

# 7 PUBLIC HEALTH AND SAFETY

The Public Health and Safety chapter addresses human hazards and safety issues within the Policy Area. This chapter discusses geologic and seismic hazards, flood hazards, fire hazards, noise, hazardous materials, and emergency response programs and capabilities.

## 7.1 Geologic and Seismic Hazards

### *Introduction*

This section describes the existing conditions of the geologic resources, paleontological resources, and seismic hazards within and adjacent to the Policy Area. This section also describes soils within the Policy Area, and potential hazards associated with certain soil characteristics. Information is based upon the City of Sacramento Emergency Operations Plan, information published by the Department of Conservation, California Geology Survey (CGS), and information from the Natural Resources Conservation Service (NRCS).

### *Existing Conditions*

#### **Topography and Geology**

The Policy Area is located in the Great Valley geomorphic province of California. The Great Valley is a flat, alluvial plain approximately 50 miles wide and 400 miles long in the central portion of California. It is comprised of the Sacramento Valley drained by the Sacramento River in the north and the San Joaquin Valley drained by the San Joaquin River in the south. It is surrounded by the Sierra Nevada to the east, the Tehachapi Mountains to the south, the Coastal Range to the west, and the Cascade Range to the north.

The geology of the Great Valley is typified by thick sequences of alluvial sediments derived primarily from erosion of the Sierra Nevada Range and, to a lesser extent, erosion of the Klamath Mountains and Cascade Range to the north. These sediments were transported downstream and subsequently laid down as a river channel, floodplain deposits, and alluvial fans. The topography of the Policy Area is relatively flat. There is a gradual slope rising from elevations as low as sea level in the southwestern portion of the Policy Area up to approximately 75 feet above sea level in the northeastern portion.

## Seismic Hazards

Although all of California is typically regarded as seismically active, the Policy Area does not commonly experience strong groundshaking resulting from earthquakes along known or previously unknown active faults. There are, however, isolated areas within the city that have soils and other conditions which could result in structural damage induced by seismic activity. Seismic hazards that may affect portions of the Policy Area during, or in the aftermath of, a major seismic event may include minor groundshaking and liquefaction. Flooding resulting from seismic-induced dam failure may also be a concern in the Policy Area; the risk of dam failure is evaluated in Section 7.2 Flood Hazards.

### *Faults*

Faults are considered active when they have caused soil and strata displacement in the last 11,000 years. Potentially active faults are faults that have experienced movement in the last 11,000 to 750,000 years, and conditionally active faults are faults that have not had any fault activity in over 750,000 years. Ground rupture tends to occur along lines of previous faulting and can be recognized with a detailed investigation.

There are no known faults within the Policy Area or the greater Sacramento region. However, significant earthquakes have occurred on previously undetected faults. Known faults located nearest to the Policy Area are Foothills fault system to the east, the Midland Fault to the west, and the Dunnigan Hills Fault to the northwest.

The Foothills fault system is located on the western edge of the Sierra Nevada Range over 20 miles from the Policy Area and consists of a complex of north-south trending faults. The active Bear Mountain fault zone is at the western edge of the system (California Division of Mines and Geology 1978). The anticipated maximum magnitude of an earthquake originating from this fault zone is 6.5 moment magnitude (Mw). The Sacramento region has experienced groundshaking originating from faults in the Foothills fault system in the past. The Midland fault zone is considered to be a deep pre-Pleistocene subsurface feature extending nearly 50 miles along the west side of the Sacramento Valley, from the Delta to Lake Berryessa. This fault has been only approximately located from natural gas exploration work. Subsurface data indicate that there has been no appreciable movement on the Midland fault in the last 24 to 36 million years, and no evidence of surface expression has yet been found (Harwood and Helley 1987). The Dunnigan Hills Fault is located approximately 20 miles northwest of the City of Sacramento. The active fault is not within an Alquist-Priolo Earthquake Fault Zone.

Other faults in the region include the Great Valley fault (segments 3 and 4), located over 25 miles from the Policy Area and capable of producing a 6.5 – 6.8 Mw earthquake. The Concord-Green Valley fault and Hunting Creek-Berryessa fault are both located approximately 40 miles from the Policy Area and are capable of producing 6.9 Mw earthquakes. The Greenville fault is located approximately 50 miles from the Policy Area and is capable of producing a 6.8 Mw earthquake. The West Napa fault is also located approximately 50 miles from the Policy Area and could produce a 6.5 Mw earthquake.

Faults located further than 50 miles from the city that are considered to be “active” as defined by the Alquist-Priolo Earthquake Fault Zoning Act include the San Andreas, Calaveras, Concord, and Hayward faults. All have experienced seismic activity within the last 11,000 years and are considered capable of producing significant earthquake events. The Hayward, San Andreas and Calaveras faults are considered to pose the greatest earthquake threat to the Policy Area.

**Ground Shaking**

Generally defined, an earthquake is an abrupt release of accumulated energy in the form of seismic waves created when movement occurs along a fault plane. The severity of an earthquake generally is expressed in two ways—magnitude and intensity. Magnitude quantitatively measures the strength of an earthquake and the amount of energy released by it. Magnitude is measured on several different scales. Although the most commonly known scale measures Richter Magnitude, the most commonly used scale measures Moment Magnitude, which is related to the physical size of fault rupture and the movement or displacement across the fault, and as such is more uniform measure of the strength of an earthquake.

Unlike magnitude, intensity qualitatively measures the effects a given earthquake has on people, structures, loose objects, and the ground at a specific location. Earthquake intensity in a given locality is typically measured using the Modified Mercalli Intensity (MMI) scale with values of this scale ranging from I to XII. Table 7-1 (Modified Mercalli Intensity Scale) identifies the level of intensity according to the MMI scale and describes that intensity with respect to how it would be received or sensed by its receptors. While an earthquake has only one magnitude, it can have many intensity levels, which typically decrease with distance from the epicenter.

<b>Table 7-1 Modified Mercalli Intensity Scale</b>	
<i>Modified Mercalli Intensity</i>	<i>Description</i>
I	Detected by only sensitive instruments
II	Felt by a few people at rest
III	Felt noticeably indoors, but not always recognized as a quake; vibration like a passing truck
IV	Felt indoors by many and outdoors by few
V	Felt by most people. Some breakage of windows, dishes, and plaster
VI	Felt by all; falling plaster and chimneys; damage small
VII	Damage to buildings varies; depends on quality of construction
VIII	Walls, monuments, chimneys fall; panel walls thrown out of frames
IX	Buildings shift off foundations; foundations crack; ground cracks; underground pipes break
X	Most masonry and frame structures destroyed; ground cracks; landslides
XI	Ground fissures; pipes break; landslides; rails bent; new structures remain standing
XII	Damage total; waves seen on ground surface; objects thrown into the air

Source: Atomic Energy Commission 1963.

The peak horizontal ground acceleration values depicted on the CGS probabilistic seismic hazards assessment map represent estimates of the ground-shaking intensity likely to occur in a given area as a result of earthquake events on nearby faults, and can be used to assess the relative seismic ground-shaking hazard for a given region. According to the map, Sacramento and the surrounding area have an estimated 10 to 20 percent peak ground acceleration (California Department of Conservation and USGS 1996). The probabilistic peak horizontal ground acceleration value, and thus the seismic ground-shaking hazard for the Policy Area, is relatively low, ranking among the lowest in the State.

The maximum earthquake intensity expected from this amount of groundshaking would be between VII and VIII on the MMI. The most susceptible structures to these types of hazards are unreinforced masonry buildings or buildings constructed on unreinforced brick foundations. Due to the low probability of groundshaking affecting the Policy Area, the possibility of seismic-induced ground failure is remote.

Some common seismic hazards such as fault rupture, tsunamis and seiches, and seismic-induced landslides are not considered to be major threats to any areas within the Policy Area due to its location far from known faults and large bodies of water and the region's flat topography. The Sacramento area is not near any areas of volcanic activity, so there are no mudflow hazards.

**Liquefaction.** Liquefaction occurs when surface soils, generally alluvial soils, become saturated with water and become mobile during groundshaking caused by a seismic event. When these soils move, the foundations of structures move as well, which can cause structural damage. Liquefaction generally occurs below the water table, but can move upward through soils after it has developed. Liquefaction susceptibility decreases with the depth of the water table and the age, cementation, and compactness of the sediments. Soils subject to liquefaction are found within the Policy Area, primarily within the Central City, Pocket, and North and South Natomas Community Plan areas. Geotechnical studies prepared as part of a development project approval process are necessary to identify site-specific conditions.

**Landslides.** Landslides are often associated with earthquakes, though there are other factors that influence the occurrence of landslides. In addition to an earthquake, heavy rain or the improper grading of a construction site may trigger a landslide. However, the potential for landslides in the City is minor due to the flat topography of the area. Sacramento has a landslide rating of "nil," which indicates a low amount of landslides in the overall area.

**Tsunamis and Seiches.** A tsunami is a large sea wave caused by an earthquake or volcanic eruption. Because Sacramento is located approximately 75 miles inland from the Pacific Ocean, there is no threat of tsunami damage to the City.

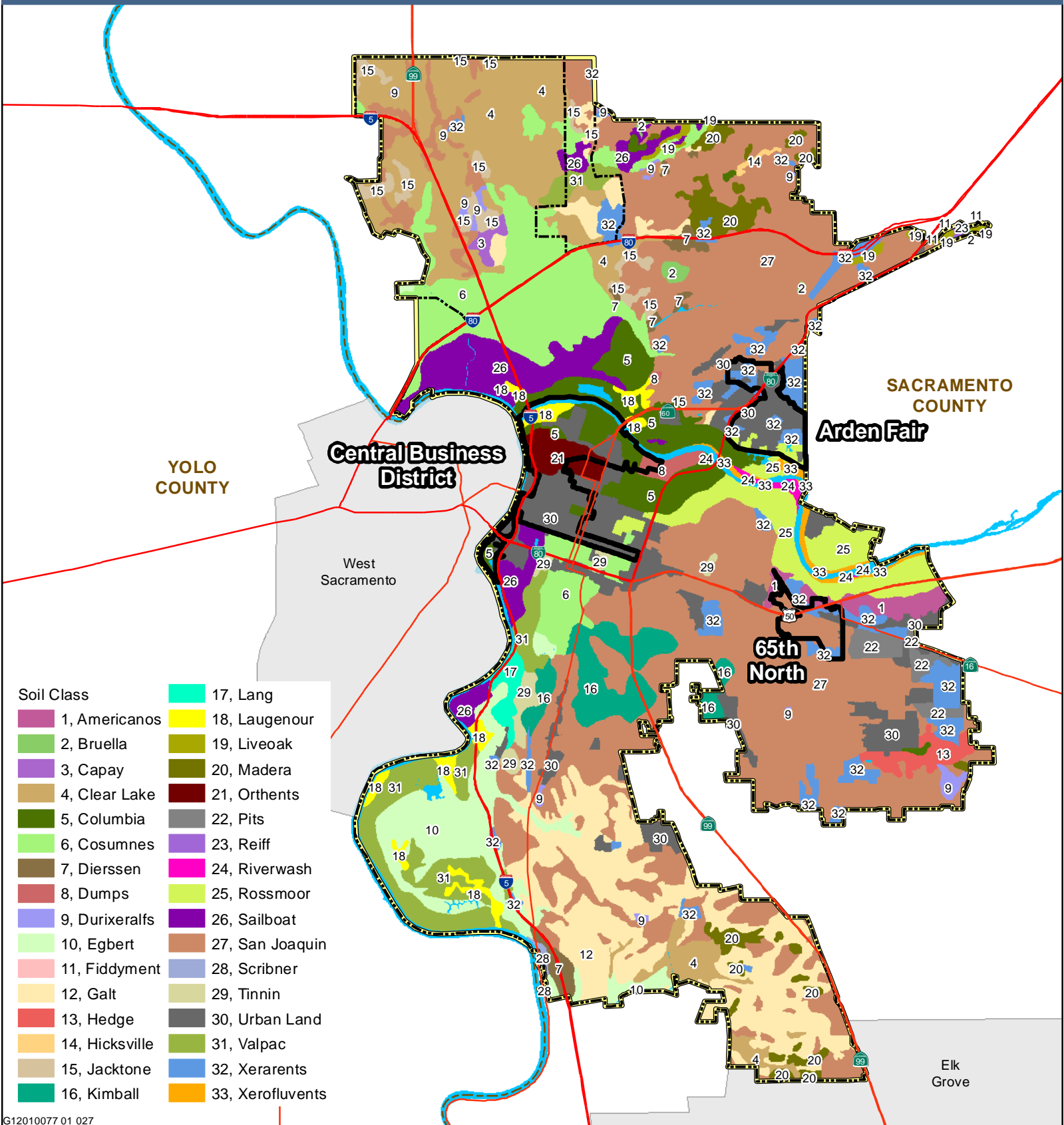
Seiches are waves induced by seismic activity on inland bodies of water. Reservoirs, lakes, ponds, swimming pools, and other enclosed bodies of water are subject to potentially damaging seiches. This hazard is dependent upon specific earthquake parameters (e.g., frequency of the seismic waves, distance and direction from the epicenter), as well as site-specific design of the enclosed bodies of water, and is thus difficult to predict. Areas of the City that may be vulnerable to this hazard are primarily improvements next to the American and Sacramento rivers.

**Dam Failure Inundation.** Dams that are under State jurisdiction are required to have inundation maps that show the potential flood limits in the remote, yet disastrous possibility a dam is catastrophically breached. This hazard is discussed in Section 7.2 Flood Hazards.

## Soils

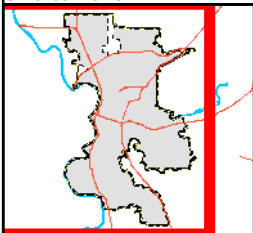
The NRCS has mapped over 30 individual soil units in the Policy Area (Figure 7-1). The predominant soil units in the Policy Area are San Joaquin, Clear Lake, Galt, Cosumnes, and Sailboat soils, which account for over 60 percent of the total land area. The remaining soil units each account for only a few percent or less of the total. The San Joaquin soils are generally present in the eastern and southeastern part of the city. The Clear Lake and Cosumnes soils occur in the northern part of the city. Galt soils are in the southwestern part of the city, in an area generally bound by Interstate 5 and State Route 99. The Sailboat soils occur along the American and Sacramento rivers.

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Soil Class	
1, Americanos	17, Lang
2, Bruella	18, Laugenour
3, Capay	19, Liveoak
4, Clear Lake	20, Madera
5, Columbia	21, Orthents
6, Cosumnes	22, Pits
7, Dierssen	23, Reiff
8, Dumps	24, Riverwash
9, Durixeralfs	25, Rossmoor
10, Egbert	26, Sailboat
11, Fiddyment	27, San Joaquin
12, Galt	28, Scribner
13, Hedge	29, Tinnin
14, Hicksville	30, Urban Land
15, Jacktone	31, Valpac
16, Kimball	32, Xerarents
	33, Xerofluvents

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**Legend**

- Tier 1 Priority Investment Areas
- Major Roads
- Highways
- Waterways
- Policy Area
- City Limits
- County Boundary



0 1 2 Miles

Data Source: City of Sacramento, 2012

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Soil descriptions for the principal soil units in the Policy Area are provided below. These descriptions were developed by the NRCS and are for soils in their native, undisturbed state. Since much of the Policy Area has been developed with urban uses, actual soil characteristics may vary considerably from the mapped locations and description.

**San Joaquin Series.** The San Joaquin series consists of soils that formed in alluvium derived from mixed but dominantly granitic rock sources. Generally, these soils are found on undulating low terraces at slopes of zero to nine percent. These soils are typically well and moderately-well drained, with medium to very high runoff, and very slow permeability. Some areas with these soils are subject to rare or occasional flooding.

**Clear Lake.** The Clear Lake series consists of very deep, poorly drained soils that formed in fine textured alluvium derived from sandstone and shale or other mixed rock sources. Clear Lake soils have clay textures and are generally located in basins and in swales of level drainageways, with slopes of zero to two percent. These soils are generally poorly drained with slow to very slow permeability, and negligible to high runoff. Typically, these soils have a water table at depths of 4 to 10 feet in the late summer, while during wet winter months the water table can be very near the surface in some areas. Some areas are artificially drained.

**Galt.** The Galt series consists of moderately deep and moderately well drained soils that were formed in fine textured alluvium from mixed, but dominantly granitic, rock sources. Galt soils are generally located on low terraces, basins, and basin rims and have slopes of zero to five percent. Some areas are rarely or occasionally flooded for brief to long periods in December through April.

**Cosumnes.** The Cosumnes series consists of very deep somewhat poorly drained soils formed in alluvium from mixed sources. Cosumnes soils are located on low flood plains and have slopes of zero to two percent. These soils have slow permeability and very slow to slow runoff potential. Flooding commonly occurs in unprotected areas, and rare flooding occurs in protected areas during prolonged periods of rainfall in the winter and early spring. Most areas are drained due to ground water overdraft. In some areas along major rivers, a water table occurs from December through April at depths of 36 to 60 inches, due to seepage.

**Sailboat.** The Sailboat series consists of very deep, somewhat poorly drained soils that contain a buried soil and formed in alluvium from mixed sources. Sailboat soils are generally located on natural levees of large rivers and sloughs, and on low flood plains of rivers and streams with slopes of zero to two percent. These soils have moderately slow permeability and slow runoff potential. Occasional flooding occurs in unprotected areas and rare flooding occurs in protected areas during prolonged periods of rainfall in the winter and early spring. Some areas are drained due to groundwater overdraft. In areas along major rivers, a water table occurs from December through April at depths of 36 to 60 inches due to seepage.

### ***Soil Hazards***

**Soil Erosion.** Erosion refers to the removal of soil from exposed bedrock surfaces by water or wind. Erosion occurs naturally in most systems, but is often accelerated by human activities that disturb soil and vegetation. The rate at which erosion occurs is largely a function of climate, soil cover, slope conditions, and inherent soil properties such as texture and structure. For example, the effects of erosion are intensified with an increase in slope (as water moves faster, it gains momentum to carry more debris), the narrowing of runoff channels (which increases the velocity of water), and by the removal of groundcover, which leaves the soil exposed. Although the Policy Area is relatively flat, erosion potential is generally identified on a case-by-case basis, depending on the above-mentioned factors.

**Shrink/Swell Potential (Expansive Soils).** Shrink/swell potential refers to soils that expand when wet and shrink when dry. This hazard occurs primarily in soils with high clay content and can cause structural damage to foundations and roads that do not have proper structural engineering and are generally less suitable or desirable for development than non-expansive soils. Many of the soil units present within the Policy Area, exhibit high shrink-swell potential. Areas within the Policy Area that may be particularly susceptible to high shrink/swell potential include the Natomas and Valley Hi areas. Site-specific geotechnical studies are necessary to identify where such hazards could occur.

**Subsidence.** Subsidence is the sinking of land, usually occurring over broad areas and, therefore, not normally perceptible at the ground surface. Subsidence can be induced by natural processes or by specific human activities. Sacramento County is affected by five types of subsidence. They are compaction of unconsolidated soils by earthquake shaking, compaction by heavy structures, the erosion of peat soils, peat oxidation, and fluid withdrawal. The pumping of water for residential, commercial and agricultural uses from subsurface water tables causes the greatest amount of subsidence in Sacramento County (Sacramento County 2011). This phenomenon particularly occurs in those areas underlain by alluvium soils. Subsidence produces cracks in pavements and buildings and may dislocate wells, pipelines, and water drains. Sacramento has experienced land subsidence in the past. One notable example is the construction of Interstate 5 in downtown Sacramento where the withdrawal of water from the alluvial soils caused the area adjacent to the freeway to subside.

### **Paleontological Background**

Paleontological resources include fossil remains, as well as fossil localities and rock or soil formations that have produced fossil material. Fossils are the remains or traces of prehistoric animals and plants. Fossils are important scientific and educational resources because of their use in: (1) documenting the presence and evolutionary history of particular groups of now extinct organisms, (2) reconstructing the environments in which these organisms lived, and (3) determining the relative ages of the strata in which they occur and of the geologic events that resulted in the deposition of the sediments that formed these strata and in their subsequent deformation. The Quaternary sediments of the Great Valley are gravels laid down by large river systems. These deposits contain well-preserved vertebrate and plant fossils similar to the flora and fauna we see today.

## *Regulatory Context*

Seismic and geologic hazards are primarily regulated at the state level. In California, seismic hazards are regulated by the Alquist-Priolo Earthquake Fault Zone Act and Seismic Hazards Mapping Act.

### **Federal**

#### *Uniform Building Code*

The Uniform Building Code (UBC) provides minimum requirements for grading, building siting, development, and seismic design. The UBC is often adopted by local jurisdictions, along with more stringent standards for development specific to that region.

#### *Federal Antiquities Act*

The Antiquities Act of 1906, as amended, sets forth penalties for damage and destructions of antiquities and stipulates the requirements for permitted excavation.

### **State**

#### *Alquist-Priolo Earthquake Fault Zoning Act*

The Alquist-Priolo Special Studies Act was signed into law in 1972 (in 1994 it was renamed the Alquist-Priolo Earthquake Fault Zoning Act). The primary purpose of the act is to mitigate the hazard of fault rupture by prohibiting the location of structures for human occupancy across the trace of an active fault. The act requires the State Geologist to delineate “Earthquake Fault Zones” along faults that are “sufficiently active” and “well defined.” The act dictates that cities and counties withhold development permits for sites within an Earthquake Fault Zone until geologic investigations demonstrate that the sites are not threatened by surface displacements from future faulting. No portion of the Policy Area is within an Earthquake Fault Zone.

#### *Seismic Hazards Map Act*

Under the Seismic Hazards Mapping Act, seismic hazard zones are to be identified and mapped to assist local governments in land use planning. The intent of this publication is to protect the public from the effects of strong ground shaking, liquefaction, landslides, ground failure, or other hazards caused by earthquakes. In addition, CGS’s Special Publications 117, “Guidelines for Evaluating and Mitigating Seismic Hazards in California,” provides guidance for the evaluation and mitigation of earthquake-related hazards for projects within designated zones of required investigations. The Sacramento region has not been subject to any seismic hazards mapping by CGS.

### ***California Building Code (CBC)***

California Code of Regulations (CCR), Title 24, Part 2, the California Building Code (CBC), provides minimum standards for building design. Chapter 16 of the CBC deals with Structural Design Requirements, including (but not limited to) regulations governing seismically-resistant construction and construction to protect people and property from hazards associated with excavation cave-ins and falling debris or construction materials. Chapters 18 deals with site demolition, excavations, foundations, retaining walls, and grading, including (but not limited to) requirements for seismically-resistant design, foundation investigations, stable cut and fill slopes, and drainage and erosion control. Construction activities are subject to occupational safety standards for excavation, shoring, and trenching as specified in California Division of Occupational Safety and Health regulations (CCR, Title 8). The City implements the CBC through the building permit process (Sacramento City Code, Title 15, Buildings and Construction).

The CBC also defines different building regions in the State and ranks them according to their seismic hazard potential. Seismic Zone 1 has the least seismic potential and Zone 4 has the highest seismic potential. The City is in Seismic Zone 3; accordingly, any future development would be required to comply with all design standards applicable to Seismic Zone 3.

Part 11 of the 2013 Title 24 Building Standards Code is the California Green Building Standards Code, also known as the CALGreen Code. This is the first statewide green building standards code in the nation. The CALGreen Code became effective on January 1, 2011. CALGreen provides a set of mandatory provisions for all new construction and includes two voluntary “Tiers” that may be adopted via local amendment. Residential provisions include energy efficiency standards, pre- and post-construction stormwater drainage retention measures, indoor water use reduction, irrigation control, diversion of construction waste, fireplace restrictions, among many other specific measures. Non-residential requirements include several similar measures as the residential but also include bicycle parking requirements, clean-air vehicle parking requirements, light pollution reduction measures, among other specific measures (USGBC nd).

## **Local**

### ***Sacramento County Local Mitigation Plan***

The Sacramento County Local Hazard Mitigation Plan aims to reduce or eliminate long term risk to people or property from natural disasters, including flood and seismic events. The plan covers areas located outside of the city boundary but within the Policy Area. The plan notes that Sacramento is located in Seismic Hazard Zone 3. One of the most notable potential hazards associated with a major seismic event is the potential for damage to flood levees (Sacramento County 2011).

### ***City of Sacramento Emergency Operations Plan***

The Emergency Operations Plan addresses the City of Sacramento’s planned response to extraordinary emergency situations associated with natural disasters, including flood events, seismic events, technological incidents, and nuclear defense operations. It provides operational concepts related to various emergency situations, identifies components of the local emergency management organization, and describes the City’s overall responsibilities for protecting life and property during an emergency. The plan also identifies possible sources of outside support (through mutual aid and specific statutory authorities) from other jurisdictions, and the private sector.

### *Sacramento City Code*

**Chapter 15.20 (Uniform Building Code).** This chapter of the Municipal Code adopts the California Building Code (CBC), 2010 Edition, and amends particular sections where appropriate to suit the specific conditions within the City of Sacramento. 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.

**Chapter 15.88 (Grading and Erosion and Sediment Control).** The city's grading ordinance is enacted for the purpose of regulating grading on property within the city 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 from construction sites; to comply with the City's National Pollution Discharge Elimination System Permit issued by the California Regional Water Quality Control Board; and to ensure that the graded site within the city limits complies with 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 maintains policies and guidelines regarding grading, erosion control, stormwater drainage design, inspection, and permitting. It is responsible for issuing several types of permits, including grading and construction permits.

### *Findings*

- Within the City of Sacramento and the Sacramento region, there are no known faults. The greatest earthquake threat to the city comes from earthquakes along Northern California's major faults, which are the San Andreas, Calaveras, and Hayward faults. Ground shaking on any of these faults could cause shaking within the City to an intensity of 5 to 6 Mw.
- Sacramento's seismic ground-shaking hazard is low, ranking among the lowest in the state. The city is in Seismic Zone 3; accordingly, any future development, rehabilitation, reuse, or possible change of use of a structure would be required to comply with all design standards applicable to Seismic Zone 3.
- Areas susceptible to liquefaction hazards include the Central City, Pocket, and North and South Natomas. [Mintier—please verify terminology consistency] However, because soil types can vary considerably and depth to groundwater is an important factor in liquefaction potential, site-specific geotechnical studies should be used to determine whether a specific location may be subject to liquefaction hazard.
- Because the City is flat, slope stability, landslide, and erosion hazards do not present substantial hazards to people and property. Site-specific effects of erosion are generally limited to construction, when stormwater runoff can carry sediment into local waterways or fugitive dust emissions.

- A general review of soil characteristics indicate most of the Policy Area is underlain by soils that exhibit low expansion (shrink/swell) properties. Areas in the Natomas and Valley Hi neighborhoods are the primary locations where expansive soils are present. Site-specific geotechnical investigations should be used to delineate expansive soils at a site.
- Land subsidence has been identified as a potential hazard in the Policy Area, primarily related to groundwater withdrawal.

## 7.2 Flood Hazards

### *Introduction*

Over the course of Sacramento's history, floods have been the most frequent and considerable natural hazard affecting the City's environment and economy (Sacramento County 2008). This section describes the existing flood hazards within the Policy Area, as well as the flood protection measures provided by federal, state, and local programs. The information for this section comes from a variety of documents, including the Sacramento County Local Hazard Mitigation Plan (Sacramento County 2011), the Sacramento and San Joaquin River Basins Comprehensive Study Interim Report (Reclamation Board and Corps 2002), and the subsequent Central Valley Flood Protection Plan (DWR 2012).

### *Existing Conditions*

The City of Sacramento is located at the confluence of the Sacramento and the American rivers in the southern portion of the Sacramento River Basin. The Sacramento River Basin encompasses about 27,000 square miles and is bounded by the Sierra Nevada to the east, the Coast Ranges to the west, the Cascade Range and Trinity Mountains to the north, and the Delta to the southeast. The Sacramento River forms the western boundary of the Policy Area from Interstate 80 to south of the Pocket Area (see Figure 6-7). The American River transects the Policy Area, flowing west to join the Sacramento River roughly along the northern boundary of the Central Business District. The American River watershed is situated on the western slope of the Sierra Nevada. Elevations in the watershed range from over 10,000 feet above mean sea level in the high Sierra to 23 feet above mean sea level at the confluence of the American and Sacramento rivers.

The Policy Area contains many natural and man-made drainage features, which ultimately drain into the Sacramento River. Six small tributaries of the Sacramento River pass through, and provide drainage for, the City of Sacramento. These tributaries include Dry Creek, Magpie Creek, and Arcade Creek in the northern portion of the City, and Morrison Creek, Florin Creek, Elder Creek, Unionhouse Creek, and Laguna Creek in the southern portion of the City. These creeks, in addition to local surface water drainages such as Chicken Ranch and Strong Ranch sloughs form the major natural drainages within the Policy Area. Man-made drainage canals, such as the Natomas East Main Drain Canal and the East, West, and Main Drainage Canals provide drainage for a large portion of the urbanized areas within the Policy Area that are not served by the Combined Sewer System or the City's sumps.

High water levels along the Sacramento and American rivers are a common occurrence in the winter and early spring months due to increased flow from storm runoff and snowmelt. An extensive system of dams, levees, overflow weirs, drainage pumping plants, and flood control bypass channels strategically located on the Sacramento and American rivers has been established to protect the area from flooding. These facilities control floodwaters by regulating the amount of water passing through a particular reach of either river. The amount of water flowing through the levee system can be controlled from outside of the Policy Area by Folsom Dam on the American River and the reserve overflow area of the Yolo Bypass on the Sacramento River.

Folsom Dam is located on the American River approximately 15 miles east of the Policy Area. The dam is owned and operated by the U.S. Bureau of Reclamation. Folsom Lake and its afterbay, Lake Natoma, release water to the lower American River and to the Folsom South Canal. The operation of Folsom Dam directly affects most of the water utilities on the American River system.

Water flows into the Yolo Bypass via the Fremont Weir northwest of the Policy Area and the Sacramento Weir west of the Policy Area. The Sacramento River bypass system was federally authorized in 1917 and includes a system of flood relief structures and weirs that release Sacramento River flows into the bypass system west of the Policy Area when flows exceed downstream channel capacity (DWR 2011). Downstream of the American River confluence, the Sacramento River has a design capacity of 110,000 cubic feet per second (cfs). The American River, however, enters the Sacramento River with a design capacity of 180,000 cfs. During periods of high flow, the 2-mile portion of the Sacramento River between the Sacramento Bypass and the American River confluence can support reverse river flow so that a portion of the American River input flows upstream and through the Sacramento Weir. The Sacramento Weir diverts floodwaters west down the mile-long Sacramento Bypass into the Yolo Bypass. The Sacramento Weir was most recently opened in 1998 and 2005 (DWR 2005). It is a key structure protecting the City of Sacramento during high flows on the Sacramento River, diverting flows through the Sacramento Bypass into the Yolo Bypass for safe passage to the Delta. Additional Information on these resources is provided in Section 6.3 Water Resources.

### **100-year Flood Hazard Zone**

Flood hazard areas identified on the Flood Insurance Rate Map (FIRM) are identified as a Special Flood Hazard Area (SFHA). SFHA are defined by FEMA as the area that will be inundated by the flood event having a 1-percent chance of being equaled or exceeded in any given year. The 1-percent annual chance flood is also referred to as the base flood or 100-year flood. (FEMA 2013 [FEMA 2013. Flood Zones Definition. Available at: <http://www.fema.gov/floodplain-management/flood-zones>. Accessed October 23, 2013]). Figure 7-2 shows the FIRM flood hazard zones within the Policy Area and identifies the 100-year flood hazard zone areas. The specific FIRM zones are discussed in detail below under “Regulatory Context” within the discussion of the Federal National Flood Insurance Act of 1968.

### **200-year Floodplain**

In general, the area adjacent to a stream, river, or other water channel is called the floodplain. The floodplain is the area that is inundated during a flood event and is often physically discernible as a broad, flat area created by historical floods. Within the City of Sacramento, the 200-year floodplain (0.5% annual chance of inundation) covers 56,543 acres, which is the majority of the Policy Area. SB 1278 (2012) and AB 1965 (2012) directed DWR to release floodplain maps for urban areas by July 2,

2013, to provide information on the water surface elevation of flooding in the event of failure of State Plan of Flood Control (SPFC) facilities during a 200-year event. The 200-year floodplain is shown on Figure 7-3. The map on Figure 7-3 reflects DWR's latest available data (at the time of this writing), which utilizes data from the US Army Corps of Engineers to depict the 200-year floodplain.

## Zone X and Shaded Zone X

Areas within Zone X and shaded Zone X (See Figure 7-2 and 7-2A) are considered by FEMA to be areas of minimal hazard (500-year flood zone) or moderate hazard (100-500-year flood zone), respectively. However, buildings in these zones could be flooded by severe, concentrated rainfall coupled with inadequate local drainage systems. Local stormwater drainage systems are not normally considered in a community's flood insurance study. The failure of a local drainage system can create areas of high flood risk within these zones. Flood insurance is available in participating communities, but is not required by regulation in these zones.

## Types of Floods

Over the course of the City's history, floods have been the most frequent and considerable natural hazard affecting the City's environment and economy. There are three different types of flood events in the Sacramento area: flash, riverine, and urban stormwater. These floods are often the result of severe weather and excessive rainfall, either in the city or in areas upstream of the city (i.e., Sacramento River watershed in the northern portion of the valley).

The term flash flood describes localized floods of high volume and short duration, generally less than four hours. This type of flood usually results from a heavy rainfall on a relatively small drainage area. Precipitation of this sort usually occurs in the spring and summer. Dam failures also often result in flash flooding.

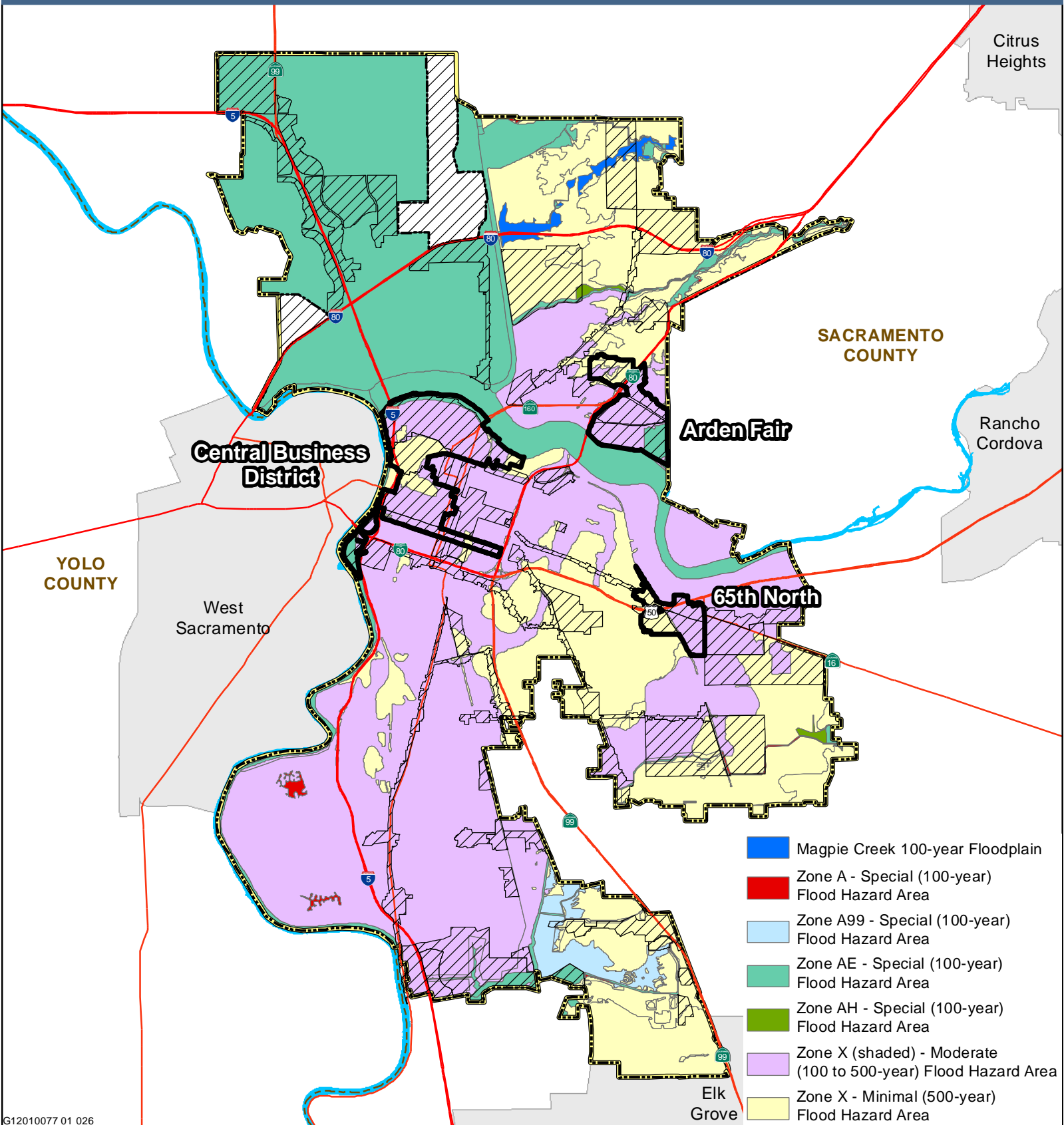
The most common type of flood event is riverine flooding, which occurs when a watercourse exceeds its bank-full capacity. Riverine flooding is a result of prolonged rainfall that is combined with saturated soils from previous rain events or snowmelt, and is characterized by high peak flows of moderate duration and by a large volume of runoff. Riverine flooding occurs in river systems with tributaries that drain large geographic areas, often including many watersheds and sub-watersheds. The duration of riverine floods varies from a few hours to many days. Factors that directly affect the amount of flood runoff include precipitation amount, intensity and distribution of rainfall, soil moisture content, channel capacity, seasonal variation in vegetation, snow depth, and water-resistance of the surface due to urbanization. In Sacramento County, riverine flooding typically occurs between November and April.

Urbanization may increase peak flow runoff, as well as the total volume of stormwater runoff from a site. The increase is dependent upon the type of soil and its topography compared to the proposed land uses. The Natural Resources Conservation Service, a division of the U.S. Department of Agriculture, has surveyed the soil types in the city and county. Much of the county is characterized by soils with low permeability and high runoff rates. For specific information regarding soil types in the Policy Area, please refer to Section 7.1 Geological and Seismic Hazards.

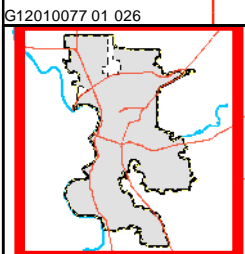


Urban stormwater flooding occurs when storm drains are not properly sized or experience temporary blockage. This flooding is typically localized. Refer to Section 4.1 Sewer/Storm Drainage for a discussion of storm drains in the Policy Area.

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- Magpie Creek 100-year Floodplain
- Zone A - Special (100-year) Flood Hazard Area
- Zone A99 - Special (100-year) Flood Hazard Area
- Zone AE - Special (100-year) Flood Hazard Area
- Zone AH - Special (100-year) Flood Hazard Area
- Zone X (shaded) - Moderate (100 to 500-year) Flood Hazard Area
- Zone X - Minimal (500-year) Flood Hazard Area



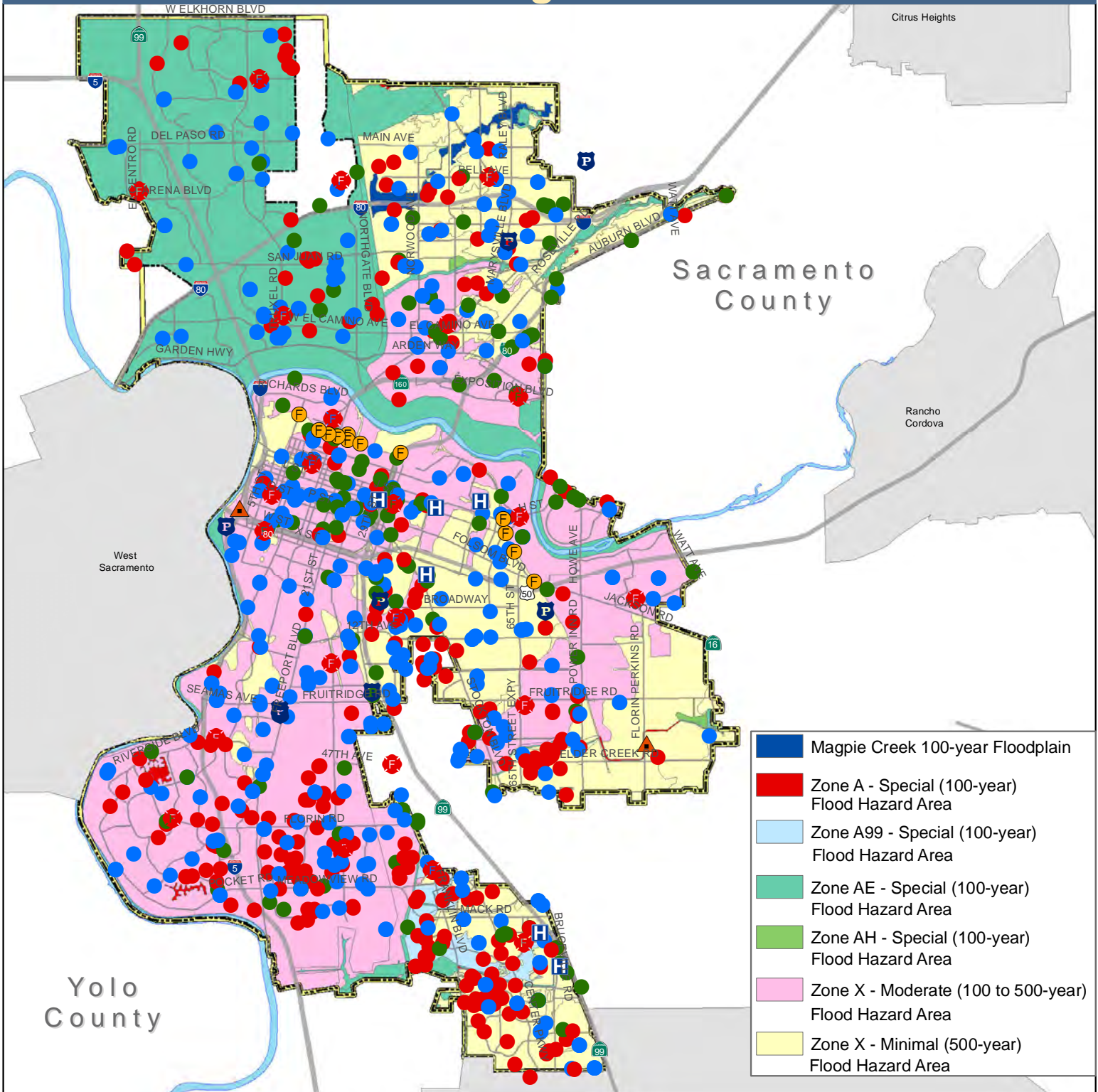
**Legend**

- Tier 1 Priority Investment Areas
- City Limits
- Policy Area
- County Boundary
- Highways
- Waterways



0 1 2 Miles

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- City Limits
- Policy Area
- Waterways

**Facility Type**

- Daycare-K thru 12
- Disabled - Elderly Care
- Adult Ed, Community & Health Cntr

- Major Hospitals
- Fire Department
- Police Department
- Animal Shelter
- Existing Flood Gate



0 1 2 Miles

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## History of Flood Protection

In the late 1800's, the last two miles of the American River were straightened so that it would connect with the Sacramento River approximately 1 mile north of the original location to create faster flows to flush mining debris in the Sacramento River. Later, a series of significant floods resulted in officials raising the level of the City by about 10 feet. Massive floods between 1902 and 1909 prompted Congressional approval of financing for a comprehensive flood control plan in 1917. With the passage of the Flood Control Act in 1944, the United States Army Corps of Engineers (USACE) began to build Folsom Dam. When the Folsom Dam was completed in 1956, it was intended to provide flood control for Sacramento up to a 500-year level storm. However, after the dam became operational, a series of record storms and flood flows resulted in downgrading the dam to flood control effectiveness only up to a 60-year storm. The Sacramento Area Flood Control Agency (SAFCA) was formed to address the Sacramento area's vulnerability to catastrophic flooding. This vulnerability was exposed during the record flood of 1986 when Folsom Dam exceeded its normal flood control storage capacity and several area levees nearly collapsed under the strain of the storm. In response, the City of Sacramento, Sacramento County, Sutter County, the American River Flood Control District, and Reclamation District 1000 created SAFCA through a Joint Exercise of Powers Agreement to provide the Sacramento region with increased flood protection along the American and Sacramento rivers. In 1994, operations at Folsom Dam were adjusted and coordinated so that upstream reservoirs could assist in flood control measures, increasing the dam's effectiveness.

In February 1996, the City prepared the Comprehensive Flood Management Plan to better protect citizens and property from major flood events. The Comprehensive Flood Management Plan was conceived as an implementation tool for the City Council to use in planning future modifications to policies and ordinances to enhance the level of flood protection in the City. Also in 1996, Congress approved funding of American River levee improvements. In 1999, Congress approved significant flood control projects, including the enlargement of the outlets in Folsom Dam, and raising the lowest levees on the American River, and Morrison Creek and its tributaries in southern areas of the city.

### *Natomas Basin and Natomas Levee Improvement Program*

In December of 2008, the Flood Insurance Rate Maps (FIRMs) for the Natomas Basin were remapped by FEMA. The area, which was previously understood to offer between 100-year and 500-year protection (Shaded X Zone) was reclassified as within the 100-year flood hazard zone (AE Zone) after the Corps decertified the levee system protecting the basin. The remap required mandatory flood insurance for property owners and meant all new construction or substantial improvements to structures had to meet a 33-foot base flood elevation requirement. Prior to the Corps decertification, SAFCA implemented the Natomas Levee Improvement Program (NLIP) to upgrade the levee system protecting the Natomas Basin (City of Sacramento 2010). Construction on the NLIP began in 2007.

The principal objective of the NLIP is providing 200-year flood protection to the Natomas Basin. As of December 2012, most of SAFCA's work under the NLIP had been completed or was planned for completion in 2013. Completion of the Corps' portion of the project was tentatively scheduled for 2014. A report documenting compliance with FEMA Zone A99 (areas subject to inundation by the 1-percent-annual-chance flood event, but which will ultimately be protected upon completion of an under-construction federal flood protection system) was submitted to FEMA in November of 2012. Congressional authorization will be required to achieve A99 status (SAFCA 2012).

### ***Folsom Dam Joint Federal Project***

This project consists of a six-gated control structure, a spillway with a stilling basin, and an approach channel in the reservoir leading to the control structure. The project is designed to improve the ability to manage large flood events by allowing more water to be safely released earlier in a storm event, thereby leaving more storage capacity in the reservoir to hold back the peak inflow when it arrives. With a peak inflow of 450,000 cfs in a 200-year design storm, releases can be held to 160,000 cfs or less, which can be safely conveyed with the improved American River levees. The new auxiliary spillway also allows passage of the probable maximum flood without damaging the dam (SAFCA 2013a). The project is expected to be completed in 2017 (Reclamation 2011).

### ***American River Common Features Project***

This project was designed to strengthen the levees along the American River so they can safely pass a flow of 160,000 cfs. The project has installed roughly 24 miles of slurry wall up to depths of 80 feet, raised levees to provide adequate freeboard, addressed slope stability issues, and corrected some erosion problems. The majority of levee work has been completed, with the exception of approximately 14 locations in the levee that do not have a slurrywall installed due to conflict with existing infrastructure (SAFCA 2013b).

The Common Features General Re-evaluation Report is planned for 2014. This report will investigate the flood protection system along the American River, Natomas, the east side of the Sacramento River, and the levees in North Sacramento to identify what improvements are needed to bring the system up to a 200-year standard (SAFCA 2013b).

### ***Sacramento Bank Protection Project***

This program addresses long term erosion protection along the Sacramento River and its tributaries. Within the Sacramento area, bank protection measures typically consist of large angular rock placed to protect the bank topped with a layer of soil/rock material to allow vegetation re-grow back on the bank. In addition, dead trees may be added to the mixture for additional habitat value. Construction under this program is ongoing, occurring at several identified hazard areas each year (SAFCA 2013c).

### ***South Sacramento Streams Group Project***

This project addresses flooding from Morrison, Florin, Elder, and Unionhouse creeks. The project is nearly complete. Flood walls have been constructed on Morrison Creek from Beach Lakes to Franklin Boulevard and on Unionhouse, Elder, and Florin creeks from the confluence with Morrison to Franklin Boulevard. In 2012, the City and SAFCA widened Unionhouse Creek east of Franklin in order to pass the 100-year flood. The widening of Florin Creek and a detention basin is planned for construction in 2014. These improvements will remove the large area of the A99 flood hazard zone and relieve residents of required flood insurance.

## **Flood Risk from Dam Failure**

Dams and reservoirs have been built throughout California for water supply, flood control, hydroelectric power and recreational facilities. The storage capacities of these reservoirs range from a few thousand acre-feet to five million acre-feet. There are numerous dams that may impact the people and resources of the city of Sacramento if they were to fail. These dams include Shasta on the Sacramento River, and Folsom and Nimbus on the American River.



When dams are constructed for flood control, they are usually engineered to contain a flood with a computed risk of occurrence. They are constructed of earth, rock, concrete, or mine tailings. Two factors that influence the potential severity of a full or partial dam failure include the amount of water impounded, and the density, type, and value of development and infrastructure located downstream. If a flood occurs that exceeds the dam's designed flood capacity, that structure will either release water through its spillway or be overtopped. Overtopping is the primary cause of earthen dam failure. Dam failures can create flash floods that are catastrophic to life and property. Other causes of dam failure include any one, or a combination of, the following causes:

- prolonged periods of rainfall and flooding;
- earthquake;
- inadequate spillway capacity, resulting in excess overtopping flows;
- internal erosion caused by embankment or foundation leakage or piping;
- improper design;
- improper maintenance;
- negligent operation; and
- failure of upstream dams on the same waterway.

For planning purposes, the State Office of Emergency Services, with information from the U.S. Bureau of Reclamation and the California Department of Water Resources (DWR), has the responsibility to provide local governments with critical hazard response information, including flooding from dam inundation. The Office of Emergency Services has mapped the dam inundation zones in the City. The occurrence of dam inundation is based on extremely remote conditions.

The dam inundation map for Folsom Dam, the largest along the American River, shows that a majority of the Policy Area would be inundated with water beyond the capacity of the current flood control levees along the river if the dam failed. The floodwaters of the Folsom Dam system would affect the cities of Folsom and Sacramento and the surrounding unincorporated areas. The failure of the earthen dikes to the north of Folsom Dam would impact the relatively low areas of Sacramento County leading to Roseville. The water would then flow into the Natomas area of the City of Sacramento and then, depending on if the levees held, this water could fill the old Lake Natomas bed and possibly flood the North Highlands and Rio Linda areas. It would then flow into the American River basin, eventually arriving in downtown Sacramento.

The Sacramento Municipal Utility District inundation map indicates that a failure of the Rancho Seco Dam would flow to the Laguna Creek Basin and stop approximately at Stockton Boulevard. Failure of Shasta Dam would affect populations south along the Sacramento River basin to about Knights Landing, where it would lose momentum. Since 1950, there have been no dam failures in Sacramento County (Sacramento County 2004).

Figure 4.65 in Section 4.3.4 of the Sacramento County Local Hazard Mitigation Plan (Sacramento County 2011) shows the inundation areas in the City of Sacramento and the County. The County's Local Hazard Mitigation Plan can be viewed online at the following URL:

<http://www.waterresources.saccounty.net/Pages/Reports-DMA.aspx>

## **Flood Risk from Levee Failure**

Urban levees in the Sacramento River Basin have been evaluated by DWR based on the Corps' Design and Construction of Levees Engineering Manual 1110-2-1913 and the DWR Interim Levee Design Criteria for Urban and Urbanizing Areas in the Sacramento-San Joaquin Valley, Version 4 (DWR 2011). This hazard classification process mapped the relative levee conditions in the Sacramento River Basin. Within the Policy Area, most levees along the American River, and along the Sacramento River between the American River confluence and the Pocket Area, are lower concern. In the northern portion of the Policy Area, the levees along the Sacramento River and the Natomas East Main Drainage Canal are of higher concern. There are also smaller sections of higher concern along the northern bank of the American River from the Natomas East Main Drainage Canal to the Sacramento River confluence, and the western bank of the Sacramento River through the Pocket Area.

In partnership with the County of Sacramento, the City of Sacramento has prepared a series of detailed maps of inundation patterns following hypothetical levee breaks. These maps include flood depths, rescue areas, evacuation areas, and potential evacuation routes. Places expected to fill with between 1 and 26 feet of water within 10 days are identified as evacuation areas. Where flood waters may reach a depth of at least 1 foot within 2 hours of a levee failure, people are more likely to be stranded and require rescue; these areas are mapped as rescue areas. The location of the rescue areas depends on the modeled levee breaches.

## **Potential Future Flood Hazards from Climate Change**

The scientific community is continuously increasing its understanding of the effects of global climate change, including the potential for an increase in flood hazards from altered meteorology and sea level rise. State, regional, and local governments in California have also been developing their awareness of the potential statewide and region-specific risks. It is important, especially for areas protected from flooding by levees, to consider the potential for climate change to adversely affect flood risks. According to the 2009 California Climate Adaptation Strategy, California's water systems are designed and currently operated to strike a balance between water storage for the dry months and flood protection during the winter and spring, when heavy rainstorms, runoff, and snowmelt can cause downstream flooding. While some climate models predict an overall drying of California's climate, there are also predictions of continued risks from intense rainfall events that can generate more frequent and/or more extensive runoff and flooding in the future (Natural Resources Agency 2009). In 2011, the California Ocean Protection Council adopted a resolution that included sea-level rise projections of 14 inches by 2050 and 55 inches by 2100, which are the averages of multiple models (COPC 2011). Sea-level rise could exacerbate flood risk in low-lying, levee-protected areas close to the Delta. Predictions of more extreme future flooding are echoed by the 2012 CVFPP; however, the CVFPP also explains that the development of climate-change influenced, flood hydrology modeling is a complicated exercise that must account for many uncertainties. DWR, in partnership with the USACE, is in the process of developing updated hydrologic modeling that includes the effects of climate change. This updated modeling will be used for technical evaluations leading to the 2017 update of the CVFPP (DWR 2012).

## Flooding Information Required in the General Plan

California Government Code Section 65302 requires General Plans to include a series of flood-related exhibits, including the 200-year flood plain (as illustrated in Figure 7-3) and the FIRM maps with hazard area zones (as provided in Figure 7-2). The additional required information is described briefly below with web links to the maps.

**California Water Code Section 9610(d) Maps.** As directed by California Water Code Section 9610(d), DWR has developed and released floodplain maps for existing urban and adjacent urbanizing areas in the event of the failure of the SPFC facilities during flooding that has a 1-in-200 chance of occurring in any given year. The maps developed pursuant to California Water Code Section 9610(d) do not affect FEMA's National Flood Insurance Program (NFIP) implementation or the target level of flood protection for USACE's federal studies. (DWR 2013) Figure 7-3 reflects DWR's most current data regarding the 200-year flood plain.

**Designated Floodway Maps.** The Designated Floodway refers to the channel of the stream and that portion of the adjoining floodplain reasonably required providing for the passage of a design flood; it is also the floodway between existing levees as adopted by the Central Valley Flood Protection Board (Board) or the Legislature. The Board, under Section 8609 of the Water Code, has the authority to designate floodways in the Central Valley. California Code of Regulations, Title 23, Waters, provide further details of the Board's regulatory authority. Specifically, Title 23, Article 5, Section 107 regulates uses in Designated Floodways. California Department of Water Resources (DWR) includes designated floodway maps on their internet file transfer site. The maps included for Sacramento County are located here:

[ftp://ftp.water.ca.gov/fpm/designated\\_floodway/Sacramento%20County/](ftp://ftp.water.ca.gov/fpm/designated_floodway/Sacramento%20County/)

**Floodplain Awareness Maps.** The intent of the DWR's Awareness Floodplain Mapping project is to identify all pertinent flood hazard areas by 2015 for areas that are not mapped under FEMA's National Flood Insurance Program (NFIP) and to provide the community and residents an additional tool in understanding potential flood hazards currently not mapped as a regulated floodplain. The awareness maps identify the 100-year flood hazard areas using approximate assessment procedures. These floodplains are shown simply as flood prone areas without specific depths and other flood hazard data. Currently, the only Awareness Floodplain Map available within the City of Sacramento is for the area south of Florin Road, available at the following website:

[http://www.water.ca.gov/floodmgmt/lrafmo/fmb/fes/awareness\\_floodplain\\_maps/sacramento/](http://www.water.ca.gov/floodmgmt/lrafmo/fmb/fes/awareness_floodplain_maps/sacramento/)

**Levee Flood Protection Zone Maps.** The Levee Flood Protection Zone (LFPZ) maps were developed by DWR as required by Water Code Section 9130 to increase awareness of flood risks associated with State-Federal levees. The maps should not be confused with FEMA's FIRMs used for the National Flood Insurance Program. They are not showing the same type of flood hazard and they were prepared for different purposes. LFPZ maps estimate the maximum area that may be flooded, if a State-Federal levee fails, with flows at maximum capacity that may reasonably be conveyed. These maps specifically focus on flood risks associated with State-Federal levees. Lands within the Levee Flood Protection Zone may also be subject to flooding due to other factors including, but not limited to, levee failure at flows less than design capacity, overtopping of a levee, drainage problems, or other types of flooding from sources on the land side of the levee. Lands not mapped within a LFPZ may also be subject to flood risk. The LFPZ for the Sacramento River Basin is available at DWR's website:

[http://www.water.ca.gov/floodmgmt/lrafmo/fmb/docs/SacramentoRiver\\_LFPZ\\_Map.pdf](http://www.water.ca.gov/floodmgmt/lrafmo/fmb/docs/SacramentoRiver_LFPZ_Map.pdf)

**Sacramento Flood Maps.** The City and County of Sacramento have prepared detailed maps showing hypothetical levee breaks, inundation levels and the time it would take for waters to rise in affected neighborhoods, and rescue and evacuation zones. These maps are available at the following URL:

[http://www.cityofsacramento.org/utilities/flood-ready/city\\_county\\_neighborhood\\_flood\\_depth\\_maps.cfm](http://www.cityofsacramento.org/utilities/flood-ready/city_county_neighborhood_flood_depth_maps.cfm)

The breaks on these maps are hypothetical and do not indicate a weakness in the levees at that particular location. The colorful maps come in pairs. One map shows where the water would flow over time and how deep it would get given the hypothetical flooding scenario. Each sample levee break location represents a hypothetical failure along that general stretch of levee. They do not depict known weak points or other issues that suggest a break would occur there versus anywhere else. The corresponding map shows the evacuation areas and evacuation routes and rescue areas.

**Dam Inundation Map.** As mentioned above, the inundation areas in the City of Sacramento and the County are shown in Figure 4.65 in Section 4.3.4 of the Sacramento County Local Hazard Mitigation Plan (Sacramento County 2011), which can be viewed online at:

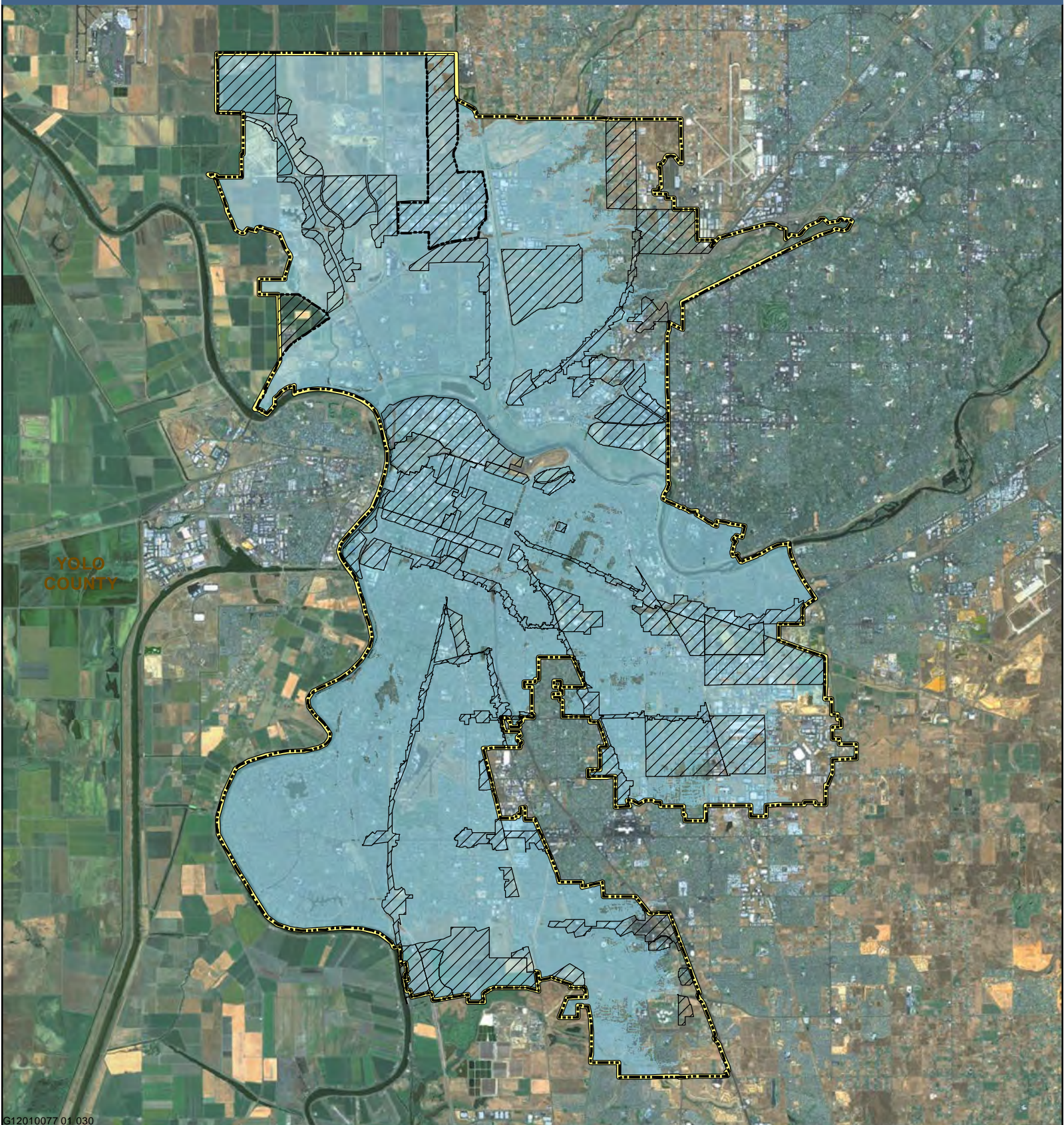
<http://www.waterresources.saccounty.net/Pages/Reports-DMA.aspx>

**Historic Flooding.** The Sacramento County Local Hazard Mitigation Plan includes Figure F.11 that illustrates the history of the City of Sacramento floodplains from prior to 1986 to 2007 and beyond. The Figure includes the history of the flood hazard mapping process for the City, as well as the construction of various flood protection facilities. Figure F.11 is on page F.41 of Annex F of the Local Hazard Mitigation Plan, which is available online at the following URL:

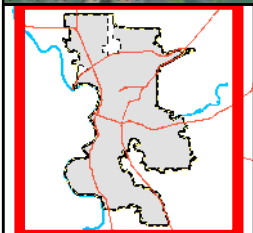
<http://www.waterresources.saccounty.net/Pages/Reports-DMA.aspx>

For a broader discussion of flooding history within the statewide context, Attachment C of DWR's *California's Flood Future* provides a history of flood management in California. (DWR 2013) Attachment C is available at the following URL:

[http://www.water.ca.gov/sfmp/resources/Attachment\\_C\\_History.pdf](http://www.water.ca.gov/sfmp/resources/Attachment_C_History.pdf)



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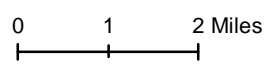


### Legend

- 200-year Floodplain
- 2030 General Plan Opportunity Areas
- City Limits
- Policy Area



0 1 2 Miles



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## *Regulatory Context*

### **Federal**

#### ***U.S. Army Corps of Engineers.***

USACE has nationwide responsibility for flood management. In California, flood management is performed through a combination of projects operated by USACE, Reclamation, the State, local maintaining agencies, and private proponents, all under official USACE flood management plans. Laws and regulations related to USACE functions are described below.

#### *Flood Control Acts*

The following Flood Control Acts have been enacted which affect the Sacramento region.

- The Flood Control Act of 1917 was enacted in response to costly floods in the lower Mississippi Valley, the Northeast, and the Ohio and Sacramento valleys between 1907 and 1913. It authorized the formation of the State/federal Sacramento River Flood Control Project which includes most of the levees, weirs, control structures, bypass channels, and river channels that make up the SPFC in accordance with initial plans contained in the 1910 California Debris Commission report as modified in 1913 and subsequently modified and extended by the Acts of 1928, 1937, and 1941.
- The Flood Control Act of 1936 was enacted as part of the federal New Deal legislation to stimulate the national economy during the Great Depression. This act declared flooding to be a menace to the national welfare and directed the federal government (USACE and the U.S. Department of Agriculture) to improve, or participate in improving, navigable waters or their tributaries if the benefits would exceed costs, and if the lives and social security of people would be adversely affected. The legislation also enabled the federal government to enter into compacts with states or other local agencies for flood management projects.
- The Flood Control Act of 1944 was passed (and amended in 1950) to formally assign the duties of flood management and navigation to USACE, and for federal authorization of projects on the Sacramento and San Joaquin rivers and tributaries. The act authorized construction of Folsom Lake in the Sacramento River Flood Control System.
- The Flood Control Act of 1960 authorized the Sacramento River Bank Protection Project to preserve the integrity of the Sacramento River Flood Control Project levee system.

#### *Operations and Maintenance Controls, Flood Control Projects*

The maintenance and operation of federal project levees is discussed in Title 33, Section 208.10, of the Code of Federal Regulations (33 CFR 208.10), Local Flood Protection Works; Maintenance and Operation of Structure and Facilities. This regulation outlines federal regulatory requirements for the maintenance and operation of structures and facilities that compose the State/federal flood protection system. It, along with Section 14 of the Rivers and Harbors Appropriation Act (Title 33, Section 408 of the U.S. Code), is the basis for requiring permission from USACE before any major

change in maintenance and operations at federal project levees and other facilities such as pumping plants can occur. It also specifies the responsibilities of the maintaining superintendent, necessary inspections, operations and maintenance reporting requirements, maintenance requirements, and high-water/flood operations for local maintenance of federal structures and flood facilities.

#### *Water Resources Development Acts*

Several Water Resources Development Acts have been enacted, which affected funding and environmental goals for USACE flood management projects.

- The Water Resources Development Act (WRDA) of 1986 was the first major “omnibus” projects authorization bill for USACE in 16 years and authorized more than 270 USACE projects for study or construction. It also contained environmental provisions addressing issues such as mitigation, enhancement and modification of USACE projects to improve the environment and authorized more than \$500 million in fish and wildlife mitigation/enhancement features. The WRDA of 1986 directed the Secretary of the Army to issue new guidelines for crediting against the nonfederal share of project costs for flood work carried out by local interests. Prior cost-share provisions for a cash contribution of 5 percent of the cost of the project and the requirement for local provision of lands, easements, rights-of-way, relocations and disposals (LEERD) remained unchanged. The WRDA of 1986 set a 25 percent minimum to 50 percent maximum contribution with LEERD and the cash contribution credited toward this percentage cost share.
- The WRDA of 1990 added environmental protection as a primary mission for USACE. The WRDA of 1990 amended the WRDA of 1986 to treat as construction the costs of planning and engineering for projects for which nonfederal interests contributed 50 percent or more of the cost of the feasibility study.
- The WRDA of 1996 amended cost sharing requirements. Nonfederal sponsors are required to contribute a minimum of 35 percent to a maximum of 50 percent.
- The WRDA of 1999 amended the Flood Control Act of 1936 to authorize funds contributed by states and other political subdivisions for environmental restoration work, in addition to flood management.

#### ***Federal Emergency Management Agency.***

FEMA is responsible for maintaining minimum federal standards for floodplain management within the United States and territories of the United States. As discussed below, FEMA plays a major role in managing and regulating floodplains, which are defined as lowland and relatively flat areas adjoining inland and coastal waters that are subject to a 1-percent or greater chance of flooding in any given year (100-year floodplain).

#### *National Flood Insurance Act of 1968*

The National Flood Insurance Program (NFIP) offers flood insurance to homeowners, renters, and business owners in participating communities. These communities agree to adopt and enforce ordinances that meet or exceed requirements established by FEMA to reduce the risk of flooding. FEMA administers the National Flood Insurance Program and delineates areas subject to flood



hazard on FIRMs for each participating community. The FIRMs show Special Flood Hazard Areas (areas subject to inundation by a flood that has a 1 percent chance or greater of being equaled or exceeded in any given year). The FIRM zones within the policy area are identified on the FIRM map shown in Figure 7-2 and are defined by FEMA as follows.

- Zone A: Areas subject to inundation by the 1-percent-annual-chance flood event generally determined using approximate methodologies. Because detailed hydraulic analyses have not been performed, no Base Flood Elevations (BFEs) or flood depths are shown. Mandatory flood insurance purchase requirements and floodplain management standards apply.
- Zone A99: Areas subject to inundation by the 1-percent-annual-chance flood event, but which will ultimately be protected upon completion of an under-construction Federal flood protection system. These are areas of special flood hazard where enough progress has been made on the construction of a protection system, such as dikes, dams, and levees, to consider it complete for insurance rating purposes. Zone A99 may only be used when the flood protection system has reached specified statutory progress toward completion. No Base Flood Elevations (BFEs) or depths are shown. Mandatory flood insurance purchase requirements and floodplain management standards apply.
- Zones AE: Areas subject to inundation by the 1-percent-annual-chance flood event determined by detailed methods. Base Flood Elevations (BFEs) are shown. Mandatory flood insurance purchase requirements and floodplain management standards apply.
- Zone AH: Areas subject to inundation by 1-percent-annual-chance shallow flooding (usually areas of ponding) where average depths are between one and three feet. Base Flood Elevations (BFEs) derived from detailed hydraulic analyses are shown in this zone. Mandatory flood insurance purchase requirements and floodplain management standards apply.
- Zone AR: Areas that result from the decertification of a previously accredited flood protection system that is determined to be in the process of being restored to provide base flood protection. Mandatory flood insurance purchase requirements and floodplain management standards apply.

The areas of minimal flood hazard, which are the areas outside the SFHA and higher than the elevation of the 0.2-percent-annual-chance flood, are labeled Zone C or Zone X (unshaded). The 100-year flood is the national minimum standard to which communities regulate their floodplains through the National Flood Insurance Program.

*Flood Insurance Reform Act of 2012 (Biggert-Waters Act)*

In 2012, Congress passed this act which calls on FEMA to make a number of changes to the way the NFIP is run. The legislation requires the NFIP to raise flood insurance rates to reflect true risk, make the program more financially stable, and change how FIRM updates impact policyholders. The changes will mean premium rate increases for policyholders over time.

## State

### ***California Department of Water Resources***

DWR was created after severe flooding occurred across Northern California in December 1955. DWR established the Division of Flood Management in November 1977, although flood forecasting and flood operations were integral functions of DWR and its predecessor agencies (e.g., Department of Public Works) for about a century. Today, the functions of statewide flood forecasting, flood operations, and other key flood emergency response activities are the primary missions of the Division's Hydrology and Flood Operations Office. As mandated by the California Water Code, DWR has responsibility for the supervision of dams and reservoirs, which is delegated to the Division of Safety of Dams.

DWR's Division of Flood Management, through its Central Valley Flood Planning Office, and the FloodSAFE Program Management Office are carrying out the work of the agency's FloodSAFE California Program, which partners with local, regional, State, Tribal, and federal officials in creating sustainable, integrated flood management and emergency response systems throughout California. Flood control legislation of 2007 and 2008 directed DWR to prepare a flood control system status report for the SPFC and CVFPP.

### ***Central Valley Flood Protection Board***

The CVFPB was authorized by Sections 8520–9110 of the California Water Code and established in 1911. Section 8590 of the Water Code describes the Board's powers:

*To carry out the primary [S]tate interest described in Section 8532 [of the California Water Code], the [B]oard may do any of the following:*

*(a) Acquire either within or outside the boundaries of the drainage district, by purchase, condemnation or by other lawful means in the name of the drainage district, all lands, rights-of-way, easements, property or material necessary or requisite for the purpose of bypasses, weirs, cuts, canals, sumps, levees,*

*overflow channels and basins, reservoirs and other flood control works, and other necessary purposes, including drainage purposes.*

*(b) Construct, clear, and maintain bypasses, levees, canals, sumps, overflow channels and basins, reservoirs and other flood control works.*

*(c) Construct, maintain, and operate ditches, canals, pumping plants, and other drainage works.*

*(d) Make contracts in the name of the drainage district to indemnify or compensate any owner of land or other property for any injury or damage caused by the exercise of the powers conferred by this division, or arising out of the use, taking, or damage of any property for any of the purposes of this division.*

*(e) Collaborate with [S]tate and federal agencies, if appropriate, regarding multiobjective flood management strategies that incorporate agricultural conservation, ecosystem protection and restoration, or recreational components.*

***California Central Valley Flood Protection Act of 2008***

In 2007, the California Legislature passed a package of several related flood bills, which included a requirement to prepare a Central Valley Flood Protection Plan (CVFPP). Additional requirements for the CVFPP were added in the California Central Valley Flood Protection Act of 2008 (Senate Bill 5), which also defined objectives, codified in California Water Code Section 9616, for reducing the risk of flooding in the Central Valley. The 2007 and 2008 legislation requires DWR to prepare, and update every five years, the CVFPP. The plan is intended to describe both structural and nonstructural means for improving the performance of the levees, weirs, bypasses, reservoirs, and other State Plan of Flood Control facilities.

The Central Valley Flood Protection Act requires that urban and urbanizing areas within the planning area make certain findings related to the provision of a minimum 200-year level of flood protection before making certain land use decisions. The legislation also requires each city and county within the Sacramento-San Joaquin Valley to amend its general plan to include data, analysis, goals, and policies for protection of lives and property, and related feasible implementation measures. With implementation of the Sacramento River Basin major capital improvements under consideration in the 2012 CVFPP, including urban levee improvements on the northern bank of the American River and along NEMDC, the Policy Area would be able to meet the required findings for an urban level of flood protection (DWR 2012).

***Water Code Sections 9602 and 9621***

The 200-year floodplain is defined by this Water Code Section 9602 as the minimum urban level of flood protection in the Sacramento-San Joaquin Valley. Water Code Section 9621 requires counties to collaborate with cities to develop flood emergency plans.

***Government Code Sections 65302 and 65860***

Under these statutes, Cities and Counties are required to amend the land use, conservation, and safety elements of their general plans to address flood risks. The code requires annual review of the land use element for areas identified by FEMA or DWR floodplain mapping. The code also stipulates that the safety element must establish a set of comprehensive goals, policies, objectives, and feasible implementation measures to protect communities from the unreasonable risks of flooding. Zoning ordinances must then be amended for consistency with the modified general plans.

***Government Code Sections 65865, 65962, and 66474***

These statutes pertain to areas within a flood hazard area and serve to limit their development, except where certain findings can be made related to provision of a 200-year level of flood protection in urban and urbanizing areas or a 100-year level of flood protection in nonurbanized areas.

***Local Flood Protection Act of 2008***

This act allows, but does not require, a local agency to prepare a local plan for flood protection. If developed, these local plans should be consistent with the CVFPP.

***State of California Uniform Building Code***

The State of California Building Code (CBC) contains requirements for constructing structures in flood hazard areas. Flood hazard areas are established as areas of special flood hazard as identified by the Federal Emergency Management Agency's Flood Insurance Study (FIS) as adopted by the local authority having jurisdiction where the project is located, as amended or revised with the

accompanying Flood Insurance Rate Map (FIRM). The CBC contains standards for the construction of new buildings, structures, and portions of buildings and structures, including substantial improvements and restoration of substantial damage to buildings and structures. These structures are to be designed and constructed to resist the effects of flood hazards and flood loads (CBC Section 1612A).

## **Local**

### ***Sacramento Area Flood Control Agency Act of 1990***

SAFCA was formed as a Joint Exercise of Powers Agreement to address the Sacramento area's vulnerability to catastrophic flooding. SAFCA's mission is to provide the region with at least a 100-year level of flood protection as quickly as possible while seeking a 200-year or greater level of protection over time. Under the Sacramento Area Flood Control Agency Act of 1990, the California Legislature has given SAFCA broad authority to finance flood control projects and has directed the Agency to carry out its flood control responsibilities in ways that provide optimum protection to the natural environment.

### ***Sacramento County Office of Emergency Services***

The Sacramento Office of Emergency Services (SacOES) coordinates the overall City of Sacramento and countywide response to large scale incidents and disasters. SacOES is responsible for alerting and notifying appropriate agencies when disaster strikes; coordinating all agencies that respond; ensuring resources are available and mobilized in times of disaster; developing plans and procedures in response to and recovery from disasters; and developing and providing preparedness materials for the public.

### ***American River Flood Control District***

The American River Flood Control District (ARFCD), formed in 1927 by the State Legislature, maintains 40 miles of levees along the American River and portions of Steelhead, Arcade, Dry Creek, and Magpie Creek.

### ***Reclamation District 1000***

Reclamation District 1000 (RD1000) is a State-Legislature-created special district that has been providing flood protection and public safety to the Natomas Basin since 1911. RD 1000 is responsible for maintaining over 40 miles of levees surrounding the perimeter of the Natomas Basin to keep floodwaters from the Sacramento River, American River, Natomas East Main Drain Canal, Pleasant Grove Creek Canal, and Natomas Cross Canal out of the basin. RD 1000 also operates and maintains hundreds of miles of canals and seven pump stations to collect and safely discharge rain that falls within the Natomas basin back into the river.

### ***Maintenance Area 9***

Maintenance Area 9 (MA9) is operated by the State of California, Department of Water Resources. MA9 maintains the levees on the east side of the Sacramento River downstream of Sutterville Road to Snodgrass Slough in the County.

### *City of Sacramento*

The City of Sacramento maintains the levees on the Sacramento River from the confluence with the American River downstream to Sutterville Road. The City also maintains the levees/floodwalls within the South Sacramento Streams Group (Morrison Creek).

### *Findings*

- Major surface water resources in the Policy Area include the Sacramento River, the American River, and other natural and man-made drainage features. Flood control facilities along the rivers in Sacramento include a comprehensive system of dams, levees, overflow weirs, drainage pumping plants, and flood control bypass channels.
- Over the course of the Sacramento's past, floods have been the most frequent and considerable natural hazard that has affected the City. Three different types of floods that include flash, riverine, and urban stormwater often occur as a result of severe weather and excessive rainfall, either in the City or in areas upstream of the city.
- Within the Policy Area, 19,651 acres are within the 100-year flood hazard zone and 56,543 acres are within the 200-year floodplain.
- An increase in the urbanization within the Policy Area will increase the number of structures and people exposed to the risks of flooding from floods that are greater than the 100-year flood event.
- The OES has mapped the dam inundation zones in the City. The dam inundation map for Folsom Dam, the largest along the American River, shows that a majority of the Policy Area would be inundated with water beyond the capacity of the current flood control levees along the river. The occurrence of dam inundation is based on extremely remote conditions.

## **7.3 Fire Hazards**

### *Introduction*

This section provides a general description of the urban and wildland fire hazards that exist within the Policy Area, based upon information provided within the City's 2002 Multi-Hazard Emergency Plan, the 2004 Sacramento County Multi-Hazard Mitigation Plan (Sacramento County 2004), and written communication from the City's Fire Department. Resources available to respond to fires are presented in Section 5.2 Fire Protection; City and County response measures to wildland fires and other emergencies are detailed in Section 7.6 Emergency Response.

### *Existing Conditions*

Fire season in the Policy Area extends from early spring to late fall. Hazards arise from a combination of hot weather, an accumulation of vegetation, and low moisture content of the air. If coupled with high winds and years of drought, these conditions can compound the potential impact of a fire.

Major fires are typically classified as either urban fire or wildland fire. A third classification, the urban wildfire, is beginning to be recognized as the population of the Policy Area becomes less concentrated in urban areas and disperses into the more heavily-vegetated wildland/urban interface.

There are three major factors that sustain wildfires and allow for predictions of an area's potential to burn: fuel; topography; and weather. Fuel is the material that feeds a fire and is a key factor in wildfire behavior. Fuel is classified by type and by volume. Fuel sources are diverse and include everything from dead tree needles and leaves, twigs, and branches to dead standing trees, live trees, brush, and cured grasses. Man-made structures and other associated combustibles are also considered fuel sources. The type of prevalent fuel directly influences the behavior of wildfire. Light fuels, such as grasses, burn quickly and serve as a catalyst for fire spread. An area's terrain and land slopes, or topography, also affect its susceptibility to wildfire spread. Fire intensities and rates of spread increase as slope increases due to the tendency of heat from a fire to rise via convection.

Weather components such as temperature, relative humidity, wind, and lightening also affect the potential for wildfire. High temperatures and low relative humidity dry out the fuels that feed the wildfire, creating a situation where fuel can more readily ignite and burn more intensely. Therefore, the threat of wildfire increases during periods of drought. Wind is the most influential weather factor. The greater a wind, the faster a fire will spread, and the more intense it will be. Although significant winds can occur in the Policy Area, the winds most frequently occur during the winter storm season, not during the summer fire season.

Grass fires are an annual threat in the unincorporated areas of Sacramento County, especially within recreational areas such as the American River Parkway. Primarily because there is no forest or rangeland to burn, there is little or no risk to ecosystem health from wildfire in Sacramento County (Sacramento County 2004). The State of California has designated the eastern edge of Sacramento County, over 10 miles east of the Policy Area, as a moderate fire hazard zone. There are no state fire hazard areas in the Policy Area (Cal Fire 2007).

## **Urban Fire Hazard**

Although structural fires can occur in any developed area, there are two areas that are particularly susceptible to fire hazard: older commercial buildings in Downtown Sacramento; and older dwelling units in lower socio-economic neighborhoods. Older building standards and fire codes used in the construction of these structures, use of non-fire-resistive construction materials, and lack of internal sprinklers or other fire safety systems may make these structures more susceptible to fires.

## **Wildland Fire Hazard**

Sacramento is a developed city that has relatively few remaining wildland areas. Areas of the city that have been identified as fairly susceptible to an urban wildfire are generally along the American River Parkway from Watt Avenue to the Sacramento River and along the Garden Highway in the Natomas area. The American River Parkway near Cal Expo is the only wildfire hazard area within the city that is recognized in the Multi-Hazard Mitigation Plan (Sacramento County 2004).

The American River Parkway is a stretch of dense trees and brush on both sides of the American River. The property is owned by the State of California, maintained by the Sacramento County Parks Department, and protected from fire by the Sacramento City Fire Department. The area consists of natural habitat with no fire break areas. Fire equipment access is difficult and limited to the paved stretches of the bicycle path. Some of the potential fire areas are not accessible to vehicular traffic.

To meet the challenge of wildland fires in undeveloped portions of the Policy Area, Metro Fire maintains and operates an air operations program. Included as part of Metro Fire's scope, is the operation of one firefighting/rescue helicopter located at Station 114 (McClellan Air Field).

## *Regulatory Context*

### **Federal**

#### *Uniform Fire Code*

The Uniform Fire Code contains regulations relating to construction and maintenance of buildings and the use of premises. Topics addressed in the code include fire department access, fire hydrants, automatic sprinkler systems, fire alarm systems, fire and explosion hazards safety, hazardous materials storage and use, provisions intended to protect and assist fire responders, industrial processes, and many other general and specialized fire-safety requirements for new and existing buildings and premises. The code contains specialized technical regulations related to fire and life safety.

### **State**

#### *California Fire Code (Title 24, Part 9, California Code of Regulations)*

The California Fire Code is Part 9 of the California Code of Regulations, Title 24, also referred to as the California Building Standards Code. The California Fire Code incorporates the Uniform Fire Code with necessary California amendments. This code prescribes regulations consistent with nationally-recognized good practices for safeguarding life and property from the hazards of fire explosion and dangerous conditions arising from the storage, handling, and use of hazardous materials and devices, and from conditions hazardous to life or property in the use or occupancy of buildings or premises and provisions to assist emergency response personnel.

### **Local**

#### *County of Sacramento Municipal Code*

**Chapter 17.04 (Uniform Fire Code).** This chapter adopts the California Fire Code, Title 24, California Code of Regulations, Part 9, incorporating the Uniform Fire Code, which prescribes regulations governing conditions hazardous to life and property from fire or explosion. The provisions thereof are applicable within the limits of Sacramento County, except for any inconsistent regulations and ordinances adopted pursuant to applicable law by a fire protection district or a community service district having a fire department within the County that are controlling within that district's jurisdictional areas.

**Chapter 17.12 Weed Control.** This chapter declares that the uncontrolled growth and/or accumulation of grass, weeds or other materials or obstructions on sidewalks, streets, and on lands or lots is dangerous or injurious to neighboring property and the health or welfare of residents. In

addition, this is a public nuisance in that it creates a condition that reduces the value of private property, promotes blight and deterioration, invites plundering, creates fire hazards, constitutes an attractive nuisance creating a hazard to the health and safety of minors, creates a harbor for rodents and insects and is injurious to health, safety and general welfare. This chapter provides regulations associated with enforcement and inspection of such hazards, such as required firebreaks.

**City of Sacramento Municipal Code.** The Sacramento Municipal Code contains various titles, chapters, and sections that are associated with fire hazards in that they prescribe regulations to protect the life and safety of residents and property through appropriate building construction standards, weed abatement procedures, and other techniques. Those listed below are directly applicable to fire hazards within the Policy Area.

**Chapter 15.36 Fire Code Adopted.** This chapter, also known as the “fire prevention code” of the city, generally adopts the Uniform Fire Code with deletions, amendments, and additions, as appropriate.

**Section 8.100.630 Fire Hazard.** Listed under Chapter 8.100 (Housing Code), which provides minimum requirements for the protection of life, limb, health, property, safety, and welfare of the general public and the owners and occupants of residential buildings, this section defines fire hazards. Specifically, “any building or portion thereof, device, apparatus, equipment, combustible waste, or vegetation which, in the opinion of the city fire marshal or his or her deputy, is in such a condition as to cause a fire or explosion or provide a ready fuel to augment the spread and intensity of fire or explosion arising from any cause, shall be deemed to be a fire hazard.”

## *Findings*

- The City has identified areas characterized by older buildings constructed prior to requirements for fire-resistant construction materials, internal sprinklers, and other precautions. These areas pose an increased urban fire hazard.
- The areas along the American River Parkway from Watt Avenue to the Sacramento River (especially in the vicinity of Bushy Lake) and along the Garden Highway in the Natomas area are susceptible to wildlife fires.

## **7.4 Aviation Hazards**

### *Introduction*

This section provides a brief description of airports operating in and near the plan area. Information has been derived from several sources, including the airport master plans. Aviation facilities are further discussed in Section 3.5.



## *Existing Documents*

### **Aviation System**

Executive Airport, located in South Sacramento, is the only airport in the Policy Area. Three additional airports have safety zones that include parts of the Policy Area: Rio Linda Airport; McClellan Airfield; and Sacramento International Airport. Other nearby airports include Mather Field, located east of the Policy Area, and Franklin Field, located south of the Policy Area. A brief summary of physical and operational conditions the airports that maintain safety zones in the Policy Area is provided below. Figure 3-9 identifies airport locations.

#### ***Executive Airport***

Executive Airport is located on Freeport Boulevard in South Sacramento. The airport is owned by the City of Sacramento and operated by the Sacramento County Airport System, which has overall responsibility for the operation of the airport on a daily basis. Executive Airport is the area's principal facility for accommodating general aviation. Executive Airport supports aircraft ranging from single engine aircraft to helicopters, larger business and corporate turbine (jet) powered aircraft, and commercial passenger charter flights. The airport does not have scheduled commercial passenger service activity. It has three intersecting runways; the largest runway is 5,503 feet long and 150 feet wide. The airport does not currently have an aircraft rescue and fire fighting facility; however, the City of Sacramento Fire Department is located off Freeport Boulevard, immediately northwest of the airport (Sacramento County 2010).

#### ***Rio Linda Airport***

Rio Linda Airport is privately owned and is not part of the Sacramento County Airport System. It is located one mile south of Rio Linda and immediately north of the Policy Area. It has one runway that is approximately 2,625 feet long and 42 feet wide. A total of 163 aircraft are based at the airport, with most being single-engine planes. Rio Linda Airport serves local general aviation and transient general aviation purposes.

#### ***McClellan Airfield***

McClellan Airfield, formerly McClellan Air Force Base, is also located outside of the city but is adjacent to the northeast corner of the Policy Area. McClellan Airfield, although managed by the County Airport System, is under the County's Department of Economic Development and Intergovernmental Affairs. McClellan Airfield is owned by Sacramento County and has one runway that is 10,600 feet long and 200 feet wide. The airfield has about 84 aircraft with three single-engine, 54 multi-engine, and 19 jet-engine airplanes, four helicopters, and four military aircraft. McClellan Airfield serves air taxi purposes, military, transient general aviation, and limited local general aviation purposes.

#### ***Sacramento International Airport***

Sacramento International Airport provides commercial air service for the region. Sacramento International Airport is located outside the Policy Area, 10 miles northwest of downtown Sacramento. The airport is owned by Sacramento County and has two runways. The longest runway is 8,605 feet long and 150 feet wide. Sacramento International Airport serves millions of passengers each year, and passenger air traffic is anticipated to increase by 3.5 percent per year in the future. Sacramento International serves commercial, local general aviation, air taxi, and limited military

purposes. The County Board of Supervisors adopted a 2007 Sacramento International Airport Master Plan, which establishes a program for the improvement of existing facilities and the development of facilities at the Airport over the next 20 years. A comprehensive undertaking, the process identifies the type and extent of facilities that are required to meet projections of aviation demand and evaluates a full range of alternatives for improving facilities consistent with forecast requirements. All functions at the Airport are considered, including the airfield, terminal and related passenger services, cargo, general aviation, airport support, and access (Sacramento County 2007). The planning process is currently underway for a 2014 Draft Master Plan.

### ***Mather Airport***

Mather Airport primarily accommodates the region's all-cargo carriers. It is located 10 miles east of Sacramento and has two runways. The longest runway is 11,301 feet long and 150 feet wide. Approximately 152 aircraft are based at the airport, including 35 single-engine, 36 multi-engine, and three jet-engine airplanes, 37 helicopters, and 41 military aircraft. Mather Airport serves local general aviation, air taxi, transient general aviation, commercial, and military purposes. There is a 24-hour first response aircraft rescue and firefighting facility onsite (Sacramento County 2004).

### ***Franklin Field***

Franklin Field is a rural airport used primarily for pilot flight training and aviation-related agricultural applications. It is located approximately 20 miles south of downtown Sacramento, and outside of the Policy Area. Franklin Field is currently a public use airport owned and operated by Sacramento County. The airport has two intersecting runways, each approximately 3,000 feet long and 60 feet wide. The facility is considered an uncontrolled airport since it does not have an air traffic control tower or personnel. There are approximately 36,000 operations each year at Franklin Field, including flight training. The airport was acquired by the County of Sacramento in 1947 from the federal government under the Surplus Property Act of 1944 and was the former site of bomber training during World War II. The Elk Grove Fire Department is located approximately eight miles northeast of the Airport and provides fire and emergency response services to the site (Sacramento County 2008).

## **Aircraft Crash Hazards**

Sacramento International Airport poses the greatest risk for aircraft crash hazards within the Policy Area due to its 24-hour operation and large number of flights and passengers. Parts of the Policy Area fall within the airport's designated flight paths, but only at high altitudes. Therefore, the risk of an aircraft crash incident in the region causing a hazard to large populations is reduced.

The City of Sacramento Fire Department has mutual aid agreements with other agencies that could provide assistance in the event of an aircraft accident. Sacramento International Airport, Mather Airport, and McClellan Airfield all have airport crash vehicles that could assist in the event of an accident in the Policy Area. The City's Multi-Hazard Emergency Plan contains strategies to help plan for disaster events, including a major transportation incident, such as an aircraft crash, within the City.

## *Regulatory Context*

### **Federal**

#### ***Federal Aviation Administration Regulations***

The Federal Aviation Administration (FAA) is the federal agency tasked with regulating civil aviation to promote safety, provide an air traffic control system for both military and civil aircraft, and respond to aircraft crash incidents. FAA regulations are mandated to ensure aircraft are suitable for flight to reduce the risk of crash hazards and that airports are sited and operated in a manner to pose the least possible risk to the public.

#### ***Federal Aviation Regulation Part 77***

Federal Aviation Regulation (FAR) Part 77 establishes standards for determining obstructions in navigable airspace and requires that the Federal Aviation Administration Administrator receive notice of proposed construction or alteration at an airport. The standards established in FAR Part 77 apply to alteration of any permanent or temporary existing structure by a change in its height (including appurtenances), or lateral dimensions, including equipment or materials used for construction. Subsections 77.23, Standards for Determining Obstructions, and 77.25, Civil Airport Imaginary Surfaces, are applicable to the proposed project.

### **State**

#### ***State Aeronautics Act***

The California Department of Transportation (Caltrans) Division of Aeronautics performs many functions to promote aviation safety in California. The division relies upon the State Aeronautics Act, Public Utilities Code (PUC) sections 21001 et seq., to provide policies that promote safety in aeronautics. Functions of the division include the issuance of permits, regulations for airport inspection and design, planning to ensure consistency with federal regulations, and providing grants to airports to improve safety.

FAA regulations are administered at the state level by the Caltrans Division of Aeronautics. The California Department of Transportation's mission in aviation is to foster and promote the development of a safe, efficient, dependable, and environmentally compatible air transportation system. The Division issues permits for and annually inspects hospital heliports and public-use airports; makes recommendations regarding proposed school sites within two miles of an airport runway; and authorizes helicopter landing sites at/near schools. Aviation system planning provides for the integration of aviation into transportation system planning on a regional, statewide, and national basis. The Division of Aeronautics administers noise regulation and land use planning laws that foster compatible land use around airports and encourages environmental mitigation measures to lessen noise, air pollution, and other impacts caused by aviation. The Division of Aeronautics also provides grants and loans for safety, maintenance and capital improvement projects at airports.

### **Local**

#### ***Airport Land Use Compatibility Plans***

Public safety and the reduction of aviation hazards are concerns in the airport planning process. The Sacramento Area Council of Governments (SACOG) serves as the Airport Land Use Commission for Sacramento County. The Airport Land Use Commission has two primary functions: (1) the

protection of public health, safety, and welfare through the adoption of land use standards that minimize the public's exposure to safety hazards and excessive noise from nearby airports; and (2) to prevent the intrusion of incompatible land uses around airports to preserve the utility of the County's airports in the future. Comprehensive Land Use Plans (CLUPs) provide safety guidelines, including building restrictions and noise compatibility for areas near airports. SACOG provides CLUPs for the following airports in the vicinity of the City: Mather Airport, McClellan Air Force Base, Rio Linda Airport, Sacramento Executive Airport, and Sacramento International Airport. (SACOG 2013)

### *Findings*

- The Airport Land Use Commission establishes and implements standards that minimize the public's exposure to airport safety hazards and prevent the intrusion of incompatible land uses around airports.

## **7.5 Noise**

### *Introduction*

This section provides relevant acoustical background and the environmental noise conditions within the Policy Area by examining sources of noise attributed to freeways and highways, aircraft, railways, light rail and stationary sources. Data used in the preparation of this section are based upon field measurements, and modeling of existing noise levels from traffic data in the Policy Area.

### **Fundamentals of Sound, Noise, and Vibration**

#### *Sound Properties*

Sound can be described in terms of amplitude (loudness) and frequency (pitch). The standard unit of sound amplitude measurement is the decibel (dB). The decibel scale is a logarithmic scale that describes the intensity of the pressure vibrations that make up a sound. The pitch of the sound is correlated to the frequency of the sound's pressure vibration. Because humans are not equally sensitive to a given sound level at all frequencies, a special scale has been devised to relate noise to human sensitivity. The A-weighted decibel scale (dBA) does this by placing more importance on frequencies that are more noticeable to the human ear.

Sound is a mechanical form of radiant energy, transmitted by a pressure wave through a solid, liquid, or gaseous medium. Noise is typically defined as unwanted sound. A typical noise environment consists of a base of steady "background" noise that is made up of many distant and indistinguishable noise sources. Superimposed on this background noise is the sound from individual local sources. These can vary from an occasional aircraft or train passing by to virtually continuous noise from, for example, traffic on a major highway. Table 7-2 lists representative noise levels for typical sources of environmental noise.

**Table 7-2 Representative Environmental Noise Levels**

<i>Common Outdoor Activities</i>	<i>Noise Level (dBA)</i>	<i>Common Indoor Activities</i>
NA	110	Rock Band
Jet fly-over at 100 feet	100	NA
Gas lawnmower at 3 feet	90	NA
Diesel truck going 50 mph at 50 feet	80	Food blender at 3 feet, garbage disposal at 3 feet
Noisy urban area during daytime, gas lawnmower at 100 feet	70	Vacuum cleaner at 10 feet, normal speech at 3 feet
Commercial area, heavy traffic at 300 feet	60	Dishwasher, clothes dryer
Quiet urban area during daytime	50	Large business office, dishwasher in next room
Quiet urban area during nighttime	40	Theater, large conference room (background)
Quiet suburban area during nighttime	30	Library, bedroom at night, concert Hall (background)
Quiet rural area during nighttime	20	Broadcast/recording studio
Lowest threshold of human hearing	0	Lowest threshold of human hearing

Source: California Department of Transportation, 2009.

***Effects of Noise on Humans***

Excessive and chronic exposure to elevated noise levels can result in auditory and non-auditory impacts to humans. Auditory effects of noise on people are those related to temporary or permanent hearing loss caused by loud noises. Non-auditory effects of exposure to elevated noise levels are those related to behavioral and physiological effects. The non-auditory behavioral effects of noise on humans are associated primarily with the subjective effects of annoyance, nuisance, and dissatisfaction, which lead to interference with activities such as communications, sleep, and learning. The non-auditory physiological health effects of noise on humans have been the subject of considerable research attempting to discover correlations between exposure to elevated noise levels and health problems, such as hypertension and cardiovascular disease. The mass of research infers that noise-related health issues are predominantly the result of behavioral stressors and not a direct noise-induced response. The extent to which noise contributes to non-auditory health effects remains a subject of considerable research, with no definitive conclusions.

The degree to which noise results in annoyance and interference is highly subjective and may be influenced by several non-acoustic factors. The number and effect of these non-acoustic factors vary depending on individual characteristics of the noise environment such as sensitivity, level of activity, location, time of day, and length of exposure. One key aspect in the prediction of human response to new noise environments is the individual level of adaptation to an existing noise environment. The greater the change in the noise levels that are attributed to a new noise source, relative to the environment an individual has become accustomed to, the less tolerable the new noise source will be perceived.

With respect to how humans perceive and react to changes in noise levels, a 1 dB increase is imperceptible, a 3 dB increase is barely perceptible, a 6 dB increase is clearly noticeable, and a 10 dB increase is subjectively perceived as approximately twice as loud (Egan 2007). These subjective reactions to changes in noise levels was developed on the basis of test subjects’ reactions to changes in the levels of steady-state pure tones or broad-band noise and to changes in levels of a given noise

source. It is probably most applicable to noise levels in the range of 50 to 70 dB, as this is the usual range of voice and interior noise levels. For these reasons, a noise level increase of 3 dB or more is typically considered substantial in terms of the degradation of the existing noise environment.

### ***Vibration***

Vibration is the periodic oscillation of a medium or object with respect to a given reference point. Sources of vibration include natural phenomena (e.g., earthquakes, volcanic eruptions, sea waves, landslides) and those introduced by human activity (e.g., explosions, machinery, traffic, trains, construction equipment). Vibration sources may be continuous, (e.g., operating factory machinery) or transient in nature (e.g., explosions). Vibration levels can be depicted in terms of amplitude and frequency (relative to displacement), velocity, or acceleration.

Vibration amplitudes are commonly expressed in PPV or root-mean-square (RMS) vibration velocity. PPV and RMS vibration velocity are normally described in inches per second (in/sec).

Although PPV is appropriate for evaluating the potential for building damage, it is not always suitable for evaluating human response. It takes some time for the human body to respond to vibration signals. In a sense, the human body responds to average vibration amplitude. The RMS of a signal is the average of the squared amplitude of the signal, typically calculated over a 1-second period. As with airborne sound, the RMS velocity is often expressed in decibel notation as vibration decibels (VdB), which serves to compress the range of numbers required to describe vibration (FTA 2006). This is based on a reference value of 1 micro ( $\mu$ ) in/sec.

The typical background vibration-velocity level in residential areas is approximately 50 VdB. Groundborne vibration is normally perceptible to humans at approximately 65 VdB. For most people, a vibration-velocity level of 75 VdB is the approximate dividing line between barely perceptible and distinctly perceptible levels (FTA 2006).

Typical outdoor sources of perceptible ground vibration are construction equipment, steel-wheeled trains, and traffic on rough roads. If a roadway is smooth, the ground vibration is rarely perceptible. The range of interest is from approximately 50 VdB, which is the typical background vibration-velocity level, to 100 VdB, which is the general threshold where minor damage can occur in fragile buildings. Construction activities can generate ground vibrations, which can pose a risk to nearby structures. Constant or transient vibrations can weaken structures, crack facades, and disturb occupants.

Construction vibrations can be transient, random, or continuous. Transient construction vibrations are generated by events such as blasting, impact pile driving, and wrecking balls. Continuous vibrations result from activities such as vibratory pile drivers, large pumps, and compressors. Random vibration can result from jackhammers, pavement breakers, and heavy construction equipment. Table 7-3 describes the general human response to different levels of ground vibration-velocity levels.

<i>Vibration-Velocity Level</i>	<i>Human Reaction</i>
65 VdB	Approximate threshold of perception.
75 VdB	Approximate dividing line between barely perceptible and distinctly perceptible. Many people find that transportation-related vibration at this level is unacceptable.
85 VdB	Vibration acceptable only if there are an infrequent number of events per day.

Notes: VdB = vibration decibels referenced to 1 μ inch/second and based on the RMS velocity amplitude  
 Source: FTA 2006

## *Existing Conditions*

### **Sensitive Receptors**

Sensitive noise receptors typically include residences, schools, child care centers, hospitals, long-term health care facilities, convalescent centers, and retirement homes. Each of these land use types currently occur within the Policy Area.

### **Sources of Noise**

Land uses within the Policy Area include a range of residential, commercial, institutional, industrial, recreational, and open space areas. Although there are many noise sources within the Policy Area, the primary noise source is vehicular traffic. Significant noise also occurs from airplane traffic, railroads, and various stationary sources as described below.

#### ***Freeways and Highways in the Policy Area***

Motor vehicle noise commonly causes sustained noise levels in the vicinity of busy roadways or freeways. Several major freeways traverse the Policy Area. These include Interstate 5, Interstate 80, U.S. Highway 50, State Route 99, and State Route 160. The Policy Area also has many local roads that experience very high traffic volumes and contribute traffic noise. Most noise receptors, such as residences, built near these high-traffic corridors have some level of noise attenuation such as a sound wall or barrier. These receptors also have built-in interior noise attenuation that is the result of the building construction and insulation.

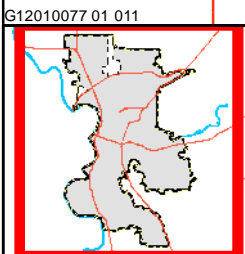
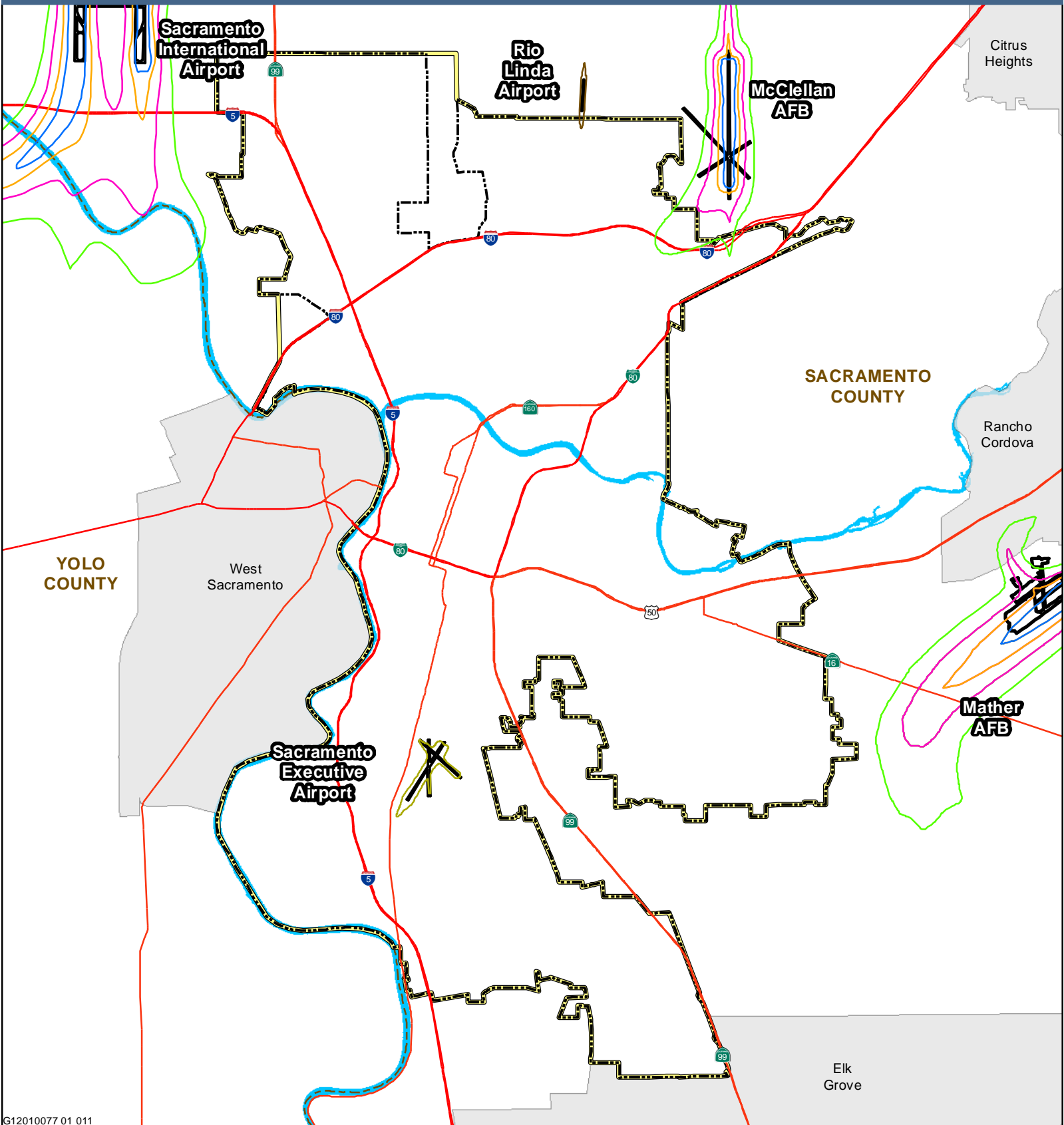
Noise levels affecting proposed new residences are reviewed on a project-by-project basis during the environmental review process. Residential projects that are proposed near major noise sources within the Policy Area are evaluated to determine whether they will be exposed to noise levels that will exceed applicable noise standards.

#### ***Aircraft Noise***

The Policy Area is served by four airports, the Sacramento International Airport, Executive Airport, McClellan Airfield, Mather Airport. The County owns and operates the airports as part of the Sacramento County Airport System. Of these airports, Sacramento International provides almost all commercial passenger flights. McClellan Airfield, formerly McClellan Air Force Base, features a 10,600 foot lighted runway approved for day/night use, includes a full-service fixed-base operator, and is shared by the U.S. Coast Guard. Mather Airport is used primarily for air shipping purposes, but also includes fixed-base operators and CalFIRE aircraft. Executive Airport is a public-use airport that serves mostly smaller, private planes. Noise contours for Sacramento area airports are shown below in Figure 7-4.

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**Legend**

- |         |                                 |                 |
|---------|---------------------------------|-----------------|
| 75 CNEL | Executive Airport Noise Contour | Policy Area     |
| 70 CNEL | Rio Linda Airport Contour       | City Limits     |
| 65 CNEL | Highways                        | County Boundary |
| 60 CNEL | Waterways                       |                 |



0 1 2 Miles

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### ***Railway Noise***

Rail lines cross through the Policy Area in a number of locations. Union Pacific trains traverse three routes:

- Generally north/south past California State University at Sacramento. This route averages approximately 17 trains per day;
- Generally north/south through downtown Sacramento. This route averages approximately 20 trains per day;
- Generally east/west through West Sacramento to the Union Pacific depot. This route averages approximately 10-12 freight trains per day.

Aside from freight trains, Amtrak passenger trains also arrive and depart from the Amtrak station located at 3rd and I streets in downtown Sacramento. The Capitol Corridor service operated by Amtrak is an intercity passenger train system serving Placer, Sacramento, and Yolo counties. It operates 32 trains daily carrying about 120,000 riders per month on average between Sacramento and San Jose, and is the fourth busiest Amtrak-operated route in the nation. Amtrak's San Joaquin Route provides intercity rail service between the Bay Area and Sacramento and Bakersfield, with bus connections to Los Angeles, Redding, Yosemite National Park and Las Vegas, Nevada. The Sacramento-to-Bakersfield segment has two daily round trips. Four daily round trips between Oakland/San Francisco and Bakersfield are also accessible by Sacramento and Elk Grove riders through Amtrak connecting buses (SACOG 2012). In addition to the noise generated by the trains themselves, noise is generated where trains intersect roadways by the warning bells used to alert motorists of a train's arrival. Railroad noise contour distances for the areas described above are provided in Appendix C.

### **Light Rail**

Light rail transit, which is a major component of the City's transit system, also runs through the City of Sacramento along three routes: the Blue Line, the Green Line, and the Gold Line. The Blue Line runs from the Interstate 80/Watt Avenue interchange to the Meadowview area. The Green Line runs from Richards Boulevard through downtown to R Street. The Gold Line runs from Folsom to the Sacramento Valley Station in downtown Sacramento. Light rail service operates daily, beginning on weekdays at 4:00 AM, with service at 15-minute intervals throughout the day and every 30 minutes in the evening. On weekdays, trains operate until 1:00 AM on the Blue Line, until 12:00 AM on the Gold Line between Sacramento Valley Station and Sunrise Station, and until 7:00 PM from Sunrise Station to the terminus at Historic Folsom. Noise generated from light rail is characterized by the noise modeling conducted, shown in Table 7-4 and shown in Figure 7-5.

### **Stationary Sources**

A wide variety of stationary noise sources are present in the Policy Area. The Policy Area contains many different land uses, all of which can produce noise. Residential areas are subject to noise through the use of heating and cooling equipment, and through landscape maintenance activities such as leaf-blowing and gasoline-powered lawnmowers. Commercial uses can also generate noise through the operation of rooftop heating and cooling equipment, truck deliveries, and other operational activities. Daily activity of certain industrial uses can generate noise as well, especially those that use heavy equipment as part of normal operations such as shipping and loading, concrete

crushing, and recycling. Outdoor sporting event facilities that can attract large numbers of spectator, such as high school or college football fields, can also produce noise. The amount of noise produced depends on the size of the facility and the turnout for a specific event.

Noise monitoring results indicate that sources that would seem intuitively to generate high noise levels may not generate much noticeable noise at all. Large manufacturing facilities or utility plants often have noise producing equipment enclosed in the interior of buildings, or are located on large sites where the equipment is set far back from potential receptors. In either case, noise from actual processes ongoing at the facility may be very low or not noticeable at all beyond the facility's property line.

## Existing Noise Levels

### *Monitored Daytime Noise Levels*

To document existing ambient daytime noise levels, ten different locations were selected to determine representative noise levels for certain sources in various portions of the Policy Area. The noise levels were monitored using a Larson-Davis Model 814 precision sound level meter, which satisfies the American National Standards Institute (ANSI) for general environmental noise measurement instrumentation. Measured noise levels for each location are identified in Table 7-4 and shown in Figure 7-5.

<i>Location #<sup>1</sup></i>	<i>L<sub>eq</sub></i>	<i>L<sub>min</sub></i>	<i>L<sub>max</sub></i>
1 Golden State Concrete Crushing – 5980 Outfall Circle	77.4	60.0	90.4
2 Recycling Industries – 3300 Power Inn Road	79.1	59.8	104.8
3 Sahota Truck Plaza – 7891 Stockton Boulevard	73.8	60.4	95.6
4 Arden Mall Transit Center <sup>2</sup>	87.1	N/A	98.0
5 Distribution Center – 4061 Gateway Park Boulevard	70.7	68.0	81.3
6 4th Avenue/Wayne Hultgren Light Rail Station <sup>2</sup>	82.4	N/A	91.6
7 I Street, between 19th and 20th Streets	93.1	58.9	111.7
8 Sacramento Water Treatment Plant, corner of Fruitridge Boulevard and Freeport Boulevard <sup>2</sup>	70.3	63.9	82.4
9 Amtrak Station – Northeast of 2nd and I Streets	78.6	67.9	96.4
10 Meadowview Light Rail Station <sup>2</sup>	79.2	70.9	85.2

Notes:

<sup>1</sup>Descriptions of noise measurement locations and descriptions are provided in Appendix D.

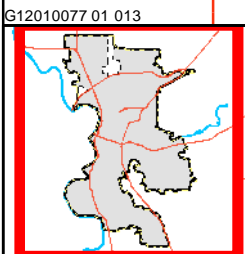
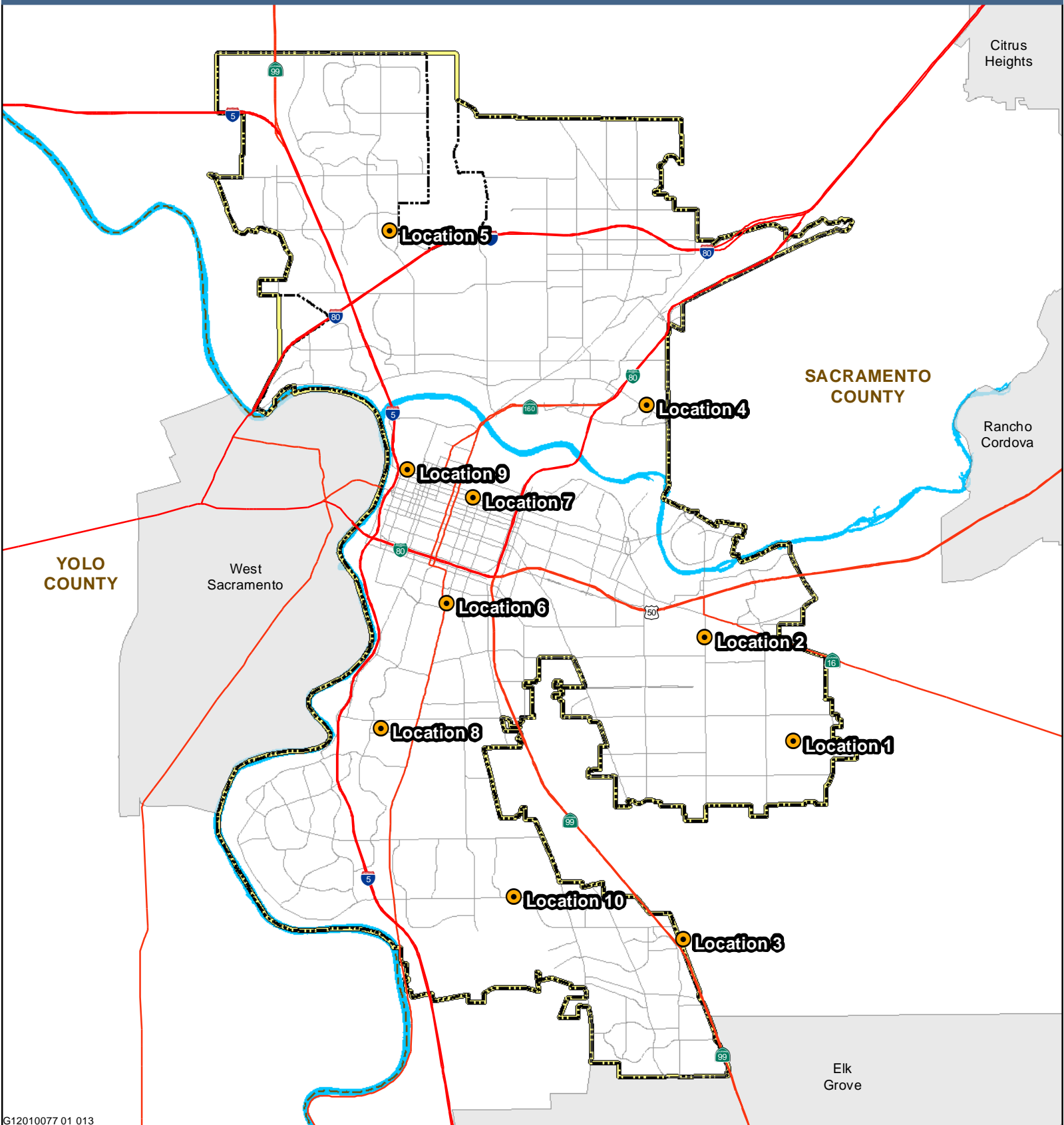
<sup>2</sup>Measurements were conducted for the Sacramento 2030 General Plan MEIR (2009) by PBS&J

All readings were taken on days with clear atmospheric conditions and little to no wind.

Source: EIP Associates, 2005.

### *Roadway Noise Levels*

Existing 24-hour noise levels have been calculated for various freeways, highways, and road segments throughout the Policy Area. Noise levels were modeled for the roadways with the highest traffic volumes within the Policy Area.



**Legend**

- Noise Monitoring Location
- Major Roads
- Highways
- Waterways
- ▭ Policy Area
- ▭ City Limits
- County Boundary



0 1 2 Miles

*Data Source: City of Sacramento, 2012*

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Traffic noise modeling was consistent with FHWA and Caltrans Traffic Noise Model (FHWA 2006 and Caltrans 2009) and used traffic volume data developed for the transportation analysis (F&P 2013). The modeling is based on the reference noise emission levels for automobiles, medium trucks, and heavy trucks, with consideration given to vehicle volume, speed, roadway configuration, distance to the receiver, and ground attenuation factors. Truck usage and vehicle speeds on study area roadways were provided by the project-specific traffic report (F&P 2013). The modeling conducted does not account for any natural or human-made shielding (e.g., the presence of vegetation, berms, walls, or buildings) and, consequently, represents worst-case noise levels.

The calculated noise levels at 50 feet are presented in Appendix E along with the distances to various noise level contours. Freeways and major surface streets were the greatest sources of traffic noise.

## *Regulatory Setting*

### **Federal**

#### *The Federal Noise Control Act of 1972*

The basic motivating legislation for noise control in the U.S. was provided by the Federal Noise Control Act (1972), which addressed the issue of noise as a threat to human health and welfare, particularly in urban areas. In response to the Noise Control Act, the Environmental Protection Agency (EPA) published Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety (EPA 1974). In summary, EPA findings were that sleep, speech, and other types of essential activity interference could be avoided in residential areas if the Ldn did not exceed 55 dBA outdoors and 45 dBA indoors. The EPA's intent was not that these findings necessarily be considered as mandatory standards, criteria, or regulatory goals, but as advisory exposure levels below which there is no reason to suspect that the general population would be at risk from any of the identified health or welfare effects of noise. The EPA Levels report also identified 5 dBA as an adequate margin of safety before an increase in noise level would produce a significant increase in the severity of community reaction (i.e., increased complaint frequency, annoyance percentages, etc.) provided that the existing baseline noise exposure did not exceed 55 dBA Ldn.

#### *U.S. Department of Transportation*

To address the human response to ground vibration, the Federal Transit Administration (FTA) of the U.S. Department of Transportation (DOT) has set forth guidelines for maximum-acceptable vibration criteria for different types of land uses. These guidelines are presented below in Table 7-5:

<b>Table 7-5 Ground-Borne Vibration (GBV) Impact Criteria for General Assessment</b>			
<i>Land Use Category</i>	<i>GBV Impact Levels (VdB re 1 micro-inch/second)</i>		
	Frequent Events <sup>1</sup>	Occasional Events <sup>2</sup>	Infrequent Events <sup>3</sup>
Category 1: Buildings where vibration would interfere with interior operations.	654	654	654
Category 2: Residences and buildings where people normally sleep.	72	75	80
Category 3: Institutional land uses with primarily daytime uses.	75	78	83

Notes:

1. "Frequent Events" is defined as more than 70 vibration events of the same source per day.
2. "Occasional Events" is defined as between 30 and 70 vibration events of the same source per day.
3. "Infrequent Events" is defined as fewer than 30 vibration events of the same source per day.
4. This criterion limit is based on levels that are acceptable for most moderately sensitive equipment such as optical microscopes. Vibration-sensitive manufacturing or research will require detailed evaluation to define the acceptable vibration levels.

Source: Federal Transit Administration, Transit Noise Impact and Vibration Assessment, May 2006.

## State

The State of California General Plan Guidelines 2013 (Guidelines) promotes use of Ldn or CNEL for evaluating noise compatibility of various land uses with the expected degree of noise exposure. The designation of a level of noise exposure as "normally acceptable" for a given land use category implies that the expected interior noise would be acceptable to the occupants without the need for any special structural acoustic treatment. The Guidelines identify the suitability of various types of building construction relative the range of customary outdoor noise exposures. The Guidelines provide each local community some leeway in setting local noise standards that allow for the variability in individual perceptions of noise in that community. Findings presented in EPA Levels have had an obvious influence on the content of the State Guidelines, most importantly in the latter's choice of noise exposure metrics and in the upper limits for the "normally acceptable" exposure of noise-sensitive uses (i.e., no higher than 60 dBA Ldn or CNEL for low-density residential, which is just at the upper limit of the 5 dBA "margin of safety" defined by the EPA for noise-sensitive land use categories).

### *Caltrans*

In 2004, the California Department of Transportation (Caltrans) published the Transportation-and Construction-Induced Vibration Manual, which provides general guidance on vibration issues associated with construction and operation of projects in relation to human perception and structural damage.

Table 7-6 presents recommended levels of vibration that could result in damage to structures exposed to continuous vibration.



<i>PPV (in/ec)</i>	<i>Effect on Buildings</i>
0.4-0.6	Architectural damage and possible minor structural damage
0.2	Risk of architectural damage to normal dwelling houses
0.1	Virtually no risk of architectural damage to normal buildings
0.08	Recommended upper limit of vibration to which ruins and ancient monuments should be subjected
0.006-0.019	Vibration unlikely to cause damage of any type

Source: Caltrans 2004

**Local**

***City of Sacramento Municipal Code***

Chapter 8.68 of the City of Sacramento Municipal Code contains applicable noise regulations within City Limits, as listed below:

Section 8.68.060 – Exterior Noise Standards:

- a. The noise standards that apply to all agricultural and residential properties are:
  - 1. From seven a.m. to ten p.m. the exterior noise standard shall be fifty-five (55) dBA.
  - 2. From ten p.m. to seven a.m. the exterior noise standard shall be fifty (50) dBA.
- b. It is unlawful for any person at any location to create any noise which causes the noise levels when measured on agricultural or residential property to exceed for the duration of time set forth following, the specified exterior noise standards in any one hour by:

<i>Cumulative Duration of the Intrusive Sound</i>	<i>Allowance Decibels</i>
Cumulative period of 30 minutes per hour	0
Cumulative period of 15 minutes per hour	+5
Cumulative period of 5 minutes per hour	+10
Cumulative period of 1 minute per hour	+15
Level not to be exceeded for any time per hour	+20

Source: Sacramento City Code, 2012.

- c. Each of the noise limits specified in subsection B of this section shall be reduced by five dBA for impulsive or simple tone noises, or for noises consisting of speech or music.
- d. If the ambient noise level exceeds that permitted by any of the first four noise categories specified in subsection B of this section, the allowable noise limit shall be increased in five dBA increments in each category to encompass the ambient noise level. If the ambient noise level exceeds the fifth noise level category, the maximum ambient noise level shall be the noise limit for that category.

Section 8.68.070 - Interior Noise Standards:

- a. In any apartment, condominium, townhouse, duplex or multiple dwelling unit it is unlawful for any person to create any noise from inside his or her unit that causes the noise level when measured in a neighboring unit during the periods ten p.m. to seven a.m. to exceed:
  1. Forty-five (45) dBA for a cumulative period of more than five minutes in any hour;
  2. Fifty (50) dBA for a cumulative period of more than one minute in any hour;
  3. Fifty-five (55) dBA for any period of time.
- b. If the ambient noise level exceeds that permitted by any of the noise level categories specified in subsection A of this section, the allowable noise limit shall be increased in five dBA increments in each category to encompass the ambient noise level.

## *Findings*

- Over the entire Policy Area, the largest source of noise is generated by vehicle traffic on freeways and surface streets. This will continue to be the noise source that affects most people in the Sacramento area. Other sources of noise exist as well. These can be grouped into three categories:
  - Non-road transportation noise: This includes noise sources such as heavy rail, light rail, and noise generated by airport operations.
  - Stationary point-source noise: Mostly heavy-commercial or industrial operations that generate noise as part of normal operations. Noise can be an issue especially where heavy equipment is consistently used in outdoor areas.
  - Places where trucks congregate: This includes truck stops, repair facilities, and distribution hubs.
- Sources that would seem intuitively to generate high noise levels, such as large manufacturing facilities or utility plants, may not generate much noticeable noise at all, due to noise-generating equipment stored inside many industrial uses and distance of equipment to the property line (and therefore distance to nearby sensitive receptors).

## **7.6 Hazardous Materials**

### *Introduction*

This section is based on information derived from the City of Sacramento 2005 Emergency Operations Plan, County of Sacramento 2011 Local Hazard Mitigation Plan, applicable Airport Land Use Compatibility Plans, and information from federal, state, and local agency databases. For further information on response to a hazardous materials release, see Section 7.6 Emergency Response.

## *Existing Conditions*

### **Hazardous Materials Use**

Hazardous materials are routinely used, stored, and transported in the Policy Area by businesses (including industrial and commercial/retail businesses), public and private institutions (such as educational facilities and hospitals), and households. The Sacramento County Environmental Management Department (SCEMD) maintains a database of all businesses in the City of Sacramento using hazardous materials in excess of the threshold quantities (55 gallons for a liquid, 200 cubic feet for a compressed gas, and 500 pounds for a solid). The “Master List of Facilities within Sacramento County with Potentially Hazardous Materials” is downloadable from the County’s website (<http://www.emd.saccounty.net/>

[Documents/lists/mstr.pdf](#)) and is readily available to the public (Sacramento County 2013). Businesses in the Policy Area that use and store hazardous materials in quantities subject to federal and state regulations that require community notification are required to prepare and submit a Hazardous Materials Management Plan (or “Business Plan”) and/or Risk Management Plans (RMPs), as appropriate, to the SCEMD.

### **Hazardous Waste Generation**

The Environmental Compliance Division of the Sacramento County Environmental Department has published Guidelines for Generators of Hazardous Waste (Sacramento County 2008), which summarizes the various requirements for generating, storing, handling, transporting, and disposing of hazardous wastes. In addition to major hazardous waste generators, it should also be noted that hazardous materials (household hazardous materials) such as cleaning products, paints, solvents, motor oil, and gasoline, are used in small quantities by households and businesses every day. The City of Sacramento operates programs to collect and properly dispose of household hazardous waste.

#### ***Treatment, Storage, and Disposal Facilities***

Safety-Kleen Systems, Inc. operates the Sacramento Accumulation Center in the southeastern portion of the Policy Area (6000 88th Street) that handles a variety of hazardous wastes. The facility is permitted by the California Department of Toxic Substances Control (DTSC) to store and transfer hazardous wastes from outside generators, such as automotive repair and maintenance shops, to the Safety-Kleen Reedley Recycling Center for recycling, or to a permitted facility for disposal or treatment (DTSC 2006).

### **Sites with Known Contamination**

The Policy Area contains sites that were historically contaminated but have been remediated and sites that are known, or believed to be, contaminated that are currently being characterized or cleaned-up. Contamination has resulted from lack of awareness, accidental occurrences, intentional actions, and historical business practices that pre-date current regulatory standards,

Federal and state agencies responsible for hazardous materials management, along with the County of Sacramento, maintain databases of such sites. Below is a brief description of five of the databases that provide information about hazardous materials sites within the Policy Area. Appendix F contains information from these databases.

### ***Comprehensive Environmental Response, Compensation and Liability Information System***

The Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA), is a regulatory or statute law developed to protect the water, air, and land resources from the risks created by past chemical disposal practices. Under CERCLA, the US EPA maintains the Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS). CERCLIS contains information on hazardous waste sites, potential hazardous waste sites, and remedial activities, including sites that are on the National Priorities List (NPL) or being considered for the NPL (“Superfund”).

The CERCLIS database lists 13 sites in the Policy Area. Only one of these sites, the Sacramento Army Depot (8350 Fruitridge Road), is on the NPL. Contaminants on this site include metals, polychlorinated biphenyls, petroleum hydrocarbons, and volatile organic compounds. Remediation activities at the Sacramento Army Depot are ongoing, but the threats of human exposure and groundwater contaminant migration are believed under control (US EPA 2009).

### ***California Department of Toxic Substances Control Envirostor Database***

The California Department of Toxic Substances Control (DTSC) maintains the Envirostor electronic database, which contains information on properties in California where hazardous substances have been, or have potential to be, released. This database is one of a number of lists that comprise the “Cortese List” (a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5). EnviroStor provides a brief history of cleanup activities, contaminants of concern, and scheduled future cleanup activities.

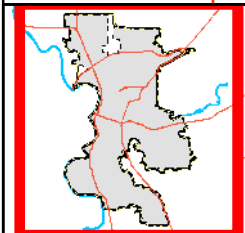
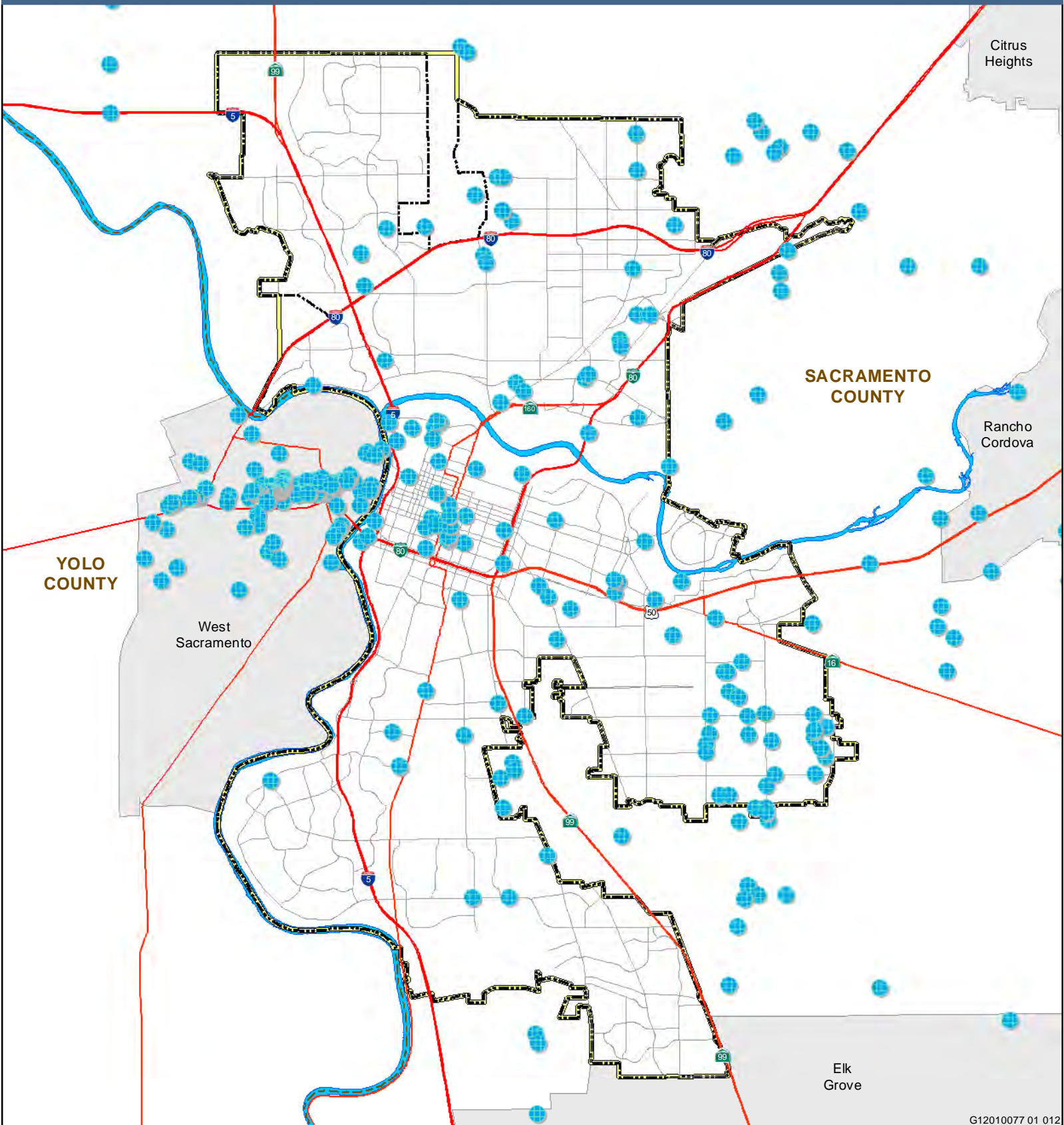
A review of the EnviroStor database in December 2012 identified approximately 140 sites in the Policy Area, 20 of which are currently listed as active and 24 of which are listed as inactive and in need of evaluation. The remaining sites have been referred to another agency, require no further action, or have been fully remediated. The majority of the active sites are located in the Central Business District. Figure 7-6 identifies the various EPA-regulated sites throughout the Policy Area. See Section 8.6 Public Health and Safety for more information on the Central Business District Tier 1 Priority Area.

### ***Regional Water Quality Control Board Spills, Leaks, Investigations and Cleanup***

The Spills, Leaks, Investigation and Cleanup (SLIC) Program was established by the State Water Resources Control Board so that Regional Water Quality Boards (RWQCBs) could oversee cleanup of illegal discharges, contaminated properties, and other unregulated releases adversely impacting the state's waters but not covered by another program. As of December 2012, there were 36 sites in the Policy Area that are currently being investigated, monitored, and/or remediated under the oversight of the RWQCB. The sites are industrial facilities including warehouse distribution centers, food processing and packaging plants, truck terminals, and commercial and vacant sites. Some of the sites are also included on lists developed by DTSC and Sacramento County.

### ***Leaking Underground Storage Tanks***

Extensive federal and state legislation addresses leaking underground storage tanks (LUSTs), including replacement and cleanup. The State of California requires that older tanks be replaced with new double-walled tanks with flexible connections and monitoring systems. The State Water Resources Control Board has been designated the lead regulatory agency in the development of LUST regulations and policy. The RWQCB, in cooperation with the Office of Emergency Services (OES), maintains an inventory of LUSTs in a statewide database.



**Legend**

- Facilities Regulated by EPA
- Major Roads
- Highways
- Waterways
- Policy Area
- City Limits
- County Boundary

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0 1 2 Miles

*Data Source: City of Sacramento, 2012 and ESRI, 2010*

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There are hundreds of LUST sites located throughout the City and the Policy Area that are under active evaluation and/or remediation under the oversight of the RWQCB and SCEMD. Most of the sites are gasoline stations, but some are industrial or commercial facilities with underground fuel tanks that have leaked hydrocarbons. Some of the sites listed by the RWQCB are also included on the RWQCB Spills, Leaks, Investigation and Cleanup Program list, and most are also on Sacramento County's Toxic Sites list (see below).

### ***County of Sacramento Toxic Sites***

Sacramento County maintains county-wide master lists of facilities with potentially hazardous materials and sites where unauthorized releases of potentially hazardous materials have occurred. The November 2012 lists include over 9,000 facilities that use hazardous materials and more than 1,500 unauthorized releases.

In general, contaminated commercial uses are primarily auto-related, including gas stations, repair shops, car washes, service stations, and car sales lots. Industrial uses generally consist of building materials, distribution and warehouses, food processing and packing facilities, fabrication, processing, and construction facilities.

## **Emergency Response**

As a developed urban area, the City of Sacramento faces the potential for hazardous material emergencies. When a hazardous material emergency occurs, multiple resources are available, with the city's Fire Department leading the response activities. The Policy Area also contains major transportation arteries, such as State Route 99 and U.S. Highway 50; Interstates 5, 80, and Capital City Freeway (Business 80), State Routes 16 and 160, and railroads; each transporting hundreds of thousands of tons of hazardous materials through and into the City each year. It is highly exposed to the effects of a major catastrophic hazardous material emergency due to the proximity of the transportation routes to densely populated areas. Additionally, the City must be concerned with the Port of Sacramento, even though it is located in Yolo County. Considerations must also be made for the numerous agriculturally-related business located within the response/mutual aid area.

The Special Operations Division of the City of Sacramento Fire Department operates a Hazardous Materials Program in partnership with the Sacramento Metropolitan Fire District and Sacramento County. In addition to responding to incidents within the city limits, the program provides 24-hour response for the County of Sacramento and the cities of West Sacramento, Elk Grove, Citrus Heights, Rancho Cordova, Folsom, and Galt, and Isleton. The program also responds to mutual aid requests from OES.

Two Type 1 Hazardous Materials Response (HazMat) Teams and two decontamination (Decon) teams are staffed by specially-trained firefighters that serve are also part of first-responding fire companies. The teams, each staffed with four specialists, are located in the following stations:

- Valley Hi (6500 Wyndham Drive)
  - Truck 7 (HazMat)
  - Engine 7 (Decon)
- Natomas (1901 Club Center Drive)

- Truck 30 (HazMat)
- Engine 30 (Decon)

Further details regarding emergency response in the Policy Area are discussed in Section 7.6 Emergency Response.

## *Regulatory Context*

An overview of key laws and regulations related to hazardous materials that have been established by federal, state, and local entities is provided below.

### **Federal**

#### *Code of Federal Regulations*

The US EPA laws governing the use, storage, and disposal of hazardous substances at the proposed project include the following:

- Resources Conservation and Recovery Act (RCRA): hazardous waste management;
- Hazardous and Solid Waste Amendments Act :hazardous waste management;
- CERCLA: cleanup of contamination;
- Superfund Amendments and Reauthorization Act: cleanup of contamination;
- Emergency Planning and Community Right-to-Know: business inventories and emergency response planning;
- Toxic Substances Control Act: tracking and screening industrial chemicals; and
- Federal Insecticide, Fungicide, and Rodenticide Act: pesticide distribution, sale, and use.

Specific requirements for implementation of these statutes are codified in Title 40 of the CFR.

The EPA has authorized the DTSC to enforce hazardous waste laws and regulations in California. Under RCRA, DTSC has the authority to implement permitting, inspection, compliance, and corrective action programs to ensure that people who manage hazardous waste follow state and federal requirements. Requirements place “cradle-to-grave” responsibility for hazardous waste disposal on the shoulders of hazardous waste generators. Generators must ensure that their wastes are disposed of properly, and legal requirements dictate the disposal requirements for many waste streams (e.g., banning many types of hazardous wastes from landfills).

Title 29, Part 1910 of the CFR describes the Hazard Communication Standard, which requires that workers be informed of the hazards associated with the materials they handle. Training in chemical work practices must include methods in the safe handling of hazardous substances, use of emergency response equipment, and an explanation of the building emergency response plan and procedures. Material safety data sheets must be available in the workplace, and containers must be appropriately labeled.



The United States Department of Transportation (US DOT) has developed regulations in Titles 10 and 49 of the CFR pertaining to the transport of hazardous substances and hazardous wastes by all modes of transportation. The U.S. Postal Service has developed additional regulations for the transport of hazardous substances by mail. The US DOT regulations specify packaging requirements for different types of materials. The US EPA has also promulgated regulations for the transport of hazardous wastes. These more stringent requirements include tracking shipments with manifests to ensure that wastes are delivered to their intended destinations.

## State

The primary state agencies with jurisdiction over hazardous materials management are the DTSC and the RWQCB. Other State agencies involved in hazardous materials management are the Department of Industrial Relations (State OSHA implementation), OES (California Accidental Release Prevention implementation), Department of Fish and Wildlife (formerly Department of Fish and Game), Air Resources Board, California Department of Transportation (Caltrans), State Office of Environmental Health Hazard Assessment (Proposition 65 implementation) and California Integrated Waste Management Board. The enforcement agencies for hazardous materials transportation regulations are the California Highway Patrol (CHP) and Caltrans. Hazardous materials and waste transporters are responsible for complying with all applicable packaging, labeling, and shipping regulations.

Hazardous chemical and biohazardous materials management laws in California include, but are not limited to, the following statutes (and regulations promulgated thereunder): the Hazardous Materials Management Act; Hazardous Waste Control Act; Safe Drinking Water and Toxic Enforcement Act of 1986; Hazardous Substances Act; Hazardous Waste Management Planning and Facility Siting (Tanner Act); Hazardous Materials Storage and Emergency Response; and the California Medical Waste Management Act.

Within the California Environmental Protection Agency (Cal EPA), DTSC has primary regulatory responsibility for hazardous waste management and cleanup. DTSC also regulates hazardous waste under the authority of the RCRA and the California Health and Safety Code, as and implements the Hazardous Waste Control Law of 1972. Cal EPA is also responsible for implementing the Unified Hazardous Waste and Hazardous Materials Management Regulatory Program.

### ***California Code of Regulations***

State regulations applicable to hazardous materials are contained in the CCR. Title 22 and 26 of the CCR pertain to hazardous materials and the management of hazardous materials. Title 8 contains Construction Safety Orders pertaining to hazardous materials, including, but not limited to, lead. In addition to Construction Safety Order 1532.1 from Title 8 of the CCR, lead-based paint exposure guidelines are provided by the Housing and Urban Development Department. In California, lead-based paint abatement must be performed and monitored by contractors with appropriate certification from the California Department of Health Services. Along with the DTSC, the RWQCB is responsible for implementing regulations pertaining to management of soil and groundwater investigation and cleanup. RWQCB regulations are contained in Title 27 of the CCR.

The California Accidental Release Prevention Program (CalARP; CCR Title 19, Division 2, Chapter 4.5) covers certain businesses that store or handle more than a specified volume of regulated substances at their facilities. The CalARP program regulations became effective on January 1, 1997, and include the provisions of the federal Accidental Release Prevention program (Title 40, CFR Part

68), with certain additions specific to the state pursuant to Article 2, Chapter 6.95, of the Health and Safety Code. The list of regulated substances is found in Article 8, Section 2770.5 of the CalARP program regulations. Businesses that use a regulated substance above the noted threshold quantity must implement an accidental release prevention program, and some may be required to complete a RMP. A RMP is a detailed engineering analysis of the potential accident factors present at a business and the mitigation measures that can be implemented to reduce this accident potential. The purpose of a RMP is to decrease the risk of an off-site release of a regulated substance that might harm the surrounding environment and community. A RMP includes the following components: safety information, hazard review, operating procedures, training, maintenance, compliance audits, and incident investigation. The RMP must consider the proximity to sensitive populations located in schools, residential areas, general acute care hospitals, long-term health care facilities, and child day-care facilities, as well as external events such as seismic activity.

### ***Hazardous Waste Control Law***

California law provides the general framework for regulation of hazardous wastes by the Hazardous Waste Control Law (HWCL) passed in 1972. The HWCL provides for state regulation of existing hazardous waste facilities, which include “any structure, other appurtenances, and improvements on the land, used for treatment, transfer, storage, resource recovery, disposal, or recycling of hazardous wastes,” and requires permits for, and inspections of, facilities involved in generation and/or treatment, storage and disposal of hazardous wastes. DTSC is the state’s lead agency in implementing the HWCL.

### ***Unified Hazardous Waste and Hazardous Materials Management Regulatory Program***

In January 1996, Cal EPA adopted regulations implementing a Unified Hazardous Waste and Hazardous Materials Management Regulatory Program (Unified Program). The six program elements of the Unified Program are: hazardous waste generators and hazardous waste on-site treatment, underground storage tanks, above-ground storage tanks, hazardous material release response plans and inventories, risk management and prevention program, and Uniform Fire Code hazardous materials management plans and inventories. The program is implemented at the local level by a local agency – the Certified Unified Program Agency (CUPA). The CUPA is responsible for consolidating the administration of the six program elements within its jurisdiction. SCEMD is the CUPA for Sacramento County.

### ***California’s Hazardous Materials Release Response Plans and Inventory Law***

State and federal laws require detailed planning to ensure that hazardous materials are properly handled, used, stored, and disposed of, and, in the event that such materials are accidentally released, to prevent or to mitigate injury to health or the environment. California’s Hazardous Materials Release Response Plans and Inventory Law, sometimes called the “Business Plan Act,” aims to minimize the potential for accidents involving hazardous materials and to facilitate an appropriate response to possible hazardous materials emergencies. The law requires businesses that use hazardous materials to provide inventories of those materials to designated emergency response agencies, to illustrate on a diagram where the materials are stored on site, to prepare an emergency response plan, and to train employees to use the materials safely.

### ***Worker and Workplace Hazardous Materials Safety***

The California Division of Occupational Safety and Health (Cal/OSHA) is responsible for developing and enforcing workplace safety standards and assuring worker safety in the handling and use of hazardous materials. Among other requirements, Cal/OSHA obligates many businesses to

prepare Injury and Illness Prevention Plans and Chemical Hygiene Plans. The Hazard Communication Standard requires that workers be informed of the hazards associated with the materials they handle. For example, manufacturers are to appropriately label containers, material safety data sheets are to be available in the workplace, and employers are to properly train workers.

### ***Hazardous Materials Transportation***

CHP and Caltrans are the enforcement agencies for hazardous materials transportation regulations. Transporters of hazardous materials and waste are responsible for complying with all applicable packaging, labeling, and shipping regulations. The OES also provides emergency response services involving hazardous materials incidents.

### ***California Education Code***

The California Education Code (Section 17210 et seq.) outlines the requirements of siting school facilities near or on known or suspected hazardous materials sites, or near facilities that emit hazardous air emissions, handle hazardous or acutely hazardous materials, substances, or waste. The code requires that, prior to commencing the acquisition of property for a new school site, an environmental site investigation be completed to determine any health and safety risks associated with a site. All proposed school sites that will receive state funding for acquisition and/or construction must go through a comprehensive investigation and cleanup process under DTSC oversight. DTSC is required to be involved in the environmental review process to ensure that selected properties are free of contamination, or if the property is contaminated, that it is cleaned up to a level that is protective of students and faculty who will occupy the new school. All proposed school sites must be suitable for residential land use, which is DTSC's most protective standard for children.

## **Local**

The SCEMD is responsible for promoting a safe and healthy environment in the county and enforcing hazardous waste laws and regulations at a local level. As the local CUPA, the SCEMD monitors the proper use, storage and clean-up of hazardous materials, monitoring wells, removal of leaky underground storage tanks, and permits for the collection, transport, use or disposal of refuse.

Hazardous waste laws and regulations are enforced locally by SCEMD. SCEMD's Hazardous Materials Business Plan, which is administered throughout Sacramento County and its incorporated cities, is an element of the County's CUPA program. Businesses are required to complete a Hazardous Materials Business Plan for safe storage and use of chemicals above reportable quantities (55 gallons for liquids, 500 pounds for solids and 200 cubic feet for compressed gases).

Other local regulations or regulating agency that are relevant to hazardous materials in the Policy Area include the City Department of Utilities, which monitors all groundwater discharges to ensure they are free of contamination through enforcement of the Department of Utilities Engineering Services Policy No. 0001 (adopted as Resolution No. 92-439 by the Sacramento City Council), and the Sacramento Metropolitan Air Quality Management District Rule 902 that protects the public from exposure to asbestos in the event of a release.

Area Plan for Emergency Response to Hazardous Materials Incidents in Sacramento County (Area Plan)

The SCEMD developed the Area Plan for Emergency Response to Hazardous Materials Incidents in Sacramento County (Sacramento County 2012). The area plan provides information for agencies involved in hazardous materials response within Sacramento County, including, but not limited to, the Sacramento County Sheriff's Department, Sacramento City Fire Department, State OES, Sacramento County Health Department, Public Works, and the CHP, if needed to respond to a hazardous materials incident.

## *Findings*

- Hazardous materials use and waste generators in the Policy Area include industries, businesses, public and private institutions, and households. Federal, state, and local agency databases maintain comprehensive lists of facilities using large quantities of hazardous materials, as well as facilities generating hazardous waste. Some of these facilities use certain classes of hazardous materials that require accidental release scenario modeling and RMPs to protect surrounding land uses.
- The City of Sacramento Fire Department has a hazardous materials incident response team and works in cooperation with other regional and state agencies in the event of major emergencies.
- There is one hazardous materials treatment, storage, and disposal facility in the Policy Area, and there are three general geographic areas where TSD facilities could be located (Sacramento International Airport area, Fruitridge/Florin area, and Airport/Meadowview – South Sacramento area). Additional comprehensive evaluation would be necessary to select specific site(s).
- Several sites in the Policy Area are under agency oversight for soil or groundwater contamination. One site is included on the federal Superfund list (Sacramento Army Depot). Most of the soil and groundwater contamination in the Policy Area is related to leaking underground fuel storage tanks, which are either being investigated or remediated under the oversight of SCEMD or RWQCB staff. Some contamination has also occurred from historic uses related to transportation (e.g., railyards) and materials processing.

## **7.7 Emergency Response**

### *Introduction*

This section provides information on emergency response services in the Policy Area. Within the Policy Area, emergency response is guided by the City's 2005 Emergency Operations Plan and the 2011 Sacramento County Local Hazard Mitigation Plan. These plans identify potential hazards and detail response actions. See the Regulatory Context discussion for a detailed description of the laws and regulations that shape the response to emergency situations in the Policy Area. For more information on potential hazards in the Plan Area, refer to Section 7.1 Geologic and Seismic Hazards, Section 7.2 Flood Hazards, Section 7.3 Fire Hazards, Section 7.4 Aviation Hazards, and Section 7.5 Hazardous Materials.

## *Existing Conditions*

The City's Office of Emergency Services (OES) provides comprehensive emergency management services for the City of Sacramento, including coordination of City-wide preparedness, planning, response, recovery, and mitigation activities. It is the mission of OES to prepare City government and the community for potential natural, human-caused, and technological emergencies. The City of Sacramento's 2005 Emergency Operations Plan identifies the following situations as hazards with potential to occur in the Policy Area: severe weather; flooding and levee or dam failure; major earthquake; hazardous material incident; major transportation accident; multi-casualty incident; urban-wildland interface fires; power outages; weather-related hazards; and homeland security hazards (nuclear attack, civil disturbance, and terrorism) (City of Sacramento 2005).

Most of Sacramento County's disaster declarations are a result of extreme weather conditions, including heavy rain/thunderstorms, tornadoes, and fog. Between 1950 and 2011, there were 16 federal emergency declarations and 23 state emergency declarations in the county. Thirteen of the federal declarations and seventeen of the state declarations were associated with flood events. Of the three remaining federal declarations, one was related to drought and two to economic/agricultural losses due to severe weather and freezes. Together, these disasters resulted in over \$700 million in damages (Sacramento County 20011).

## **Emergency Response**

### *Police and Fire Response*

The Sacramento Police Department (SPD) does not have an adopted response time standard. Incoming calls are categorized from Priority 1 to 6, with urgency descending with priority level. Priority 1 calls are considered life threatening situations and result in an immediate response to the scene. In 2010, the average response time for Priority 2 calls was 8 minutes and 16 seconds; response to Priority 6 calls was 1 hour and 6 minutes (City of Sacramento Police Department nd).

The first responding company from the Sacramento Fire Department (SFD), which is responsible for fire suppression and paramedic services, has a response time goal of arrival within 4 minutes 90 percent of the time. Medic units from the SFD have target response time of 8 minutes 90 percent of the time.

### *Response Routes*

The City Department of Transportation works with SFD to ensure that emergency response routes provide the fastest possible route throughout the Policy Area. Records of emergency response routes located throughout the city are maintained by the SFD. Development activities that could potentially interfere with emergency response routes are required to notify the City to minimize impacts that could occur due to interference with the route.

## Evacuation

In the Policy Area, threats that could warrant an evacuation response are: flooding; earthquake; fire; chemical, biological, radiological, or explosive hazardous materials release; dam failure; levee failure; civil disturbance; terrorism; and utility outage. In the event of an evacuation, an estimated 20 percent of the evacuating population will need some level of care and shelter until they can return to their homes or alternative sheltering. The Sacramento County has prepared a list of available shelters and determined that there are sufficient in-county resources to meet the needs of an evacuation (Sacramento County 2008).

### *Evacuation Routes*

The City's Emergency Operations Plan identifies specific evacuation routes for 20 different "evacuation areas" within the city. The Emergency Operations Plan also identifies access control points for each of these areas, as well as emergency shelters (City of Sacramento 2005).

## Mutual Aid

To facilitate the coordination and flow of mutual aid, the State has been divided into six OES Mutual Aid Regions (and three administrative regions). The City of Sacramento is in Mutual Aid Region IV. The City of Sacramento maintains an Automatic Aid agreement with Sacramento County and the City of West Sacramento. Under the automatic aid agreement, all emergency calls are routed through a central dispatch center and the nearest resource responds to the call. Statewide, California's mutual aid system is designed to ensure that adequate resources, facilities, and other support are provided to jurisdictions whenever their own resources prove to be inadequate to cope with a given situation. Local jurisdictions have the discretion to give and receive aid when needed, while state government is obligated to provide available resources to assist local jurisdictions in emergencies.

## Emergency Care Facilities

There are six hospitals within the Policy Area that serve the region:

- Kaiser Permanente South Sacramento Medical Center (6600 Bruceville Road);
- Mercy General Hospital (4001 J Street);
- Methodist Hospital of Sacramento (7500 Hospital Drive);
- Shriners Hospital for Children – Northern California (2425 Stockton Boulevard);
- Sutter General Hospital (2801 L Street);
- Sutter Memorial Hospital (5151 F Street) (scheduled to close in 2013); and
- UC Davis Medical Center (2315 Stockton Boulevard).

All of these facilities are designed and equipped to handle multiple, simultaneous patients during everyday activities and emergency situations.

### ***Trauma Services***

The Kaiser Permanente South Sacramento Medical Center and UC Davis Medical Center are certified trauma centers serving the Policy Area. These facilities provide an enhanced level of life-saving care to victims of traumatic injuries. These facilities are staffed 24 hours per day with physicians, nurses, and other health care professionals who have special training in treating critical injuries to the head, spine and vital organs. Kaiser Permanente's hospital is a Level II Trauma Center. The UC Davis Medical Center is a Level I trauma center and a Level I pediatric trauma center.

### **Public Alert and Warning**

Public alert and warning systems are necessary to increase public awareness of an impending threat and provide clear instructions. In the Policy Area, existing systems include the Emergency Alert System, fire and law enforcement vehicle loudspeakers, Reverse 9-1-1, Sacramento 2-1-1, and agency websites. The Emergency Alert System is designed to provide emergency information via radio and television. The City of Sacramento's Reverse 9-1-1 system can send pre-recorded messages to individual households and businesses with phone numbers listed in the 9-1-1 database. The Community Services Planning Council, a non-profit organization, operates 2-1-1 in Sacramento County. Individuals can call into the system to request information on an emergency situation (Sacramento County 2008).

### ***Regulatory Context***

#### **Federal**

##### ***Federal Emergency Management Agency***

As part of the U.S. Department of Homeland Security, the Federal Emergency Management Agency's mission is to lead the effort to prepare the nation for all hazards and effectively manage federal response and recovery efforts following any incident. The Federal Emergency Management Agency also initiates proactive mitigation activities, trains first responders, and manages the National Flood Insurance Program and the U.S. Fire Administration.

##### ***Disaster Mitigation Act of 2000***

This legislation reinforces the importance of pre-disaster infrastructure mitigation planning to reduce disaster losses nationwide, and is aimed primarily at the control and streamlining of the administration of federal disaster relief and programs to promote mitigation activities. Some of the major provisions of the Disaster Mitigation Act of 2000 include:

- Funding for pre-disaster mitigation activities,
- Developing experimental multi-hazard maps to better understand risk,
- Establishing state and local government infrastructure mitigation planning requirements,
- Defining how states can assume more responsibility in managing the Hazard Mitigation Grant Program, and

- Adjusting ways in which management costs for projects are funded.

The mitigation planning provisions outlined in Section 322 of the act establish performance-based standards for mitigation plans and require states to have a public assistance program to develop county government plans. The consequence for counties of failure to develop an infrastructure mitigation plan is the chance of a reduced federal share of damage assistance.

## State

### *California Code of Regulations, Title 19*

The California Code of Regulations establishes regulations related to emergency response and preparedness under the OES. The OES serves as the lead state agency for emergency management and coordinates the state response to major emergencies in support of local government. State OES may activate the Regional Emergency Operations Center and/or the State Operations Center at OES Headquarters in Sacramento to coordinate and support operations in affected areas. It is responsible for collecting, verifying, and evaluating information about the emergency, facilitating communication with local government, and providing affected jurisdictions with additional resources when necessary. The OES also maintains oversight of the State's mutual aid system. The State OES director assists the Governor in coordinating the activities of state government departments and agencies, and supporting emergency operations conducted by local governments.

If the situation warrants, a "local emergency" is proclaimed, the local Emergency Operating Center (EOC) is activated, and State OES will be advised. If appropriate, the State OES Director recommends to the Governor that a "state of emergency" be proclaimed in affected areas and, as required, in areas from which mutual aid might be needed. During this time, state agencies will be expected to immediately respond to requests for assistance from affected areas. If the Governor requests and receives a Presidential declaration of an "emergency" or a "major disaster" under Public Law 93-288 (Federal Disaster Relief Act of 1974), he will appoint a State Coordinating Officer (SCO). A Federal Coordinating Officer and the SCO will coordinate state and federal efforts to support local operations.

**Emergency Operations Center.** An EOC provides a central location of authority and information, and allows for face-to-face coordination among personnel who must make policy-level emergency decisions. The following functions are performed in the City of Sacramento's EOC, or alternate EOC as necessary:

- Receiving and disseminating warning.
- Managing emergency operations.
- Developing emergency response and recovery policies.
- Collecting intelligence from, and disseminating information to, the various EOC representatives, and assuring coordination between the Field Operations Center locations, building managers and departmental safety representatives throughout the City system. Coordination with Sacramento County, the Governor's Office of Emergency Services, the Federal Emergency Management Agency, and other appropriate outside agencies.



- Preparing intelligence/information summaries, situation reports, operation progress reports, and other reports as required; preparing the incident action plan.
- Maintaining general and specific maps, information display boards and other data pertaining to emergency operations.
- Continuing analysis and evaluation of all data pertaining to emergency operations.
- Controlling and coordinating, within established policy, the operations and logistical support of resources committed to City departments.

The Emergency Services Officer is responsible for the readiness state of the primary and alternate EOC locations. Readiness includes adequate communications, staff and team training, EOC support such as logistics, displays, and proper documentation procedures. Generally, the EOC will be activated under any of the following conditions:

- An earthquake causing widespread damage;
- A Hazardous Material Incident affecting a portion of the City of Sacramento;
- A major flood affecting the City of Sacramento and surrounding areas; or
- An emergency situation that has occurred or might occur that is of such a magnitude it will require a large commitment of City of Sacramento or Sacramento County resources over an extended period of time to control or mitigate.

The EOC can be activated and staffed to the extent deemed necessary to deal with the existing or impending emergency. The following individuals or their appointed alternate representative are authorized to activate the City of Sacramento Emergency Operations Center: 1) Director of Emergency Services - City Manager; 2) Assistant Director of Emergency Services - Fire Chief; or 3) Police Chief. Upon authorization to activate the EOC, the City Emergency Management Team reports to the EOC.

## **Types of Emergencies**

### *Peacetime Emergencies*

The City's response to natural disasters or technological incidents is dictated by the type and magnitude of the emergency. Generally, response to a major peacetime emergency situation will progress from local to regional, state, and federal involvement. For planning purposes, State OES has established three levels of emergency response to peacetime emergencies. Responses are based on the severity of the situation and the availability of local resources. These levels do not directly correlate with the four classifications of nuclear power emergencies.

- Level I: A minor to moderate incident in which local resources are adequate and available. A “local emergency” may or may not be proclaimed. The City's EOC will not be activated.

- Level II: A moderate to severe emergency in which local resources are not adequate and mutual aid may be required on a regional or statewide basis. A “local emergency” will be proclaimed and a “state of emergency” might be proclaimed. The City’s EOC may be activated on a partial or full activation basis.
- Level III: A major disaster in which resources in or near the impacted area are overwhelmed and extensive state and/or federal resources are required. A “local emergency” and a “state of emergency” will be proclaimed and a Presidential Declaration of an “emergency” or “major disaster” will be requested. The City’s EOC will be activated.

### *Wartime Emergencies*

The impact of wartime emergencies may range from minor inconveniences such as food and petroleum shortages to a worst case scenario involving an attack on the United States utilizing nuclear weapons. Protective measures to be employed in the event of a threatened or actual attack on the United States include:

- In-place protection using designated fallout shelters.
- Construction of fallout shelters, given adequate lead time.
- Upgrading of homes and other buildings to a radiation Protection Factor of at least 40, given adequate lead time.
- Spontaneous evacuation by an informed citizenry. Crisis relocation is not considered a viable option within the context of this plan.

### ***Standardized Emergency Management System***

The Standardized Emergency Management System (SEMS) is required by Government Code Section 8607 (a) for managing response to multi-agency and multi-jurisdiction emergencies in California. It provides the mechanism by which local governments request assistance. SEMS consists of five organizational levels that are activated as necessary: field response, local government, operational area, OES Mutual Aid Regions, State OES. The SEMS has been adopted by the City of Sacramento for managing response to multi-agency and multi-jurisdiction emergencies, and to facilitate communications and coordination between all levels of the system and among all responding agencies.

The City of Sacramento subscribes to and uses the Incident Command System. Unified Command will be established whenever possible, however, generally:

SPD will provide Incident Commanders for:

- Crime scenes.
- Civil disturbances.
- Evacuation operations.
- Search and rescue operations.

- Transportation accidents (city streets only).
- Traffic control operations.

SFD will provide Incident Commanders for:

- Fire suppression operations.
- Hazardous material incidents.
- Urban search and rescue operations.
- Heavy rescue operations.
- Radiological incidents.

## Local

### ***Sacramento County Local Hazard Mitigation Plan***

The Sacramento County Local Hazard Mitigation Plan applies to Sacramento County and the following communities: Citrus Heights; Elk Grove; Folsom; Galt; Isleton; Ranch Cordova; and Sacramento (Sacramento County 2011). In addition, the plan also covers 17 special districts and organizations within Sacramento County that meet the Disaster Mitigation Act definition of “local government” and participated in the planning process.

The Sacramento County Local Hazard Mitigation Plan aims to reduce or eliminate long term risk to people and property from natural disasters. The plan identifies goals, objectives, and measure for hazard mitigation and risk reduction to make communities less vulnerable, more disaster resistant, and sustainable. Information in the plan can also be used to help guide and coordinate mitigation activities and local policy for future land use decisions.

The plan is based on a hazard identification and risk assessment of all the potential natural hazards that could impact Sacramento County. The plan also includes a review of the County’s current capabilities with regard to reducing hazard impacts, and recommends additional action items for the County and its jurisdictions to reduce their vulnerability to potential disasters. It sets goals to promote awareness of hazards and vulnerability, and maximize use of available funding.

### ***City of Sacramento Emergency Operations Plan***

The City of Sacramento Emergency Operations Plan addresses planned response to extraordinary emergency situations associated with natural disasters, technological (human caused) emergencies, and war emergency operations in, or affecting, the City of Sacramento (City of Sacramento 2005). The Emergency Operations Plan establishes:

- An Emergency Management Organization required to mitigate any significant emergency or disaster affecting the City of Sacramento;
- The policies, responsibilities, and procedures required to protect the health and safety of the populous, public and private property, and the environment from the affects of natural and human-caused (technological) emergencies and disasters;

- The operational concepts and procedures associated with field response to emergencies, Emergency Operations Center (EOC) activities, and the recovery process; and
- The organizational framework for implementation of the Standardized Emergency Management System (SEMS) within the City of Sacramento.

The City of Sacramento Emergency Operations Plan is the principal guide for the City of Sacramento and special district agencies in responding to and mitigating emergencies and disasters affecting the City of Sacramento geographic boundaries. The Plan is intended to facilitate multi-agency and multi-jurisdictional coordination, particularly between Local Government, Operational Area (county boundary), and State Response Levels, and appropriate Federal agencies, in emergency operations.

Agencies, private enterprises, and volunteer organizations having roles and responsibilities established by the Emergency Operations Plan are encouraged to develop standard operating procedures (SOPs) and emergency response checklists based on the provisions of the plan, which should be used in conjunction with applicable local contingency plans, the Operational Area Emergency Operation Plan, and State Emergency Plan. The plan is designed to guide users through the four phases of emergency management: preparedness, response, recovery, and mitigation (City of Sacramento 2005).

### ***Sacramento Police Department***

The SPD's Office of Emergency Services and Homeland Security is a multi-agency, multi-jurisdictional office that is responsible for coordinating Homeland Security and Urban Area Security Initiative grants, conducting regional threat and vulnerability assessments, developing regional and agency terrorism response plans, coordinating and conducting regional interdisciplinary terrorism response training, designing and coordinating training exercises, and organizing volunteers to assist with disaster situations. The Office also coordinates with the Regional Terrorist Threat Assessment Center, the intelligence and analysis Fusion Center, and the Terrorism Liaison Officer Program. The Regional Community Policing Institute is also an integral part of the Office of Emergency Services and Homeland Security facilitating the instruction of core community-based Homeland Security programs including the Community Emergency Response Teams, Neighborhood Emergency Training, terrorist awareness presentations, and the Cultural Community Academies. One deputy chief and one lieutenant manage this office.

### ***Findings***

- The City of Sacramento has an Emergency Operation Plan that addresses the City's planned response to extraordinary emergency situations associated with natural disasters, technological incidents, and nuclear defense operations. The County of Sacramento has a Local-Hazard Mitigation Plan, which is a multi-jurisdictional plan that aims to reduce or eliminate long-term risk to people or property from natural disasters and their effects.

- The City of Sacramento has adopted the Standardized Emergency Management System for managing response to multi-agency and multi-jurisdiction emergencies and to facilitate communications and coordination between all levels of the system and among all responding agencies. Additionally, Sacramento is part of the State's mutual aid system and can give or receive support in an emergency situation.

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