel (e.g., crude oil) are considered mineral resources in California.

In accordance with California's Surface Mining and Reclamation Act of 1975 (SMARA), the state geologist, through the California Department of Conservation, California Geological Survey (CGS; formerly known as the California Division of Mines and Geology [CDMG]), is responsible for identifying and mapping the non-fuel mineral resources of the state. Economically significant mineral deposits are classified based on the known and inferred mineral resource potential of the land using the California Mineral Land Classification System, which includes the following four mineral resource zones (MRZs).

- MRZ 1. Areas where adequate information indicates that no significant mineral deposits are present, or where it is judged that little likelihood exists for their presence.
- MRZ 2. Areas where adequate information indicates that significant mineral deposits are present, or where it is judged that a high likelihood exists for their presence.
- MRZ 3. Areas containing mineral deposits, the significance of which cannot be evaluated.
- MRZ 4. Areas where available information is inadequate for assignment to any other zone.

Downtown Sacramento, including the RSP Area is classified as MRZ-1.[9] These sites are not underlain by significant mineral resources.

According to the Department of Conservation, Division of Oil, Gas, and Geothermal Resources (DOGGR), there are no producing, idle, or abandoned oil or gas wells within the RSP Area.[10] Furthermore, there are no aggregate quarries located within the RSU Area.[11]

8 City of Sacramento, 2005, General Plan Update Technical Background Report Chapter 7, Public Health and Safety, pages 7.1-5 through 7.1-7.

9 Dupras, D., 1999. Mineral Land Classification Map of PCC-Grade Aggregate Resources in Sacramento County, Plate 3, 1999.

10 California Division of Oil, Gas, and Geothermal Resources, 2016. Well Finder results for the Sacramento Area. Available: http://www.conservation.ca.gov/dog/Pages/Wellfinder.aspx, accessed February 8, 2016.

4.6.2 Regulatory Setting

The 2007 RSP Draft EIR summarizes applicable regulations on pages 6.4-9 through 6.4-13. The following discussion updates the information provided in the 2007 RSP Draft EIR.

Federal

Earthquake Hazards Reduction Act

Established by the U.S. Congress when it passed the Earthquake Hazards Reduction Act of 1977, the purpose of the National Earthquake Hazards Reduction Program (NEHRP) is 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." The principle behind NEHRP is that earthquake-related losses can be reduced through improved design and construction methods and practices, land use controls and redevelopment, prediction techniques and early-warning systems, coordinated emergency preparedness plans, and public education and involvement programs. There are four federal agencies that can contribute to earthquake mitigation efforts; they have been designated as NEHRP agencies and are as follows: the Federal Emergency Management Agency, the National Institute of Standards and Technology, the National Science Foundation, and the USGS.[12]

Occupational Safety and Health Administration Regulations

Excavation and trenching are among the most hazardous construction activities. The Occupational Safety and Health Administration's Excavation and Trenching standard, Title 29 of the Code of Federal Regulations, Part 1926.650, covers requirements for excavation and trenching operations. The Occupational Safety and Health Administration requires that all excavations in which employees could potentially be exposed to cave-ins be protected by sloping or benching the sides of the excavation, supporting the sides of the excavation, or placing a shield between the side of the excavation and the work area.

State

Alquist Priolo Earthquake Fault Zoning Act

The Alquist Priolo Earthquake Fault Zoning Act became law in California in 1972 to mitigate the hazard to structures for human occupancy of surface faulting. The purpose of the Alquist-Priolo Act is to regulate development on or near active fault traces to reduce the hazard of fault rupture and to prohibit the location of most structures for human occupancy[13] across these traces. Cities and counties must regulate certain development projects that are proposed to occur within an

11 U.S. Geological Survey, 2016. Mineral Resources Data System, 2016. Mineral Resources On-Line Spatial Data. Available: http://mrdata.usgs.gov/general/map.html. Accessed February 8, 2016.

12 National Earthquake Hazards Reduction Program, 2009. *About Us: Background and History*. Last updated March 6, 2009. Available: http://www.nehrp.gov/about/history.htm; accessed November 13, 2015.

13 Title 14 of the California Code of Regulations (CCR), §3601(e), defines buildings intended for human occupancy as those that would be inhabited for more than 2,000 hours per year.

Alquist-Priolo Zone, which typically includes withholding permits until geologic investigations demonstrate that development sites are not threatened by future surface displacement. Surface fault rupture is not necessarily restricted within an Alquist-Priolo Zone. Each earthquake fault zone extends approximately 200 to 500 feet on either side of the mapped fault trace, because many active faults are complex and consist of more than one branch. There is the potential for ground surface rupture along any of the branches. There are no Alquist-Priolo Zones within the RSP Area.

Seismic Hazards Mapping Act

The Seismic Hazards Mapping Act of 1990 (Public Resources Code, Chapter 7.8, Section 2690-2699.6) was adopted to reduce the threat to public safety and to minimize the loss of life and property by identifying and mitigating ground failure caused by strong earthquakes, namely liquefaction and slope failure. The Seismic Hazards Mapping Act requires the State Geologist to delineate seismic hazard zones, also known as "zones of required investigation," where regional (that is, not site-specific) information suggests that the probability of a hazard requiring mitigation is adequate to warrant a site-specific investigation. The RSP Area is not located within a zone of required investigation.

The fact that a site lies outside a zone of required investigation does not necessarily mean that the site is free from seismic or other geologic hazards. Where a project—defined by the act as any structures for human occupancy or any subdivision of land that contemplates the eventual construction of structures for human occupancy—is within a zone of required investigation, lead agencies must apply minimum criteria for project approval. The most basic criteria for project approval are that the owner/developer adequately demonstrates seismic hazards at the site have been evaluated in a geotechnical investigation, that appropriate mitigation measures have been proposed, and that the lead agency has independently reviewed the adequacy of the hazard evaluation and proposed mitigation measures. Both the geotechnical report and the independent review must be performed by a certified engineering geologist or registered civil engineer. These criteria, along with seismic hazard evaluation and mitigation standards, are outlined in CGS Special Publication 117A, revised and re-adopted in September of 2008 by the State Mining and Geology Board.[14]

Essential Services Buildings Seismic Safety Act

Chapter 2 Section 16000 of the California Health and Safety Code (CHSC) is known as the Essential Services Buildings Seismic Safety Act of 1986. The intent of the Essential Services Buildings Seismic Safety Act is to ensure that essential services buildings, those buildings capable of providing essential services to the public after a disaster, are designed and constructed to minimize fire hazards and to resist, insofar as practical, the forces generated by earthquakes, gravity, and winds. It is also the intent that non-structural components vital to the operation of

[14] California Geological Survey, 2008. *Guidelines for Evaluating and Mitigating Seismic Hazards in California*, Special Publication 117A, October 7, 2008.

essential services buildings are also be able to resist, insofar as practical, the forces generated by earthquakes, gravity, fire and winds.

Pursuant to Section 16007 of the HCSC, "'[e]ssential services building' means any building, including buildings designed and constructed, for public agencies used, or designed to be used, or any building a portion of which is used or designed to be used, as a fire station, police station, emergency operations center, California Highway Patrol office, sheriff's office, or emergency communication dispatch center." Based on this definition, the proposed fire station and police station to be located within the RSP Area would be considered essential service buildings pursuant to the Essential Services Buildings Seismic Safety Act.

1983 Alfred E. Alquist Hospital Seismic Safety Act (Alquist Act), Senate Bill 1953 (SB 1953) and OSHPD

All California acute care medical center properties fall under the jurisdiction of the Alquist Act, as amended in 1994 by SB 1953. The Alquist Act requires medical facilities to comply with seismic safety building standards as defined by the California Office of Statewide Health Planning and Development (OSHPD) within specific time frames. The Alquist Act would apply to the hospital building which would be part of the proposed KP Medical Center. OSHPD is a department of the California Health and Human Services Agency and is responsible for carrying out the provisions of the Alquist Act and serves as the building authority for acute care facilities in lieu of local jurisdictions. The Hospital Building Safety Board further advises the director of OSHPD on the administration of the Alquist Act and acts as a board of appeals for hospital seismic safety issues.[15]

The Alquist Act was adopted in part so that after a major earthquake or disaster, hospital facilities can continue to provide care to their current occupants as well as any new patients that might arrive after the event. During and after the 1994 Northridge earthquake, hospitals that were compliant with the Act sustained minimal structural damage and continued to function. Hospitals that were not compliant, sustained major damage and had to be abandoned.[16]

Nonstructural Performance Category (NPC) and Structural Performance Category (SPC) ratings are assigned to existing hospitals. In general, low ratings (e.g., SPC-1) mean hospital building systems are not prepared for a disaster, and high ratings (e.g., SPC-4) mean hospital building systems are prepared for a disaster. If the building is determined not to be in compliance with the Alquist Act based on the following NPC and SPC ratings, seismic retrofit regulations (Division III-R) must be applied to guide the building's retrofit, thus increasing the NPC and SPC rating of

[15] California Office of Statewide Health Planning and Development, 2016. Available: http://www.oshpd.ca.gov/Boards/HBSB/.

[16] California Office of Statewide Health Planning and Development, 2014. Seismic Compliance Program Overview. Available: http://www.oshpd.ca.gov/fdd/seismic_compliance/SB1953/SB1953Overview.pdf. Accessed February 8, 2016.

the building.[17] New construction that is designed and constructed to current seismic and building code standards, such as that for the proposed KP Medical Center hospital building, would be exempt from NPC and SPC ratings although in full compliance with the Alquist Act, because the building would be designed and constructed in compliance with all necessary standards.

California Building Code

The California Building Code (CBC), codified in Title 24 of the California Code of Regulations, Part 2, was promulgated to safeguard the public health, safety, and general welfare by establishing minimum standards related to structural strength, egress facilities, and general building stability. The purpose of the CBC is to regulate and control the design, construction, quality of materials, use/occupancy, location, and maintenance of all building and structures within its jurisdiction. Title 24 is administered by the California Building Standards Commission, which, by law, is responsible for coordinating all building standards. Under State law, all building standards must be centralized in Title 24 or they are not enforceable. The provisions of the CBC apply to the construction, alteration, movement, replacement, and demolition of every building or structure or any appurtenances connected or attached to such buildings or structures throughout California.

Chapter 16 of the CBC covers structural design. The earthquake design requirements of the CBC take into account the occupancy category of the structure, site class, soil classifications, and various seismic coefficients, which are used to determine a seismic design category for a project. The seismic design category is a classification system that combines the occupancy categories with the level of expected ground motions at the site and ranges from seismic design category A (very small seismic vulnerability) to seismic design category E/F (very high seismic vulnerability and near a major fault). Design specifications are then determined according to the seismic design category.

Chapter 18 of the CBC covers the requirements of geotechnical investigations (Section 1803), including excavation, grading, and fills (Section 1804). Chapter 18 also describes analysis of expansive soils and the determination of the depth to groundwater table. Appendix G of the *State CEQA Guidelines* states that expansive soil is to be characterized as defined in Table 18-1-B of the 1994 Uniform Building Code. However, that table is no longer used and the current CBC definition is as follows:

> **1803.5.3 Expansive Soil.** In areas likely to have expansive soil, the building official shall require soil tests to determine where such soils do exist. Soils meeting all four of the following provisions shall be considered expansive, except that tests to show compliance with Items 1, 2 and 3 shall not be required if the test prescribed in Item 4 is conducted:

[17] Alquist Seismic Safety Act, amended by SB1953, and codified in the 2007 California Building Standards Administrative Code, Title 24, Part 1, Chapter 6.

1. Plasticity index of 15 or greater, determined in accordance with ASTM D 4318
2. More than 10 percent of the soil particles pass a No. 200 sieve (75 micrometers), determined in accordance with ASTM D 422
3. More than 10 percent of the soil particles are less than 5 micrometers in size, determined in accordance with ASTM D 422
4. Expansion index greater than 20, determined in accordance with ASTM D 4829

Under OSHPD requirements, the construction of new hospitals must comply with the California Building Code, as amended for hospitals. Institutional Group I Occupancy, as defined in Chapter 3 of the California Building Code to include hospitals with non-ambulatory patients, includes, among others, the use of a building or structure, or a portion thereof, in which people are cared for or live in a supervised environment, having physical limitations because of health or age are harbored for medical treatment or other care or treatment, or in which people are detained for penal or correctional purposes, or in which the liberty of the occupants is restricted. Non-OSHPD structures (i.e., structures that do not house OSHPD-regulated hospital functions) are subject to the 2011 California Building Code and currently applicable building codes, State and federal accessibility requirements, and local regulations.

California Occupational Safety and Health Administration Regulations

Occupational safety standards exist in federal and state laws to minimize worker safety risks from both physical and chemical hazards in the work place. In California, the California Division of Occupational Safety and Health (Cal/OSHA) and the federal OSHA are the agencies responsible for ensuring worker safety in the workplace.

The OSHA Excavation and Trenching standard (29 CFR 1926.650), described above in Federal Regulations, covers requirements for excavation and trenching operations, which are among the most hazardous construction activities. OSHA requires that all excavations in which employees could potentially be exposed to cave-ins be protected by sloping or benching the sides of the excavation, supporting the sides of the excavation, or placing a shield between the side of the excavation and the work area. Cal/OSHA is the implementing agency for both state and federal OSHA standards.

California Excavation Notification Requirements

California Code of Regulations Section 4216 requires that construction contractors report a project that involves excavation 48-hours prior to breaking ground. This program allows owners of buried installations to identify and mark the location of its facilities before any nearby excavation projects commence. Adherence to this law by project contractors reduces the potential of inadvertent pipeline or utility damage or leaks.

Road Design Standards

To safeguard life and property, the State of California has established construction standards and design criteria for roadways. Construction standards and seismic design criteria are contained in such regulatory codes as Caltrans' *Seismic Design Criteria Version 1.4* (June 2006), Highway Design Manual, Sections 110.6, *Earthquake Consideration* (September 2014), or similar codes adopted by a city for roadway corridor protection. These criteria deal with pavement and subsurface utility design (flexible joints and couplings, overpass construction, etc.), slope stability (especially slumping, settling, and liquefaction in fills), alignment modification to reduce exposure to fault rupture or intense groundshaking, and ground failures such as liquefaction. Prior to construction, geotechnical studies are required to be undertaken; recommended seismic-protection measures are required to be accommodated in the project design. The recommendations provide the required protection from the anticipated effects of seismic groundshaking or other soil and geotechnical conditions. Adherence to these standards of protection are mandatory and reduce the risk of injury or death from earthquakes or other geological or soil movement to the maximum extent technically practicable.

California Department of Conservation

The California Department of Conservation (CDC) is the primary agency charged with mineral resource protection in California. Several divisions within the CDC (the CGS, the Office of Mine Reclamation, the Division of Land Resource Protection, and the Division of Oil, Gas, and Geothermal Resources) are responsible for managing the development, utilization, and conservation of mineral resources, and the reclamation of mined lands.

Surface Mining and Reclamation Act of 1975

The SMARA (California Public Resources Code, Chapter 9, Division 2, Section 2710 et seq.) requires the State Mining and Geology Board (SMGB) to adopt state policies for the reclamation of mined lands and the conservation of mineral resources. These policies are found in Title 24 of the California Code of Regulations, Division 2, Chapter 8, Subchapter 1.

In accordance with SMARA, the State of California established the Mineral Land Classification System to help identify and protect mineral resources in areas that are subject to urban expansion or other irreversible land uses that would preclude mineral extraction. Protected mineral resources include construction materials, industrial and chemical mineral materials, metallic and rare minerals, and non-fluid mineral fuels.

Local

City of Sacramento 2035 General Plan

The following goals and policies from the 2035 General Plan are relevant to Seismicity, Soils, and Geology.

Goal EC 1.1 Hazards Risk Reduction. Protect lives and property from seismic and geologic hazards and adverse soil conditions.

Policies

EC 1.1.1 **Review Standards.** The City shall regularly review and enforce all seismic and geologic safety standards and require the use of best management practices (BMPs) in site design and building construction methods.

EC 1.1.2 **Geotechnical Investigation.** The City shall require geotechnical investigations to determine the potential for ground rupture, ground-shaking, and liquefaction due to seismic events, as well as expansive soils and subsidence problems on sites where these hazards are potentially present.

ER 1.1.7 **Construction Site Impacts**. The City shall minimize disturbances of natural water bodies and natural drainage systems caused by development, implement measures to protect areas from erosion and sediment loss, and continue to require construction contractors to comply with the City's erosion and sediment control ordinance and stormwater management and discharge control ordinance.

As discussed below and in Impacts 4.6-1 through 4.6-6, development consistent with the proposed RSPU, including the proposed KP Medical Center, MLS Stadium, and Stormwater Outfall, would be required to comply with City seismic and soils-related standards. In addition, the City requires that a project-specific geotechnical investigation be submitted prior to development. The hospital building within the proposed KP Medical Center would further be required to comply with the requirements of the California OSHPD. Subject to such oversight, the proposed RSPU, KP Medical Center, MLS Stadium, and Stormwater Outfall would be consistent with the General Plan goals and policies. Further, all development within the DRV-owned portions of the RSP Area would be required to comply with the Soil and Groundwater Management Plan, as discussed in detail in Chapter 4.7, Hazards and Hazardous Materials.

Sacramento City Code

The City of Sacramento has adopted the updated CBC, with amendments, per Chapter 15.20 of the Municipal Code. This chapter mandates compliance with the CBC and all of its amendments adopted by the code. All new construction and modifications to existing structures within the city are subject to the requirements of the code.

The City of Sacramento has a grading ordinance (Chapter 15.88 of the Sacramento Municipal Code) that regulates grading on property within the City limits to safeguard life, limb, health, property, and the public welfare; to avoid pollution of watercourses with nutrients, sediments, or other materials generated or caused by surface water runoff; to comply with the City's national pollution discharge elimination system issued by the California regional water quality control board; and to ensure that the intended use of a graded site within the City limits is consistent with the 2035 General Plan, any adopted specific plans, and all applicable City ordinances and regulations. The grading ordinance is intended to control all aspects of grading operations within the City.

Department of Utilities

The City of Sacramento Department of Utilities (DOU) maintains polices, guidelines, and regulations regarding grading, erosion control, stormwater drainage design, inspection, and permitting. DOU is responsible for issuing and oversight of several types of development permits, including grading and building permits.[18]

Site-Specific Geotechnical Investigation

Prior to the commencement of any earthwork at a construction site in the RSP Area, a geotechnical investigation must be prepared for that site, as required by the CBC and City codes. The geotechnical investigation must include soil borings to collect samples and laboratory testing to determine the appropriate design parameters for use for structural fill, roadbed fill, and landscaping fill, along with the fill placement requirements. The various soils may be tested for corrosivity to allow for proper infrastructure and foundation design.

A grading permit must be approved prior to grading activities. An applicant must submit, for City review and approval, Improvement and/or Grading Plans, along with a site-specific erosion and sedimentation control plan.

4.6.3 Analysis, Impacts, and Mitigation

Significance Criteria

Appendix G of the CEQA Guidelines identifies potential significance criteria for the evaluation of impacts related to geology, soils, and seismicity. Those same criteria, with some minor modifications, are provided below. The criteria listed below, with the exception of Mineral Resources, are the same as those used in the 2007 RSP EIR. For the purposes of this SEIR, implementation of the proposed RSPU, KP Medical Center, MLS Stadium, or Stormwater Outfall would have a significant impact related to geology, soils, and seismicity if it would:

- Expose people or structures to potential substantial adverse effects, including 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 ground-shaking;
    - Seismic-related ground failure, including liquefaction and lateral spreading;
    - Seismically-induced landslides;

[18] City of Sacramento, 2015. *City of Sacramento 2035 General Plan Master Environmental Impact Report*. Certified March 3, 2015.. Appendix C, p. 7-13.

- Result in substantial soil erosion capable of causing significant property damage or the loss of useable 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 onsite or offsite landslides, subsidence, soil failure or soil compaction;

- Be located on problematic soils such as those characterized as expansive, as defined in 24 CCR 1803.5.3 of the California Building Code (2013), or corrosive; or

- Be located on soils that are incapable of adequately supporting alternative methods of wastewater disposal where sewers are not available for the disposal of wastewater.

For the purposes of this SEIR, the proposed RSPU, KP Medical Center, MLS Stadium, or Stormwater Outfall would have a significant impact on mineral resources if it would:

- Result in the loss of availability of a known mineral resource that would be of value to the region and residents of the state; or

- Result in the loss of availability of a locally-important mineral resource recovery site delineated on a local general plan, specific plan or other land use plan.

Methodology and Assumptions

This section assesses the potential for the proposed RSPU, KP Medical Center, MLS Stadium and Stormwater Outfall to adversely change geologic and soil conditions or expose structures or people to unstable geologic conditions during project activities, using existing site conditions as a baseline for comparison. The potential for damage to proposed structures or increased risk of injury due to geologic hazards is analyzed using available data from site-specific investigations, and existing publications and maps completed by state and federal agencies, such as the USGS, and CGS. The severity and significance of geology and soils impacts are analyzed in the context of existing geologic and seismic hazard regulations and policies. The methods employed in this analysis are similar to those used in the 2007 RSP EIR.

Since certification of the 2007 RSP EIR, the California Supreme Court recently found that "agencies subject to CEQA generally are not required to analyze the impact of existing environmental conditions on a project's future users or residents." In *California Building Industry Association v. Bay Area Air Quality Management District* (2015) __Cal.4th__, 2015 WL 9166120 (Case No. S213478), the Supreme Court explained that an agency is only required to analyze the potential impact of such hazards on future residents if the project would exacerbate those existing environmental hazards or conditions. Ordinary CEQA analysis is therefore concerned with a project's impact on the environment, rather than with the environment's impact on a project and its users or residents. Thus, with respect to geologic and seismic hazards, the City is not required to consider the effects of bringing a new population into an area where such

hazards exist, because the project itself would not increase or otherwise affect the geologic conditions that create those risks. Nonetheless, in order to provide a complete picture of how the effects of the proposed RSPU compare to the effects that were disclosed in the 2007 RSP EIR, these impacts are addressed below (see specifically Impacts 4.6-1 and 4.6-4).

Issues Not Further Discussed in Impacts Analysis

Impact 6.4-1 of the 2007 RSP EIR found that the 2007 RSP would have no impact regarding the exposure of people of structures to rupture of a known earthquake fault as there are no faults that cross or trend towards the RSP Area. The full discussion of this topic can be found on page 6.4-14 of the 2007 RSP EIR. As discussed in Section 4.6.1 Environmental Setting, above, for the RSP Area the fault-location information is unchanged since certification of the 2007 RSP EIR; therefore, the proposed RSPU would result in no impact regarding the exposure of people of structures to rupture of a known earthquake fault, and this issue is not further addressed.

Landslides generally are any type of ground movement that occurs primarily due to gravity acting on relatively weak soils and bedrock on an over-steepened slope. Slope instability is often initiated or accelerated from soil saturation and groundwater pressure, though can also be aggravated by grading activity, such as removal of toe support by excavation or addition of new loads, such as fill placement. Areas that are more prone to landslides include old landslides, the bases or tops of steep or filled slopes, and drainage hollows. Impact 6.4-5 of the 2007 RSP EIR found that the 2007 RSP would have no impact regarding the exposure of people of or structures to landslides due to the level topography. The full discussion of this topic can be located on page 6.4-17 of the 2007 RSP EIR. As discussed in Section 4.6.1 Environmental Setting, the topographic conditions remain unchanged as the RSP Area is nearly flat while the banks of the Sacramento River are relatively steep. The RSPU would result in no impact regarding the exposure of people of structures to landslides, and this issue is not addressed further. The potential to expose people or structures to unstable soil conditions, including slope stability, is addressed in Impact 4.6-4.

The RSP Area is within an area that has been identified as Mineral Resource Zone 1, where available geologic information indicates there is little or no likelihood for presence of significant mineral resources. The RSP Area is within the urbanized area of the City of Sacramento, and unlikely to be available in the long-term for mineral extraction. Thus the implementation of the RSPU, KP Medical Center, MLS Stadium, and Stormwater Outfall would not adversely affect mineral resources. Therefore this issue is not addressed further.

Impacts and Mitigation Measures

Impact 4.6-1: The proposed projects could expose people and structures to seismic hazards, such as groundshaking and liquefaction.

The 2007 RSP EIR discussed seismic hazards, such as groundshaking and liquefaction, under Impacts 6.4-2 and 6.4-3 on pages 6.4-14 through 6.4-16. These effects are addressed together in this Draft SEIR because they both stem from seismic activity.

Impact 6.4-2 of the 2007 RSP EIR found that the 2007 RSP would have a less-than-significant impact related to the exposure of people or structures to damage resulting from strong seismic groundshaking. This determination was based on the recognition that development pursuant to the 2007 RSP would be required to adhere to the provisions of the then-current CBC (Chapters 16, and 18) and various design standards.

Impact 6.4-3 of the 2007 RSP EIR found that the 2007 RSP would have a less-than-significant impact regarding the exposure of people or structures to seismic-related ground failure, including liquefaction. It was determined that the RSP Area contains soil that is prone to liquefaction, but that compliance with the then-current CBC, General Plan, City Municipal Code, State laws, and various design standards would ensure the maximum practicable protection available from soil failures.

Railyards Specific Plan Update

As discussed under Methods, above, the California Supreme Court has recently held that CEQA does not require an EIR consider impacts of the existing environment on the future project, including structures, residents, or employees. Impacts 6.4-2 and 6.4-3 of the 2007 RSP EIR address these types of impacts, where the project would bring a new population into an area that has existing seismic-related hazards. Although not required by CEQA, those impacts are addressed here to demonstrate how the effects of the RSPU would compare to the 2007 RSP.

As discussed in the 2007 RSP EIR, the RSP Area could be subject to seismic hazards such as, groundshaking and liquefaction, caused by major seismic events outside of the RSP Area. The highest intensity of groundshaking experienced in the RSP Area (MMI VI to VII) would be caused by a Mw 7.9 earthquake on the San Andreas Fault or a Mw 6.6 earthquake on the Dunnigan Hills fault, which is the closest fault to the RSP Area. The resulting vibration could cause damage to buildings, roads, and infrastructure (primary effects), and could cause ground failures such as liquefaction or settlement in loose alluvium and/or poorly compacted fill (secondary effects).[19]

Portions of the city, including the RSP Area, are underlain by artificial fill and alluvial deposits that, in their present states, could become unstable during seismic ground motion. To reduce the

[19] City of Sacramento, 2015. *City of Sacramento 2035 General Plan Master Environmental Impact Report*. Certified March 3, 2015.. p. 4.5-4.

primary and secondary risks associated with seismically induced groundshaking, it is necessary to take the location and type of subsurface materials into consideration when designing foundations and structures. In Sacramento, commercial, institutional, and large residential buildings and all associated infrastructure are required to reduce the exposure to potentially damaging seismic vibrations through seismic resistant design, in conformance with Chapter 16, Structural Design Requirements of the CBC. Further, the adherence to the site-specific soil and foundation seismic design requirements in Chapters 16 and 18 of the CBC and the grading requirements in Chapters 18 of the CBC, as required by City and state law, ensures the maximum practicable protection available from soil failures under static or dynamic conditions for structures and their associated infrastructure, trenches, temporary slopes, and foundations.

Similarly, as described on page 6.4-15 of the 2007 RSP EIR, the design of roads and bridges (vehicular and pedestrian overcrossings) would be required to comply with Caltrans design criteria, City Department of Transportation design standards, and/or other accepted non-building structure standards to reduce the primary and secondary risks associated with seismically-induced groundshaking.

Based on an existing regulatory framework that addresses earthquake safety issues and requires adherence to the requirements of the CBC and design standards, seismically-induced groundshaking and liquefaction would not be a substantial hazard in the RSP Area. In view of the above, the RSPU would have a **less-than-significant** impact regarding exposure people or structures to seismic hazards, such as groundshaking and liquefaction. This impact would be similar to Impacts 6.4-2 and 6.4-3 of the 2007 EIR.

Railyards Specific Plan Update Land Use Variant

The RSPU Land Use Variant would be subject to the same seismic hazards, such as groundshaking and liquefaction, as those caused by major seismic events described for the RSPU. As such, the discussion above would be applicable to the RSPU Land Use Variant and the effects of the RSPU Land Use Variant would be equal to those of the RSPU, resulting in **less–than-significant** impact.

KP Medical Center

The proposed KP Medical Center would be subject to the same seismic hazards, such as groundshaking and liquefaction, as those described above for the proposed RSPU. The KP Medical Center would be required to comply with Chapter 16, Structural Design Requirements of the CBC. Further, adherence to the site-specific soil and foundation seismic design requirements in Chapters 16 and 18 of the CBC and the grading requirements in Chapters 18 of the CBC, as required by City and state law, would ensure the maximum practicable protection available from soil failures under static or dynamic conditions for structures and their associated infrastructure, trenches, temporary slopes, and foundations.

Ground-shaking hazards would also be mitigated as necessary through the application of current industry standard geotechnical practices and seismic structural design according to the requirements found in the most recent version of the CBC. In accordance with the State Health and Safety Code, OSHPD is required to review the structural systems and related details of the construction or renovation of medical buildings with acute care facilities, as well as the recommendations of any site-specific geotechnical investigations prepared for those buildings, to ensure compliance with the Seismic Safety Act and the CBC.

In addition to reviewing the proposed structural plans, OSHPD is responsible for overseeing construction of the proposed hospital building to ensure that construction complies with the approved plans. For all proposed non-acute care facilities such as parking structures, the project sponsor would be required to adhere to the CBC and any specific or locally more stringent requirements.

Based on an existing regulatory framework that addresses earthquake safety issues and requires adherence to the requirements of the CBC, the Alquist Act, and various design standards, seismically-induced groundshaking and liquefaction would not be a substantial hazard at the KP Medical Center. The KP Medical Center would have a **less-than-significant** impact related to exposure people or structures to seismic hazards, such as groundshaking and liquefaction.

MLS Stadium

The proposed MLS Stadium would be subject to the same seismic hazards, such as groundshaking and liquefaction, as those described for the proposed RSPU. The proposed MLS Stadium would be required to comply with the same regulations and standards as discussed above for the entirety of the RSPU. Based on an existing regulatory framework that addresses earthquake safety issues and requires adherence to the requirements of the CBC and design standards, seismically-induced groundshaking and liquefaction would not be a substantial hazard at the proposed MLS Stadium. The proposed MLS Stadium would have a **less-than-significant** impact regarding exposure people or structures to seismic hazards, such as groundshaking and liquefaction.

Stormwater Outfall

The proposed Stormwater Outfall would be subject to the same geotechnical conditions and seismic hazards as described above for the proposed RSPU. The Stormwater Outfall would be contained within armored, FEMA certified levee. The final choice for design, site preparation requirements and construction materials for the Stormwater Outfall would be informed by soil and/or geotechnical engineering reports to be prepared prior to final designs. As described above in the setting, the CBC requires that a geotechnical report be prepared. Likely feasible design measures that would be used to address seismic hazards and liquefaction, depending on the results of site-specific geotechnical studies, might include removal and replacement of liquefiable soils, use of deep foundations, and/or soil compaction and mixing. Further, the proposed Stormwater Outfall would also be required to comply with any and all requirements of an Encroachment Permit issued by the Central Valley Flood Protection Board (CVFPB), ensuring

that its construction and operation would not increase the risk of failure of the Sacramento River levee on which the Outfall would be constructed.

Based on an existing regulatory framework that addresses earthquake safety issues and requires adherence to the requirements of the CBC and various design standards including Encroachment Permit conditions, seismically-induced groundshaking and liquefaction would not be a substantial hazard at the Stormwater Outfall site. In view of the above, the Stormwater Outfall would have a **less-than-significant** impact regarding exposure people or structures to seismic hazards.

Summary

Compliance with existing regulatory framework that addresses earthquake safety issues and adherence with CBC and design standards and permit conditions, seismically induced groundshaking and liquefaction would not be a substantial hazard for development pursuant to the proposed RSPU, including the RSPU Land Use Variant, KP Medical Center, MLS Stadium, or Stormwater Outfall. In view of the above, impacts related to exposure of people or structures to seismic hazards, such as groundshaking and liquefaction, would be **less than significant**.

The magnitude of this impact is the same as described in Impacts 6.4-2 and 6.4-3 in the 2007 RSP EIR.

Mitigation Measure

None required.

Impact 4.6-2: The proposed projects could result in damage to the historic Central Shops.

Impact 6.4-4 of the 2007 RSP EIR found that the 2007 RSP could result in damage to the historic Central Shops, but that with implementation of mitigation, the impact could be reduced to a less-than-significant level. The full discussion of this topic is located on pages 6.4-16 and 6.4-17 of the 2007 RSP EIR.

Railyards Specific Plan Update

Similar to the 2007 RSP EIR, the proposed RSPU would require excavation and trenching around the existing historic buildings to install utility lines, roadways, or hardscaping. These excavations would be vertical and would be in unconsolidated sediments or artificial fill. If not undertaken with appropriate preventative measures, slumping of material in the excavation walls and/or trenches could endanger workers and undercut ground support for the foundations of the historic structures.

Installation of utilities or other subsurface construction could require temporary dewatering due to shallow groundwater depth. Even temporary dewatering could cause settlement, which could crack the foundations, walls, or floor slabs of the existing historic buildings and other structures.

Construction of new buildings on parcels adjacent or near to the existing historic structures, such as on Blocks 22 and 23 within the Central Shops District, or the nearby Blocks 8 through 11 and 15 located between the Central Shops and Camille Lane, could result in temporary instability in the soil near the existing historic buildings, which could affect the existing buildings as described above. Also, the weight of new buildings could potentially result in settlement that could affect soils around and under the existing historic buildings. As with dewatering, settlement could adversely affect the integrity of the existing buildings, and when the existing buildings are occupied, could present a physical hazard to occupants. This is considered a **potentially significant** impact.

For a discussion of potential construction vibration effects on the historic Central Shops, please also see Impact 4.10-1of the Draft SEIR.

Railyards Specific Plan Update Land Use Variant

Under the RSPU Land Use Variant, the potential for construction activities to result in damage to the historic Central Shops buildings is the same as discussed above for the proposed RSPU. As a result, the potential risk of damage to the historic buildings is considered a **potentially significant** impact.

KP Medical Center

The KP Medical Center would be located approximately 700 feet from the closet building in the historic Central Shops. While the construction of the KP Medical Center would require some subsurface activity in order to auger piles and install subsurface utilities and infrastructure, soils near the Central Shops would not be substantially affected due to distance. Similarly, it is very unlikely that there would be any settlement effects of temporary construction dewatering at that distance from the proposed KP Medical Center site. Therefore, the impact on the Central Shops would be **less than significant** for the KP Medical Center.

MLS Stadium

The proposed MLS Stadium would be located approximately 2,000 feet from the closest building in the Central Shops. At this distance, subsurface activity, such as pile driving and installation of subsurface utilities and infrastructure, should not affect the stability of soils near the Central Shops. Similarly, it is very unlikely that there would be any settlement effects of temporary construction dewatering at that distance from the proposed Stadium site. Therefore, the impact on the Central Shops would be **less than significant** for the MLS Stadium.

Stormwater Outfall

The proposed Stormwater Outfall would be located over 1,000 feet from the Central Shops. As a result there would be no potential effects of subsurface activity and short-term riverside dewatering that may be required for the Stormwater Outfall. For these reasons, **no impact** would occur.

Summary

Buildings proposed to be constructed near or adjacent to the existing historic Central Shops buildings pursuant to the RSPU and the RSPU Land Use Variant could result in temporary instability in the soil surrounding the existing historic buildings. As a result, the potential risk of damage to the historic buildings is considered a potentially significant impact. This impact would be the same as Impact 6.4-4 of the 2007 RSP EIR. The proposed KP Medical Center and MLS Stadium would require subsurface construction activities, but are located far enough from the Central Shops that effects on soils stability would be less than significant. The Stormwater Outfall would not result in damage to the historic Central Shops due to distance from the shops and the nature of outfall construction.

Mitigation Measure

Mitigation Measure 4.6-2 described below is similar to Mitigation Measure 6.4-4, page 6.4-17 of the 2007 RSP EIR. The measure has been revised to add specific requirements for preventing damage to the Central Shops. This measure would be required of construction in proximity to the Central Shops (between Camille Avenue and the Central Shops and within the Central Shops district). No mitigation is required for the KP Medical Center, the MLS Stadium or the Stormwater Outfall.

Mitigation Measure 4.6-2 (RSPU)

a) To the extent feasible, the historic buildings shall be stabilized and reinforced prior to trenching or other construction activities within 50 feet of the buildings.

b) A pre-excavation settlement-damage survey shall be prepared that shall include, at a minimum, visual inspection of existing vulnerable structures for cracks and other settlement defects, and establishment of horizontal and vertical control points on the buildings. A monitoring program of surveying horizontal and vertical control points on structures and shoring shall be followed to determine the effects of dewatering, excavation, and construction on the particular building site. If it is determined by the engineer that the existing buildings could be subject to damage, work shall cease until appropriate remedies to prevent damage are identified.

c) If necessary and with approval by the City Chief Building Official, the construction contractor shall install temporary shoring or stabilization to help avoid permanent impacts. Stabilization may involve structural reinforcement or corrections for deterioration that would minimize or avoid potential structural failures or avoid accelerating damage to the historic structure. Stabilization shall be conducted following the Secretary of Interior Standards Treatment of Preservation. This treatment shall ensure retention of the historical resource's character-defining features. Stabilization may temporarily impair the historic integrity of the building's design, material, or setting, and as such, the stabilization must be conducted in a manner that will not permanently impair a building's ability to convey its

significance. Measures to shore or stabilize the building shall be installed in a manner that when they are removed, the historic integrity of the building remains, including integrity of material.

Impact Significance After Mitigation: Mitigation Measure 4.6-2 would ensure all appropriate measures are taken to minimize damage to the historic Central Shops as a result of construction related activities adjacent to the historic Central Shops. With the implementation of Mitigation Measure 4.6-2, this impact would be reduced to a **less-than-significant** level.

Impact 4.6-3: The proposed projects could cause erosion or the loss of topsoil during construction or operation.

Impact 6.4-6 of the 2007 RSP EIR found that the 2007 RSP impacts related to erosion or the loss of topsoil would be less than significant, because erosion or the loss of topsoil would be managed through Storm Water Pollution Prevention Plans (SWPPPs), stormwater BMPs, and an Erosion and Sediment Transport Control Plan. The 2007 RSP EIR discussed this topic on pages 6.4-17 and 6.4-18.

Railyards Specific Plan Update

Although the RSP Area is relatively flat, like the 2007 RSP the proposed RSPU would require excavation and grading that has the potential to result in top soil loss and soil erosion by exposing bare and loosened soil to wind and rain. As with the 2007 RSP, the proposed RSPU would disturb more than one acre of ground surface, and, therefore, would be required to comply with Construction General Permit requirements. These requirements include the development of a SWPPP that includes erosion control BMPs designed to prevent erosion from occurring on project sites. BMPs include such steps as maintaining existing vegetation, applying soil stabilizers, and covering of soil stockpiles. Compliance with the City of Sacramento's Grading Ordinance, Chapter 15.88 of the Sacramento Municipal Code, requires that prior to the commencement of grading an Erosion and Sediment Control Plan be prepared for each project within the City. An erosion control professional, landscape architect, or civil engineer specializing in erosion control must prepare the Erosion and Sediment Control Plan and during the installation of erosion and sediment control measures be on the project site to supervise implementation of the installation and maintenance of such facilities throughout the site clearing, grading and construction periods.[20]

In addition, 2035 General Plan policy EC 1.1.2 requires that projects within the City prepare a geotechnical investigation to determine site-specific seismic and soil characteristics and recommend appropriate mitigation measures to mitigate any potential impacts. Further, 2035

[20] City of Sacramento, 2015. *City of Sacramento 2035 General Plan Master Environmental Impact Report*. Certified March 3, 2015.. p. 4.5-6.

General Plan policy ER 1.1.7 requires that necessary erosion control measures are used during site development activities for all projects in the City.[21] As with the 2007 RSP addressed in Impact 4.6-6 of the 2007 RSP EIR, compliance with all State and City requirements would reduce impacts of the proposed RSPU related to substantial soil erosion and loss of topsoil to a **less-than-significant** level.

Railyards Specific Plan Update Land Use Variant

The RSPU Land Use Variant would grade and disturb the same area as the proposed RSPU, so potential to result in the loss of topsoil and erosion would be equal to those of the RSPU. The discussion above would be applicable to the RSPU Land Use Variant. The impact would be **less than significant,** the same as with disclosed under Impact 4.6-6 of the 2007 RSP EIR.

KP Medical Center

As with other development under the proposed RSPU, the proposed KP Medical Center has the potential to result in the loss of topsoil and cause erosion. Since the proposed KP Medical Center would disturb more than one acre of ground surface and would account for approximately 18 acres of the larger RSPU, it would be required to comply with Construction General Permit requirements. Also like other development pursuant to the proposed RSPU, the proposed KP Medical Center would be required to comply with City of Sacramento's Grading Ordinance and 2035 General Plan policies EC 1.1.2 and ER 1.1.7, discussed above. Thus, like the 2007 RSP and the proposed RSPU, the proposed KP Medical Center's compliance with State, and City requirements would reduce impacts related to substantial loss of topsoil and soil erosion to a level that would be **less than significant**.

MLS Stadium

Like other development pursuant to the proposed RSPU, the proposed MLS Stadium would have the potential to result in the loss of topsoil and cause erosion. The proposed MLS Stadium construction would disturbance of a site of approximately 13.5 acres, more than the one acre of ground surface, and would be part of the larger RSPU, so construction comply with Construction General Permit requirements. Like other development in the Railyards, the proposed MLS Stadium would also be required to comply with City of Sacramento's Grading Ordinance and General Plan policies EC 1.1.2 and ER 1.1.7, discussed above. Thus, like the 2007 RSP and the proposed RSPU, compliance of the proposed MLS Stadium with State, and City requirements would reduce impacts related to substantial loss of topsoil and soil erosion to a level that would be **less than significant**.

Stormwater Outfall

The proposed Stormwater Outfall would be located on the Sacramento River riverbank. If grading occurred during the rainy season or during high water flows in the Sacramento River, such

[21] City of Sacramento, 2015. *City of Sacramento 2035 General Plan Master Environmental Impact Report*. Certified March 3, 2015.. p. 4.5-6.

construction activity would have the potential to result in the substantial erosion. The Stormwater Outfall would be design to confirm with the Department of Water Resources Urban Levee Design Criteria to limit erosion and or loss of soil. Due to the extent of soil disturbance required for the Stormwater Outfall coverage under the Construction General Permit would be required. Development and implementation of a SWPPP would be required to obtain coverage under this permit. Typical construction BMPs include scheduling or limiting activities to certain times of the year; installing sediment barriers such as silt fences and fiber rolls along the perimeter of the construction area; methods to control the tracking of soil by construction vehicles; and developing and implementing a spill prevention and cleanup plan. The proposed Stormwater Outfall would also be required to comply with the provisions of the CVFPB's Encroachment Permit, as well as the City of Sacramento's Grading Ordinance and General Plan policies EC 1.1.2 and ER 1.1.7, discussed above. Compliance with State and City requirements would reduce impacts related to substantial soil erosion and loss of topsoil to be **less than significant**.

Summary

Compliance with State and City requirements would reduce impacts related to substantial soil erosion and loss of topsoil to be **less than significant** for the proposed RSPU, KP Medical Center, MLS Stadium, and Stormwater Outfall projects. This impact would be similar to Impact 6.4-6 of the 2007 RSP EIR.

Mitigation Measure

None required.

Impact 4.6-4: The proposed projects could expose people or structures to unstable soil conditions, including expansive soils and subsidence.

The 2007 RSP EIR discusses unstable soil conditions, such as expansive soils and subsidence under Impacts 6.4-7 and 6.4-8 on pages 6.4-18 through 6.4-22. These impacts are addressed together in this EIR, because they both stem from soil conditions.

Impact 6.4-7 of the 2007 RSP EIR found that the 2007 RSP impacts related to on- or off-site lateral spreading, subsidence, settlement, or collapse as the result of being located on a unstable geologic and soil units to be less than significant. This determination was based on the 2007 RSP adherence to the then-current State laws and City building code. The 2007 RSP EIR discusses this topic on pages 6.4-18 through 6.4-21 of the 2007 RSP EIR. Impact 6.4-8 of the 2007 RSP EIR found that the 2007 RSP would have a less than significant impact regarding the exposure of people of structures to expansive soil as the 2007 RSP would implement the measures outlined in the then-current City's Building Code. The 2007 RSP EIR discusses this topic on page 6.4-21.

Railyards Specific Plan Update

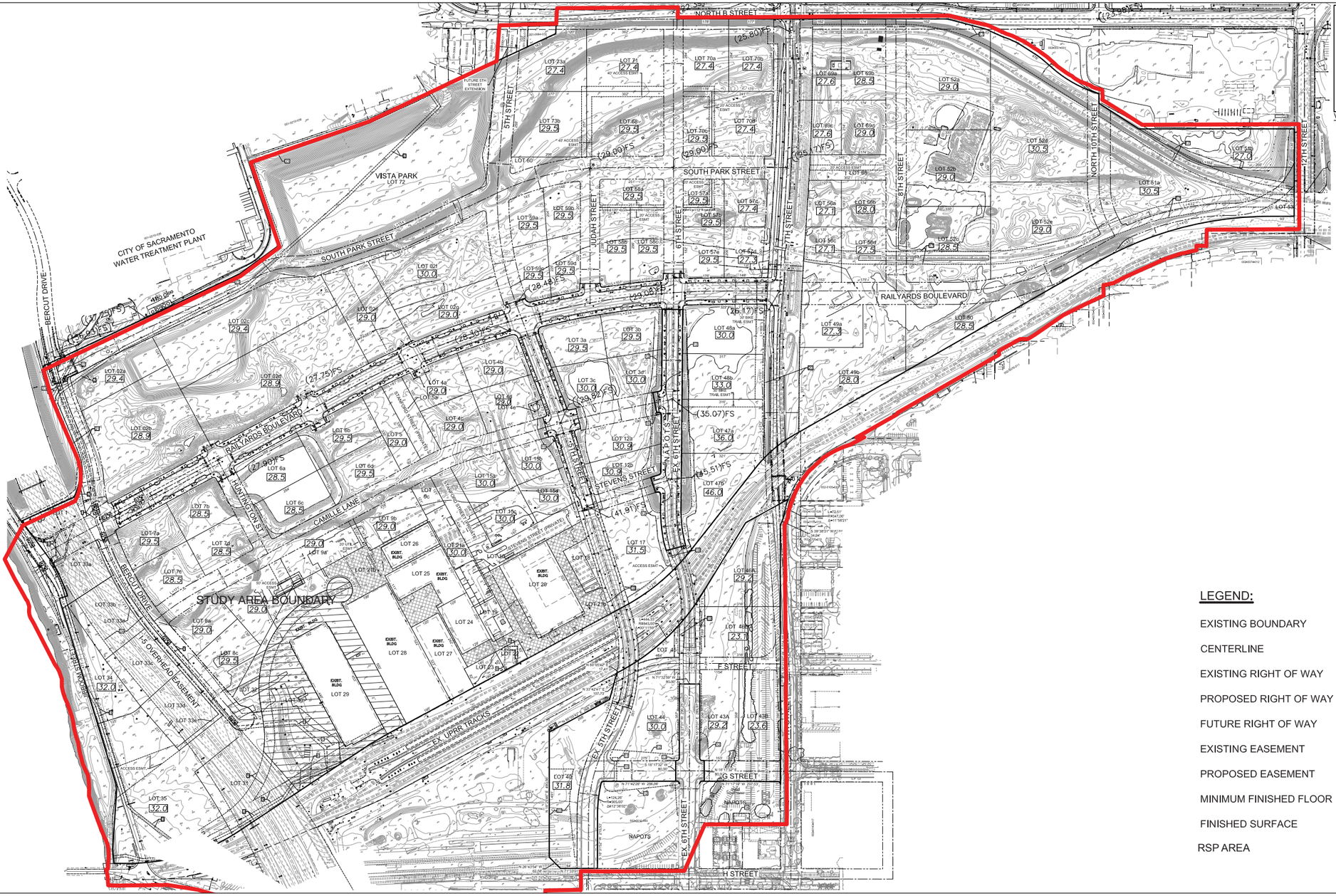
As discussed under Methods, above, the California Supreme Court has recently held that CEQA does not require an EIR consider impacts of the existing environment on the future project, including structures, residents, or employees. Impacts 6.4-7 and 6.4-8 of the 2007 RSP EIR address these types of impacts, where the project would bring a new population into an area that has existing seismic-related hazards. Although not required by CEQA, those impacts are addressed here to demonstrate how the effects of the RSPU would compare to the 2007 RSP.

Like the 2007 RSP, the proposed RSPU would require cut and fill on-site to create the final topography to make the site suitable for development. Some on-site soils would be used for fill, but only those soils that meet the applicable Department of Toxic Substances Control thresholds and comply with the Railyards Projects Soil and Ground Water Management Plan. It is anticipated that an additional 750,000 cubic years of clean fill would be imported from various sources, including the Regional San's Sacramento Regional Wastewater Treatment Plant. The proposed grading plan is shown in **Figure 4.6-2**.

Because cuts would be made and soils from the site could be re-used elsewhere on-site as fill, it would be necessary to ensure that materials used for foundation support are geotechnically adequate. Using unsuitable materials (e.g., fill that has not been compacted properly or includes inappropriate materials such as organic materials) would have the potential to create heaving, subsidence, or collapse problems leading to excavation wall failure, building or bridge settlement, and/or utility line and pavement disruption. As discussed on page 6.4-10 of the 2007 RSP EIR, the risk of soils collapse and settlement would be highest in areas of the filled China Lake and Willow Lake lakebeds. Lateral spreading could occur along the Sacramento and American River levees. Lateral spreading and collapse could occur in unsupported walls of pits excavated in the existing fill or loose alluvium.

To eliminate any adverse effects of weak materials in the cut-and-fill locations, the buildings and structures would need to be constructed on foundations that do not depend on weak soils for support. As required by the CBC and City Code, a geotechnical investigation would be required for all projects within the RSP Area. The geotechnical investigation would include recommendations to ensure soil stability and structure safety. The recommendations may include methods such as removing the existing fill and replacing it with select fill (non-expansive, non-organic, appropriately sized mix of materials); covering the existing fill with select fill; extending the foundations below the existing fill using cast-in-place piers, driven piles, or similar deep-foundation design.

It is relatively common to re-engineer weak soils specifically for stability prior to use. This can be done for the support of surface parking areas and light structures. An acceptable degree of soil stability can be achieved for expansive material by the required incorporation of soil treatment programs (e.g., replacement, grouting, compaction, drainage control) in the grading and construction plans to address site-specific soil conditions. As part of the geotechnical



SOURCE: Baker-Williams Engineering Group, April 2016

Figure 4.6-2
Preliminary Grading Plan

investigation, a site-specific evaluation of soil conditions is required by the City and must contain recommendations for ground preparation and earthwork specific to the site, and incorporated into the construction design.

Subsidence or settlement could also occur over smaller areas near construction dewatering activities. Because of the shallow water table, dewatering would be necessary during many excavation and foundation support construction activities within the RSP Area. Often, groundwater provides partial support for the near-surface soil materials and, when withdrawn, allows the soils to slough into the excavation. If the dewatering system draws down the water table adjacent to the excavation, there is the possibility of undermining foundations on the adjacent site, causing cracking or collapse. To avoid these conditions, the dewatering system and excavation-wall support would need to be designed in a manner appropriate to the soil conditions. The required site-specific evaluation of soil conditions must contain recommendations for these systems specific to the site, and be incorporated into the construction design.

As part of the construction permitting process, the City requires completed reports of soil conditions at the specific construction sites to identify potentially unsuitable soil conditions including liquefaction, settlement, subsidence, lateral spreading, and collapse. The City requires that these evaluations be conducted by registered soil professionals, and measures to eliminate inappropriate soil conditions must be applied, depending on the soil conditions. The design of foundation and excavation-wall support must conform to the analysis and implementation criteria described in the CBC, Chapters 16, 18, and 33. Adherence to the City's codes and policies would ensure the maximum practicable protection available for users of buildings and infrastructure and their associated trenches, slopes, and foundations. Thus, like the 2007 RSP, the proposed RSPU would have a **less-than-significant** impact regarding exposure of people or property to the hazards of unstable geologic units or soils. This impact would be similar to Impacts 6.4-7 and 6.4-8 of the 2007 RSP EIR.

Railyards Specific Plan Update Land Use Variant

The potential of the RSPU Land Use Variant to expose people or structures to unstable soil conditions, including expansive soils and subsidence, would be the same as described for the proposed RSPU. The discussion above would be applicable to the RSPU Land Use Variant, and the effects of the RSPU Land Use Variant would be equal to those of the RSPU, resulting in a **less-than-significant** impact.

KP Medical Center

The proposed KP Medical Center site includes geologic and soils conditions similar to those described above for the entirety of the RSP Area. The site is north of, and not overlying, the locations of the historic China Lake and Willow Lake, so the risk of collapse or settlement would be less severe than for those areas located over these historic lakes.

As described in the Project Description, the shallow footings for most structures at the proposed KP Medical Center would be supported on prepared pads. Some excavation would be required to support the new slab on grade.

The project foundations for larger structures, such as the hospital building, would be supported by the use of driven piles, or other similar foundation support systems. Some limited construction period dewatering may be required during excavation for deeper driven pile caps, grade beams, and underground vaults.

As discussed above, depending on the depth and length of the dewatering activities, subsidence or settlement could occur near dewatering activities. The City may require the contractor to install monitor wells around the KP Medical Center hospital building site to gain water depth data both prior to and during the hospital construction dewatering. Such information could be used to determine subsidence parameters which in turn would dictate to the dewater subcontractor how low the immediate water table at the hospital site can be dropped. The development of such subsidence parameters would limit the potential subsidence or settlement as a result of dewatering.

The proposed KP Medical Center would be required to comply with the CBC, City's codes and policies which would ensure the maximum practicable protection available for users of buildings and infrastructure and their associated trenches, slopes, and foundations. In addition, the California OSHPD would require that the design of the hospital building comply with the Alquist Act as modified by SB 1953. Construction dewatering activities would be regulated pursuant to City codes to avoid settlement and resultant damage to adjacent or nearby structures, such as the historic Central Shops buildings or the City's Sacramento River Water Treatment Plant, to the north. As a result of compliance with the existing codes and requirements, this impact would be **less than significant** for the KP Medical Center.

MLS Stadium

The proposed MLS Stadium site includes geologic, seismic, and soils conditions as described above for the entirety of the RSP Area. The site is northeast of, and not overlying, the locations of the historic China Lake and Willow Lake, so the risks associated with unstable soils would be less severe.

As is described in the Project Description, there would be grading and fill activities to raise the finished ground surface elevation of the proposed MLS Stadium. The Stadium structure would be supported by foundations and footings sitting on pre-drilled, driven piles. The construction of the foundation system could require temporary dewatering of the pile caissons.

The proposed MLS Stadium would be required to comply with the CBC, City's codes and policies which would ensure the maximum practicable protection available for users of buildings and infrastructure and their associated trenches, slopes, and foundations.

As discussed above, depending on the depth and length of the dewatering activities, subsidence or settlement could occur near dewatering activities. The City may require the Stadium contractor to install monitor wells to determine subsidence parameters which in turn would dictate to the dewater subcontractor how low the immediate MLS Stadium water table can be dropped. The development of these subsidence parameters would limit the potential subsidence or settlement as a result of dewatering.

Adherence to the CBC, City's codes and policies would ensure the maximum practicable protection available for users of buildings and infrastructure and their associated trenches, slopes, and foundations. Thus, the MLS Stadium would have a **less-than-significant** impact regarding exposing people or property to the hazards of unstable geologic units or soils.

Stormwater Outfall

The proposed Stormwater Outfall potential to expose people or structures to unstable soil conditions, including expansive soils and subsidence would be unique at the Railyards due to the planned construction of the outfall structure on a steep section of Sacramento River riverbank. Unstable soil conditions, during construction or following construction during the operational period, could result in slumping or other earth movement around the outfall structure, especially during high water events on the Sacramento River.

In additional to the compliance with the State and local requirements discussed for the RSPU, the design and construction of the Stormwater Outfall would be required to comply with regulations under the purview of the CVFPB, including acquisition of an encroachment permit pursuant to Title 23 of the California Code of Regulations. The CVFPB would only approach an encroachment permit based on a design that it determines would avoid any potential for slumping or other slope instability during construction or operation of the outfall.

Compliance with the requirements of the CVFPB Encroachment Permit, the CBC, and the City's codes and policies would render this impact **less than significant**.

Summary

Compliance with CBC, City's codes and policies would ensure the maximum practicable protection available for users of buildings and infrastructure and their associated trenches, slopes, and foundations. In view of the above, the RSPU, KP Medical Center, MLS Stadium, and Stormwater Outfall would have a **less-than-significant** impact regarding exposure people or structures to unstable soil conditions, including expansive soils and subsidence. This impact would be similar to Impacts 6.4-7 and 6.4-8 of the 2007 RSP EIR.

Mitigation Measure

None required.

Cumulative Impacts

As discussed on page 6.4-22 of the 2007 RSP EIR, the geographic context for the analysis of impacts resulting from geological hazards is site-specific rather than cumulative in nature, because each development site has unique geological and soils characteristics that would be subject to site development and construction standards imposed by the State and the City of Sacramento, as described in the above impacts. These standards are applied to all construction projects within the City where geological or soils conditions could pose a risk to buildings or public safety. Therefore the following cumulative analysis focuses on the increased number of people who would be exposed to such risks and the potential for increased erosion in the Sacramento River Watershed.

Impact 4.6-5: The proposed projects could contribute to cumulative increases in the number of people exposed to seismic and geologic risks.

Impact 6.4-9 of the 2007 RSP EIR found that the 2007 RSP would have a less than significant impacts relating to the exposure of people to seismic and geologic risk. This topic can be located on page 6.4-22 of the 2007 RSP EIR.

As discussed under Methods, above, the California Supreme Court has recently held that CEQA does not require that impacts of the existing environment on the project, including future project structures, residents, or employees, be evaluated. Impact 6.4-9 of the 2007 RSP EIR addressed these types of impacts, wherein the project would bring a population of residents and employees into an area that has potential seismic-related hazards. Although not required by CEQA, those impacts are addressed here to provide a comparison of the cumulative effects with the proposed RSPU, including the proposed KP Medical Center, MLS Stadium, and Stormwater Outfall, to the cumulative impacts disclosed in the 2007 RSP EIR.

Similar to the analysis presented in the 2007 RSP EIR, the proposed RSPU, including the proposed KP Medical Center, MLS Stadium, and Stormwater Outfall, would be exposed to potential geologic hazards related to soil and subsurface conditions at individual building sites, and to groundshaking from earthquakes along known and unknown faults in the Coast Ranges and the Sierra Nevada.

Although these effects vary in intensity and are common throughout California, their effects would be site-specific. As previously discussed, buildings and facilities for human occupancy in Sacramento are required to be sited and designed in accordance with appropriate geotechnical and seismic guidelines and recommendations consistent with the CBC, the Sacramento Building Code, and the Alquist Act for hospitals. As a result of adherence to relevant plans, codes, and regulations with respect to project design and construction that require the prescribed levels of safety for the geotechnical and soils conditions at the site, the RSPU, including the proposed KP Medical Center, MLS Stadium, and Stormwater Outfall, would not make considerable contributions to cumulative impacts, as defined in the CEQA Guidelines, §15065(a)(3).

Consequently, project-related cumulative impacts regarding geologic hazards would be **less than significant.**

Mitigation Measure

None required.

Impact 4.6-6: The proposed projects could contribute to cumulative increases in erosion within the Sacramento watershed.

The cumulative context for water quality related to soil erosion considers the geographic scope of the Basin Plan and, therefore, development within the larger Sacramento River watershed and the Sacramento–San Joaquin Delta (Delta). The Sacramento River watershed covers 27,000 square miles. The Delta extends for 24 miles from east to west and 48 miles from north to south where the Sacramento and San Joaquin rivers meet before discharging into the San Francisco Bay.

The alteration of topographic features can lead to increased erosion by creating unstable rock or soil surfaces, by changing the permeability or runoff characteristics of the soil, or by modifying or creating new pathways for drainage. Cumulative land development in the City of Sacramento, in addition to other development in the Sacramento River watershed and Delta, would result in an increase in such soil erosion processes if not properly mitigated. The proposed RSPU would cause the modification of site conditions to accommodate development and to provide a stable and safe environment. During the construction phase, this modification could expose soil to erosion by wind or water.

To reduce the potential for cumulative erosion impacts, all projects in the watershed are required to be developed in conformance with the provisions of applicable federal, state, county, and/or city laws and ordinances. Compliance with the City of Sacramento's Grading Ordinance, Chapter 15.88 of the Sacramento Municipal Code, requires that prior to the commencement of grading an Erosion and Sediment Control Plan be prepared for each project within the City. An erosion control professional, landscape architect, or civil engineer specializing in erosion control must prepare the Erosion and Sediment Control Plan and during the installation of erosion and sediment control measures be on the project site to supervise implementation of the installation and maintenance of such facilities throughout the site clearing, grading and construction periods.[22]

In addition, 2035 General Plan policy EC 1.1.2 requires that projects within the City prepare a geotechnical investigation to determine site-specific seismic and soil characteristics and recommend appropriate mitigation measures to mitigate any potential impacts. Further, 2035

[22] City of Sacramento, 2015. *City of Sacramento 2035 General Plan Master Environmental Impact Report*. Certified March 3, 2015.. p. 4.5-6.

General Plan policy ER 1.1.7 requires that necessary erosion control measures are used during site development activities for all projects in the City.[23] The individual contribution of the RSPU to cumulative erosion impacts in the watershed would not be considerable, because the RSPU would also be subject to State and City regulations as described in Impact 4.6-3. Consequently, project-related cumulative impacts regarding erosion and loss of topsoil would be **less than significant**.

Mitigation Measure

None required.

[23] City of Sacramento, 2015. *City of Sacramento 2035 General Plan Master Environmental Impact Report*. Certified March 3, 2015.. p. 4.5-6.