7 SAFETY ELEMENT

The Safety Element provides information about risks in Vacaville due to natural and human-made hazards. It establishes mechanisms to reduce death, injuries, and damage to property, and to address the negative effects of public safety hazards like flooding, fires, and seismic events. Hazards are an unavoidable aspect of life, and although the Safety Element cannot eliminate risk completely, it contains policies to minimize risk exposure. The Safety Element addresses the protection of the community from any unreasonable risks associated with the effects of:

- Geologic hazards, including earthquakes, ground failure, and slope instability
- Flooding and dam failure
- Wildland fires
- Hazardous materials and waste
- Climate change, including agricultural and ecosystem pests, drought, extreme temperatures, human health hazards, and severe weather.

This Element also contains information and policies regarding general emergency preparedness.

Detailed information on the issues discussed in this Safety Element, including the findings of the Vulnerability Assessment, are included in the Safety Element Background Report (Appendix A).

State Requirements

The California Government Code Section 65302(g) requires Safety Elements to address the following:

- Protect the community from risks associated with a variety of hazards, including seismic activity, landslides, flooding, and wildfire.
- Map and assess the risk associated with flood and wildfire hazards and include specific policies in response to these hazards.
- Assess the risks posed by climate change and include policies to increase community resilience to climate change-related hazards.
- Map residential areas that face evacuation constraints.

The Safety Element can meet some of the requirements of the California government through the incorporation of the Solano County Multi-Jurisdictional Hazard Mitigation Plan (HMP) (available online at https://mitigatehazards.com/solanohmp/). The HMP identifies and profiles hazard conditions, analyzes risk to people and facilities, and develops mitigation actions to reduce or eliminate hazard risks in Vacaville. The City prepared a Jurisdictional Annex to the HMP in accordance with the federal Disaster Mitigation Act of 2000 and the Federal Emergency Management Agency's (FEMA's) Local Hazard Mitigation Plan (LHMP) guidance. The mitigation actions in the HMP include both short-term and long-term strategies, and involve planning, policy changes, programs, projects, and other activities. The HMP and Safety Element address similar issues, but the Safety Element provides a higher-level framework and set of policies, while the HMP focuses on more specific mitigation, often short-term, actions. The HMP, as its name implies, focuses on mitigation-related actions, while the Safety Element also includes policies related to emergency response, recovery, and preparation activities. The current HMP is incorporated into this Health and Safety Element by reference, as permitted by California Government Code Section 65302.6.

Vulnerability Assessment

Under California law, the Safety Element is required to include a Vulnerability Assessment that looks at how people, buildings, infrastructure, and other key community assets may be affected by climate change. The City conducted a Climate Change Vulnerability Assessment in the spring of 2022 to analyze Vacaville's susceptibility to climate change hazards. Vacaville's Vulnerability Assessment, prepared in accordance with the most recent available guidance in the 2020 *California Adaptation Planning Guide*,[1] assesses the degree to which eight different climate-related hazards (agricultural and ecosystem pests, drought, extreme temperatures, human health hazards, inland flooding, landslides, severe weather, and wildfire and wildfire smoke) may affect different population groups and community assets. Where deemed applicable, each population group and community asset was assigned a vulnerability score for each climate. Those population groups and community assets that received the highest scores are highlighted as part of each climate hazard's discussion and these vulnerabilities were taken into account when developing the Safety Element's policies.

Information on health and safety issues contained in this Element has been coordinated with the other Elements of the City's General Plan, particularly Land Use, Conservation and Open Space, and Public Facilities and Services.

Geologic and Seismic Hazards

Background Information

Earthquake Hazards

Vacaville is in a seismically active region and earthquakes have the potential to cause ground shaking of significant magnitude. The intensity of the ground shaking varies depending on the severity of the earth movement, proximity to the movement and fault lines, and local soil and geological conditions.

The law requires the California Geological Survey (CGS) to establish regulatory zones (known as Earthquake Fault Zones or Alquist-Priolo Zones) around the surface traces of active faults and to issue maps to all affected cities, counties, and State agencies for use in planning and controlling development. **Figure SAF-1** shows the approximate location of the major fault zones local to Vacaville, and **Figure SAF-2** shows Vacaville in relation to regional faults.

Major named faults near Vacaville include the Rio Vista Fault system, the Great Valley Thrust Fault system, and the Lagoon Valley Fault. The Great Valley Fault is an active fault and has been responsible for occasional moderate or major earthquakes, including an estimated magnitude 6.5 earthquake in 1892 centered near Bucktown north of Vacaville. The Green Valley Fault, west of Vacaville, is also considered an active fault, last causing an earthquake sometime in the past 200 to 400 years. There are no records of substantial earthquakes along the Rio Vista Fault system, and the Lagoon Valley Fault is considered inactive. Also, an unnamed fault lies northwest of the city.

Regionally, the Hayward-Rodger's Creek Fault system in Sonoma County and the East Bay, along with the San Andreas Fault, are considered the most likely sources of a major earthquake. It has been estimated that there is a 33 percent chance of a magnitude 6.7 or greater earthquake on the combined Hayward-Rodger's Creek Fault System by 2043.[2] Scenario modeling conducted as part of the Solano County HMP shows that a magnitude 7.1 earthquake along the Hayward-Rodger's Creek would subject the majority of Vacaville to moderate to strong shaking, with some areas subject to violent shaking.[3]

A large earthquake along any of the major faults in the region could result in substantial casualties and damage from collapsed buildings, damaged roads and bridges, fires, flooding, and other threats to life and property. Most of the loss of life and injuries from earthquakes are due to damage and collapse of buildings and structures. Building codes for new construction have generally been made more stringent following damaging earthquakes. However, homes and structures built prior to 1980 may not be seismically sound. The damage caused by the shaking of earthquakes may trigger secondary hazards, including urban fires, dam failures, and toxic chemical releases.

Liquefaction

Liquefaction occurs when loosely packed sandy or silty materials saturated with water are shaken hard enough to lose strength and stiffness, affecting structures built on or in them. Liquefied soils behave like a liquid and are responsible for tremendous damage in an earthquake, such as building collapse, pipe leakage, and road damage. **Figure SAF-3** shows the liquefaction risk in Vacaville, which is often highest near Ulatis and Alamo Creeks.

Landslides and Ground Failure

Landslides result from wet weather, seismic shaking, or improper construction, grading, and drainage. Most of Vacaville's area is flatland with some sloped areas having had small, scattered landslides. Very small areas on the northern and western edges of the city limit have had mapped landslides. Western Vacaville, including the foothills of the Vaca Mountains, has the highest risk of landslides in the community. Areas with steeper slopes, in combination with other factors described here, are more susceptible to landslides than areas on shallow slopes. **Figure SAF-4** shows landslide-prone areas in Vacaville.

Expansive Soils

Certain types of soils have characteristics that make them more susceptible to geotechnical hazards, such as erosion and expansion. Soils subject to expansion increase when water is added and shrink when water dries out. Identifying local soil types and understanding their characteristics help cities to establish appropriate engineering and construction standards for new buildings and remodeling. The primary soil types in the Vacaville area are silty, sandy, and clay loams, with a smaller portion being made up of purely clay soils. Though not all types of clay are expansive, soils with a clay component are more prone to expansion. Approximately 64 percent of Vacaville's soils contain at least some clay component. One large section of clay-containing soil moves diagonally from the western to the southern side of the city. Another large section of clay-containing soil occupies much of the eastern side of the city.

Subsidence

Land ***subsidence*** is the sinking of a large area of ground surface with little or no horizontal movement. Subsidence areas are associated with land over areas where groundwater or natural gas is extracted and can also occur from seismic activity. Subsidence can occur throughout Vacaville, but particularly in any areas where groundwater has been extracted. However, the small amounts of subsidence recorded within the Solano Subbasin have not resulted in reported adverse impacts to infrastructure or conditions at the land surface.[4]

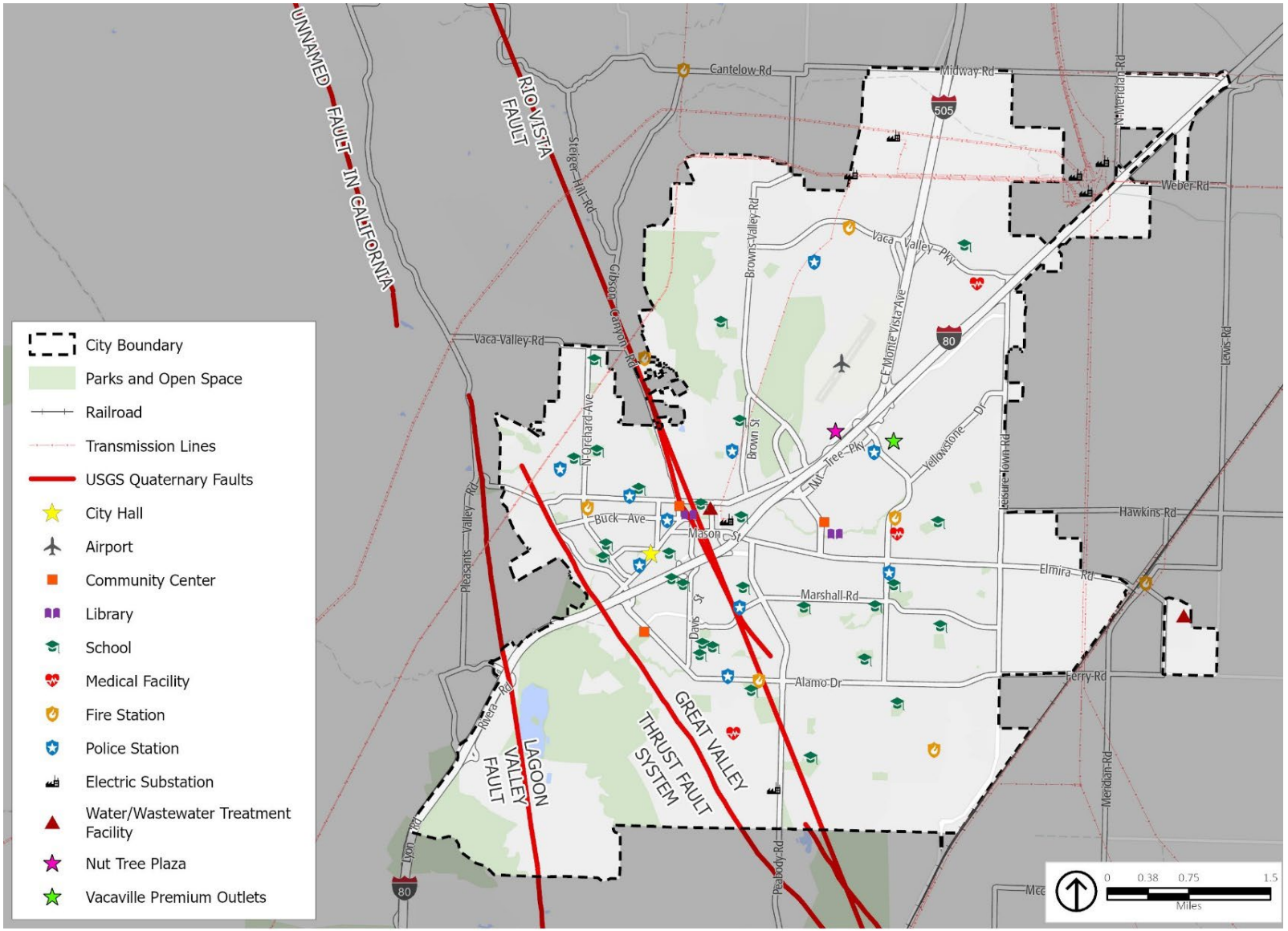
Future Risks and Effects of Climate Change

Climate change is making flooding and droughts more extreme. California has experienced, and continues to experience, severe drought conditions that dry out soils and make them less able to absorb moisture. This contributes to increased flooding and wildfire events. When drought and/or wildfires remove vegetation from hillsides, heavy precipitation can result in landslides.

Some Vacaville populations face elevated vulnerability from the increased risk of geologic hazards as a result of climate change, due to features such as age, available resources, and physical abilities. Households in poverty and low-resourced people of color could be significantly impacted by property losses from landslides and may lack the financial resources to increase the resiliency of their homes. Seniors and those with limited mobility or physical disabilities are at higher risk of being harmed by a landslide due to evacuation barriers and generally greater physical susceptibility to injury.

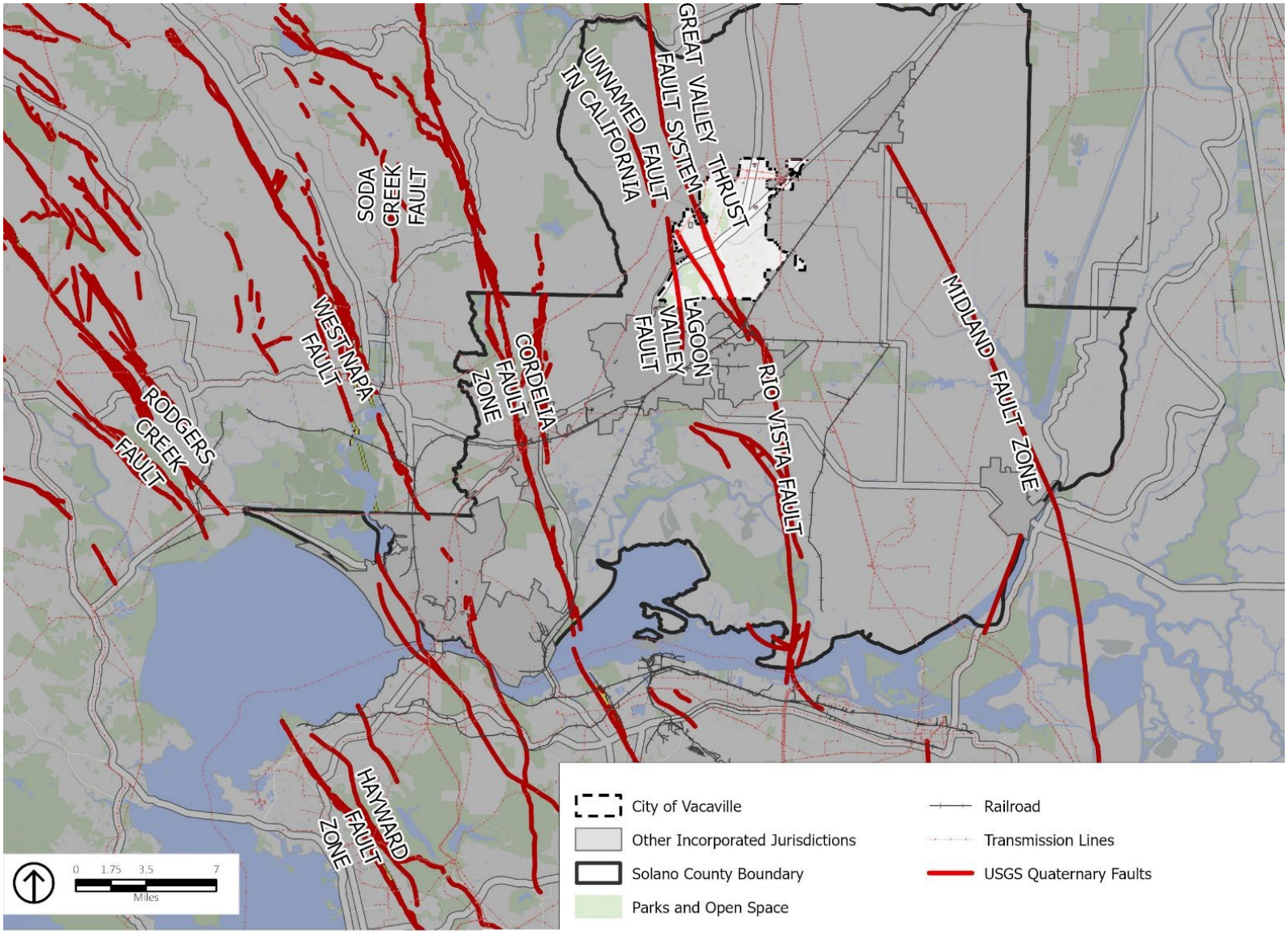
Vacaville transportation and energy infrastructure, homes, and parks are also especially vulnerable to landslides. Thirty bridges, including those along I-80, I-505, and Alamo Drive, are in areas of medium to high landslide potential. Landslides can cause these bridges to become unstable and fail, causing major disruptions in the transportation network. Major roads and highways and public transit infrastructure may also be damaged by landslides, potentially causing injury and interrupting daily activity. Nearly four miles of Vacaville's electrical transmission lines are in medium to high landslide hazard areas. Landslides can damage or destroy power lines and the towers that support them, interrupting electricity service. Homes and parks on the western side of the city could be damaged or destroyed by landslides.

Figure SAF-1 Local Faults



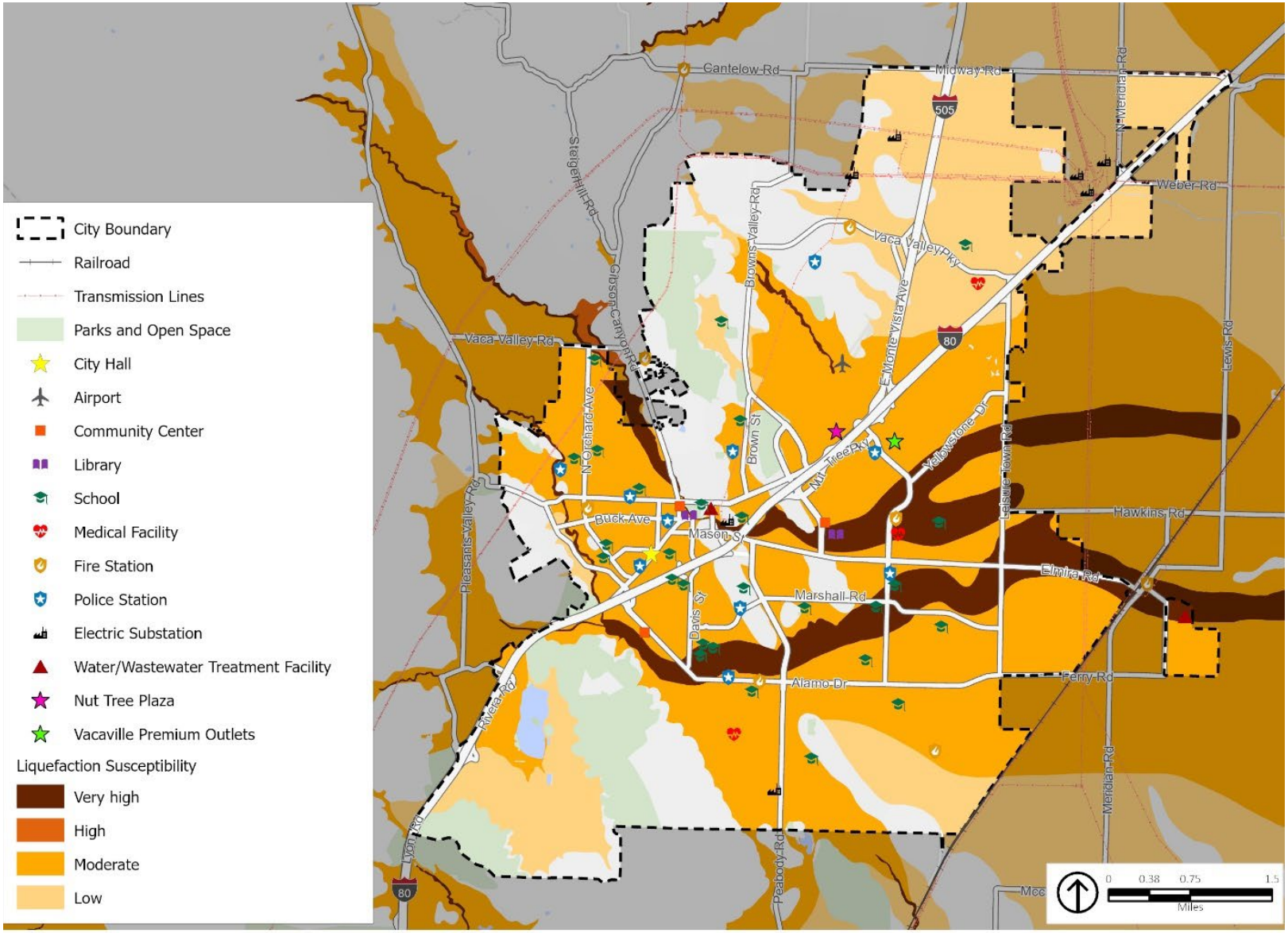
Source: USGS 2018, CGS 2017, PlaceWorks 2022, ESRI

Figure SAF-2 Regional Faults



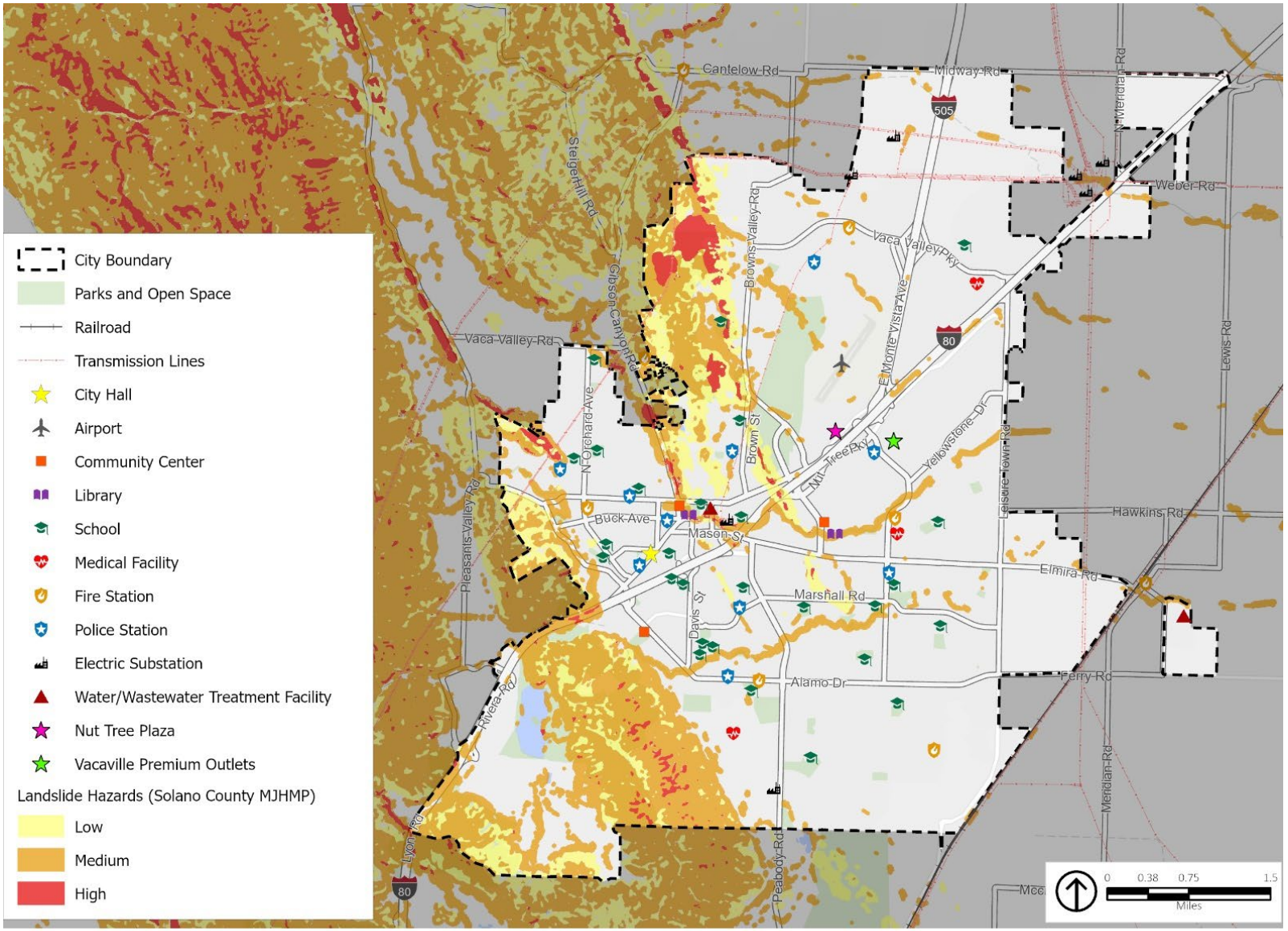
Source: USGS 2018, CGS 2017, PlaceWorks 2022, ESRI

Figure SAF-3 Liquefaction Potential



Source: USGS 2006, PlaceWorks 2022, ESRI

Figure SAF-4 Landslide Hazard Zones



Source: Solano County 2021, PlaceWorks 2022, ESRI

Goals, Policies, and Actions

Goal SAF-1	**Minimize exposure to geologic hazards, including slope instability, subsidence, and expansive soils, and to seismic hazards, including ground shaking, fault rupture, liquefaction, and landslides.**

Policies

Policy SAF-P1.1 Consider geologic conditions when designating land use and designing development in Vacaville. Where potential geologic or seismic risks are high and unmitigable, retain low-occupancy or open space forms of use.

Policy SAF-P1.2 Prohibit development on ridges and slopes at or exceeding 25 percent.

Policy SAF-P1.3 Evaluate and consider the geologic and soil hazards for any proposed extension of urban or suburban land uses into areas that are characterized by slopes from 15 to 25 percent.

Policy SAF-P1.4 Determine the geologic suitability of proposed development sites during the earliest stages of the planning process. Such analyses should consider the potential structural engineering needs of the project and the impacts development activities may have on adjacent lands.

Policy SAF-P1.5 Require geotechnical studies prior to approving rezoning requests, specific plans, or subdivision maps in areas facing a high risk of landslides, as shown in **Figure SAF-4**, and that are within a quarter-mile of a fault, as shown on **Figure SAF-1.**

Policy SAF-P1.6 Require preparation of a soils report prior to issuing a building permit, except where the Building Official determines that a report is not needed.

Policy SAF-P1.7 Require comprehensive geologic and engineering studies of new critical structures, such as hospitals, fire and police stations, utility centers and substations, emergency communications facilities, overpasses, and bridges, regardless of location.

Policy SAF-P1.8 To the extent practical, do not allow facilities and structures that are public, high-occupancy, or critical in disaster situations (e.g., hospitals, fire and police stations, and bridges) to be sited in areas highly susceptible to damage resulting from earthquakes. If locating such a facility or structure in a high-risk area is deemed essential to the public welfare, require that they be sited, designed, and constructed with consideration of the potential for damage.

Policy SAF-P1.9 Limit cut slopes to 2:1 (50 percent slope) except where an engineering geologist can establish that a steeper slope would perform satisfactorily over the long term. Where practicable, require more gentle slopes than the 2:1 standard. Encourage use of retaining walls, rock-filled crib walls, or stepped-in buildings as alternatives to high cut slopes.

Policy SAF-P1.10 Require contour rounding and revegetation to preserve natural qualities of sloping terrains, mitigate the artificial appearance of engineered slopes, and control erosion. Encourage the use of native trees and shrubbery in revegetation areas.

Policy SAF-P1.11 Require financial protection for public agencies and individuals as a condition of development approval for projects that are in areas where geologic conditions indicate a potential for high maintenance or repair costs.

Policy SAF-P1.12 Require the formation of geological hazard abatement districts, or other methods to reduce potential exposure to geologic hazards, as new high-risk areas are identified. Require that hazard abatement programs be in place prior to development approval.

Actions

Action SAF-A1.1 Consider implementing a hazard-reduction program for existing development in high-risk zones. This would include inspection of structures for conformance with the Building Code and could give priority for inspection to emergency and critical facilities, older structures, and public facilities.

Flooding and Storm Drainage

Background Information

Floods are usually caused by large amounts of precipitation, either from a period of very intense precipitation or a long period of steady precipitation. Historically, Vacaville has been at risk of flooding primarily during the winter and spring months when streams swell with heavy rainfall. This type of flood results from prolonged, heavy rainfall and is characterized by high peak flows of moderate duration and by a large volume of runoff. Flooding is more severe when prior rainfall has resulted in saturated ground conditions.

Floods can be extremely dangerous and are among the costliest natural disasters in terms of human hardship and economic loss nationwide. Floodwaters can transport people and large objects downstream, threatening human safety and damaging stationary structures such as dam spillways and bridges. Floodwaters can also break utility lines and interrupt services. Standing water can cause damage to roads, foundations, and electrical circuits. Other problems connected with

flooding and stormwater runoff include erosion, sedimentation, degradation of water quality, loss of environmental resources, and health hazards.

Major recent floods occurred in or around Vacaville in 1986, 1996–1997, 2002, and 2005–2006. The floods of December 2002 caused widespread structural damage within the Ulatis Creek Watershed. On December 31, 2005, flooding was reported along Ulatis Creek at Leisure Town Road and between Ulatis Creek and Aegean Way, where several apartment buildings and businesses were flooded. In addition, Alamo Creek damaged homes and businesses in the Brookdale/Tulare area, along Alamo Creek at Beelard Park, and in the Southwood/Eastwood area. Overtopping of Alamo Creek occurred at Vanden Road, in the Seneca/Cheyenne Drive area, and at Interstate 80. The city has also been subject to periodic moderate flood events, most recently in the winters of 2017, 2019, and 2021. These floods closed roads and downed trees across the city.

Flood Zones

The most recent mapping of areas subject to flooding, shown in **Figure SAF-5**, shows the boundaries of the 100- and 500-year floodplains as mapped by the Federal Emergency Management Agency (FEMA). Approximately 1.70 square miles of Vacaville and 1,500 properties fall within the 100-year floodplain, and 5.07 square miles fall within the 500-year floodplain; Interstate 80 has been shut down multiple times due to flooding since the 1986 storm. The State has also mapped additional zones, called awareness zones, that are not used for regulatory or insurance rating purposes, nor included in the FEMA floodplains, but face an increased flood risk.

Given Vacaville's extensive history of periodic flooding, managing and mitigating flood risk should be a high priority in future planning. As land uses and climate conditions shift and as improvements are made to flood-control channels, the size of existing flood zones is likely to change.

Storm Drainage

In general, creeks in Vacaville flow in an east-southeasterly direction and ultimately drain into the Sacramento River via Cache Slough. The southern portion of Vacaville drains either to the Noonan Drain, which discharges ultimately to Barker Slough, or to Union Creek, which discharges to Suisun Bay. The major stream courses within the city include:

- Alamo Creek, including its tributaries Laguna Creek and Encinosa Creek
- Ulatis Creek
- Horse Creek, including its tributary Pine Tree Creek
- Gibson Canyon Creek

There are two existing reservoirs in Vacaville: Lagoon Valley Lake, which is a tributary to Laguna Creek, draining a portion of Lower Lagoon Valley, and the Basherini Reservoir on Vine Street that is owned and operated by the Solano Irrigation District.

As seen in **Figure SAF-6**, the City constructs detention basins to help address flooding hazards. The City's existing 21 detention basins are located throughout the city, primarily along the city's major creeks. The Pleasants Valley Detention Basin (#17) was constructed shortly after the 2005 flood and has significantly reduced flooding along Alamo Creek. Ten additional basins are currently proposed.

The major creeks that flow through Vacaville are largely in their natural state and alignment, except at the eastern edge of the city where flood-control channels have been constructed. The natural, unaltered portions of the creeks generally do not have adequate flow capacity to convey a 100-year storm event, which is a storm that has a 1 percent chance of occurring in any given year.

Historically, flooding from creeks or streams overtopping their banks has occurred during 10-year or greater storms (i.e., a storm that has a 10 percent chance of occurring in any given year) in areas where channel capacities are exceeded, resulting in flooding of residential properties, blocking roads, and disrupting traffic. Areas susceptible to flooding include (1) Alamo Creek at Seneca Way and Cheyenne Dr., at Tulare and Southwood Drives, and at Vanden Road; (2) Ulatis Creek at Andrews Park, Aegean Way, and Leisure Town Road; (3) Laguna Creek at Interstate 80 and Rivera Road; and (4) Gibson Canyon Creek at Leisure Town Road.

Dam Inundation

All dams pose the potential risk of failure, most likely from seismically induced ground shaking or a related seismic hazard, which threatens the area below the dam with inundation of water spilling from the dam. As illustrated in **Figure SAF-7,** the northeastern portion of Vacaville is subject to potential dam inundation by the Monticello Dam. The potential for a dam failure event in Vacaville is likely to remain a risk in future years as the city grows to the northeast, although the odds of such events are expected to remain very low.

Flood Hazard Mitigation and Response

To address these flooding problems, Vacaville uses a variety of flood-control facilities and measures. As shown in **Figure SAF-6**, the City has built several regional detention basins that reduce the flow from the Vaca Mountains before they reach the city to reduce urban flooding. The City also maintains a network of storm drains and works to keep channel flowlines free from debris

and vegetation. As part of past flood-control efforts, certain creekways have been engineered to handle larger volumes of stormwater than they would in their natural states. In addition, Vacaville's Residential Design Guidelines minimize the extent of ***impervious surfaces***, surfaces through which water cannot penetrate, such as a roof, road, sidewalk, or paved parking lot. Because impervious surfaces do not allow water to penetrate into the ground, they increase runoff volumes and contribute to flooding. Minimizing the amount of permitted impervious surfaces helps reduce flooding. The City maintains the Storm Drainage Master Plan, last revised and adopted in March 2022, which identifies storm drainage deficiencies and improvements needed to address local flooding problems. The Storm Drainage Master Plan identifies regional detention basins to mitigate the increase in runoff from new development. New development is required to provide 100-year-level flood protection within the proposed development area and ensure that developed areas are not adversely impacted.

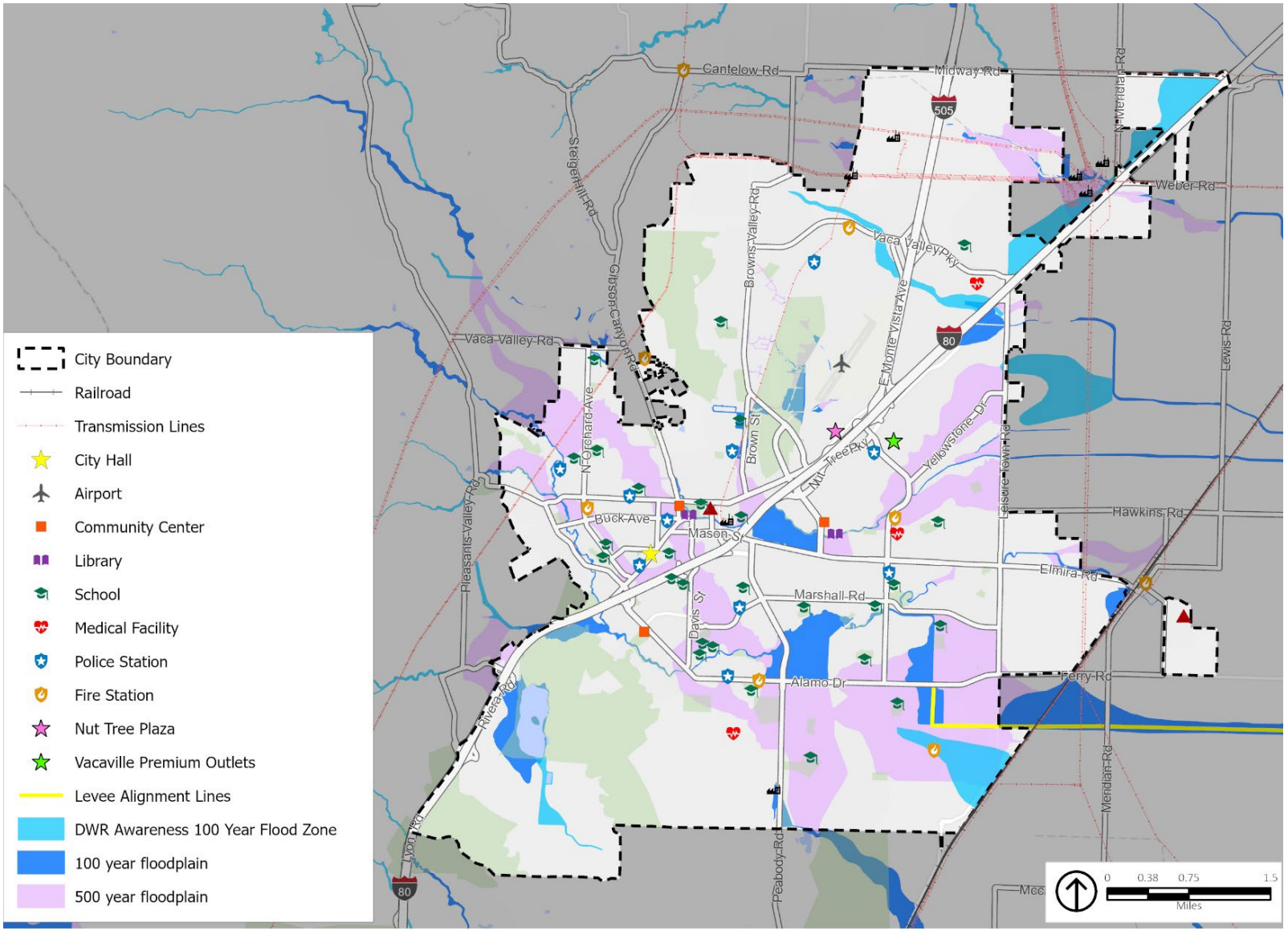
Floodplain Development Regulations

Vacaville has adopted a Floodplain Management Ordinance (Section 14.18 of the Municipal Code) that outlines the requirements for construction within a designated 100-year floodplain or areas prone to flooding. The Floodplain Management Ordinance contains provisions for anchoring, construction materials and methods, and elevation and floodproofing of new construction as well as provisions specific to nonresidential construction, utilities, subdivisions, manufactured housing, recreational vehicles, and floodway construction. Vacaville's Department of Public Works collaborates with the City's fire and police departments and Solano County's Office of Emergency Services to alert and help the community prepare for flooding. Regulation of development in known flood-prone areas, based on Federal Emergency Management Agency (FEMA) mapping and other information, is a key tool in reducing flooding risks to life and property.

Future Risks and Effects of Climate Change

Climate change and associated changes to the local and regional hydrologic cycle may exacerbate flood risk. Vacaville's 100- and 500-year floodplains contain homes and living spaces, including homes that belong to low-income households and households in poverty, homeless communities, low-resourced people of color, pollution-burdened communities, and mobile home communities. Flooding in these areas could damage property, inflict injury, and facilitate the contraction of illness. Crucial community infrastructure, including bridges, major roads, parks, and railways, fall within the 100- and 500-year floodplains and could be damaged by floodwaters, potentially precipitating significant community-wide impacts to health, safety, and commerce.

Figure SAF-5 FEMA Flood Zones



Source: DWR 2021, Solano County 2021, PlaceWorks 2022, ESRI

Figure SAF-6 Existing and Proposed Drainage Facilities

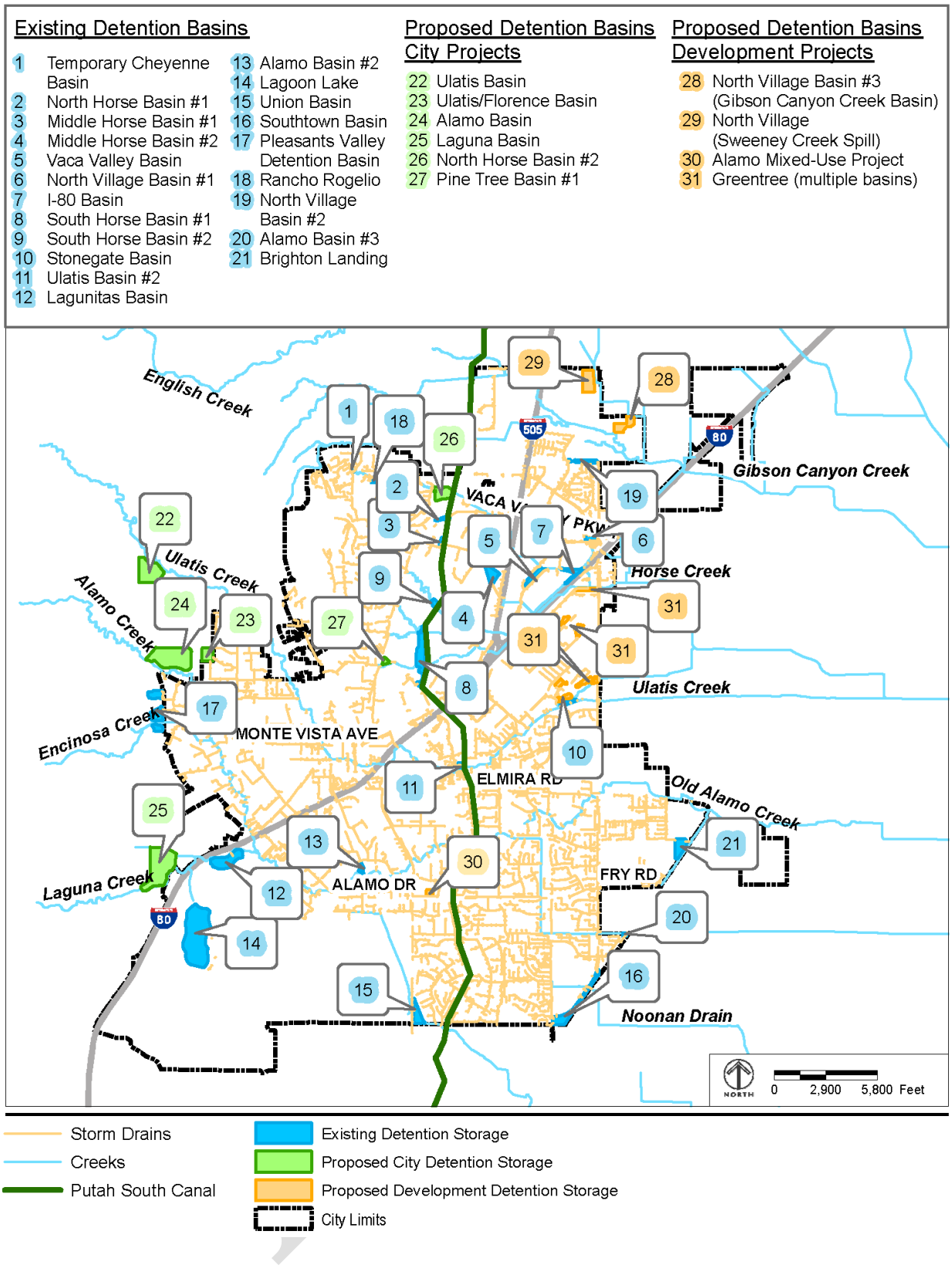
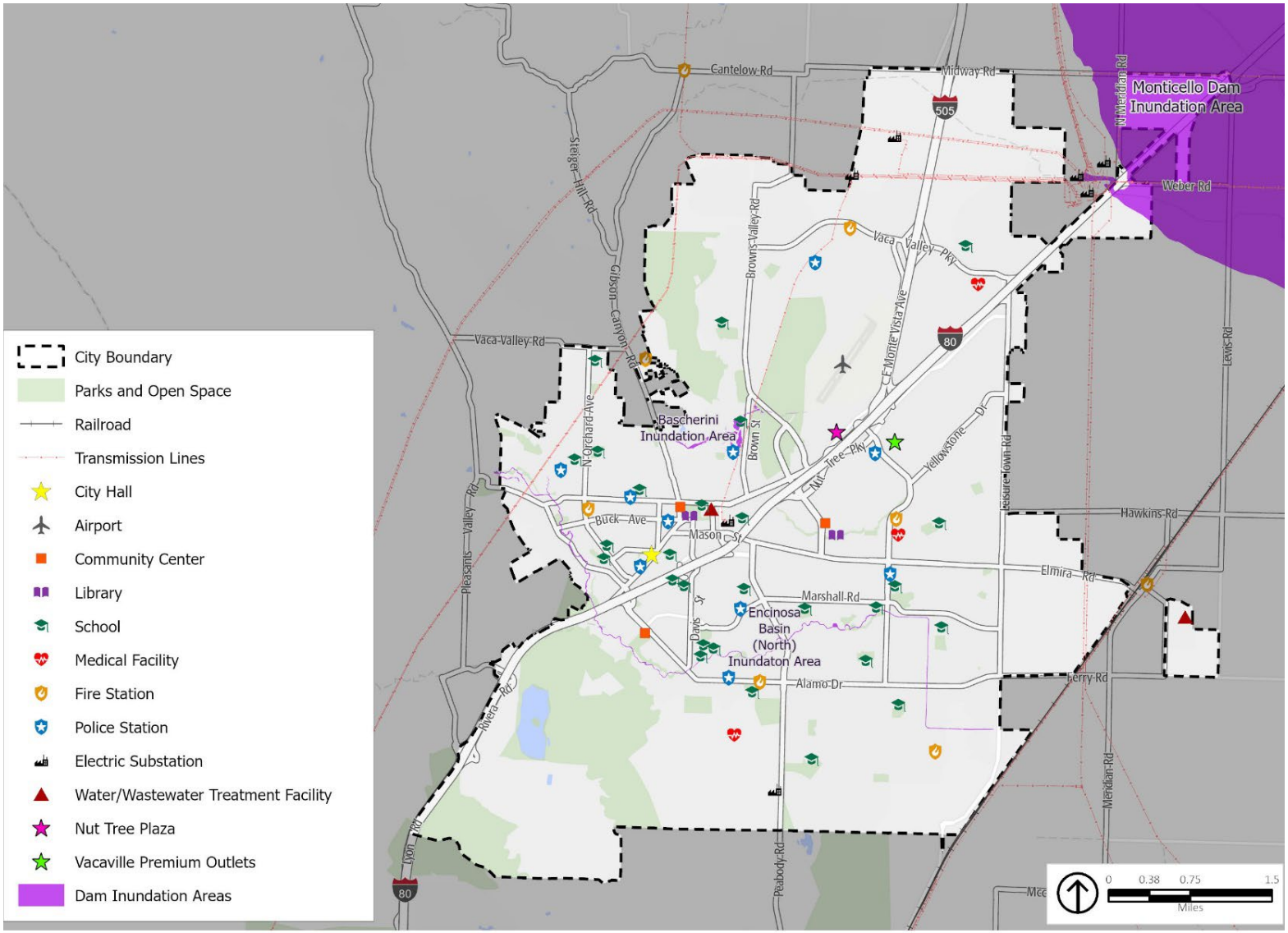


Figure SAF-7 Dam Inundation Areas



Source: DWR DSOD 2021, PlaceWorks 2022, ESRI

Goals, Policies, and Actions

Goal SAF-2	**Collect, convey, store, and dispose of stormwater in ways that provide an appropriate level of protection against flooding, account for existing and future development, and address applicable environmental concerns.**

Policies

Policy SAF-P2.1 Continue to develop a comprehensive system of drainage improvements to minimize flood hazards, and maintain storm drainage infrastructure in good condition.

Policy SAF-P2.2 Assess the adequacy of storm drainage utilities in existing developed areas, and program any needed improvements in coordination with new infrastructure that will serve developing areas.

Policy SAF-P2.3 Encourage the formation of flood-control assessment districts for areas with flooding and drainage problems.

Policy SAF-P2.4 Design storm drainage infrastructure to serve dual purposes to the extent possible. This includes the following:

- Drainage facilities integrated into recreation corridors with bike paths, sidewalks, and landscaping.
- Drainage channels integrated with transportation and environmental corridors.
- Active and passive recreation areas incorporated into detention basins where feasible.
- Drainage facilities designed to incorporate natural infrastructure and support ecosystem health where feasible.

Policy SAF-P2.5 Maintain open areas needed to retain stormwater and prevent flooding of urban or agricultural land.

Policy SAF-P2.6 Require new development adjacent to creeks to dedicate 40 feet from the stable top of bank to the City. The decision maker may require more than 40 feet from the top of the bank to mitigate potentially significant environmental impacts in compliance with CEQA.

Actions

Action SAF-A2.1 Study the feasibility of establishing specific fees for those areas in which flooding and drainage problems exist. Assessed fees would be used to mitigate flooding through physical improvements.

Action SAF-A2.2 Develop a financing plan for the construction and ongoing maintenance of upstream regional flood-control detention basins.

Action SAF-A2.3 Continue to construct upstream regional flood-control detention basins.

Action SAF-A2.4 Continue to update the five-year Capital Improvement Plan to provide for needed storm drainage facilities in relation to the City's financial resources.

Action SAF-A2.5 Develop a long-range strategic capital development plan for storm drainage facilities consistent with the General Plan.

Action SAF-A2.6 Regularly update the City's Storm Drainage Master Plan to identify storm drain facility improvements necessary to eliminate existing flooding hazards and drainage problems.

Action SAF-A2.7 Continue to implement the storm drain facility improvements identified in the City's Storm Drainage Master Plan and the Ulatis System Drainage Study.

Action SAF-A2.8 Continue to cooperate with the Solano County Water Agency on developing a comprehensive stormwater management program to accommodate additional development in undeveloped areas.

Goal SAF-3 Provide effective storm drainage facilities for development projects.

Policies

Policy SAF-P3.1 Evaluate the storm drainage needs for each project; this evaluation should account for projected runoff volumes and flow rates once the drainage area is fully developed. In the Alamo Creek watershed upstream of Peabody Road (including Alamo, Laguna, and Encinosa Creeks), require post-development 10-year and 100-year peak flows to be reduced to 90 percent of predevelopment levels. In the remainder of Vacaville, for development involving new connections to creeks, peak flows shall not exceed predevelopment levels for 10- and 100-year storm events.

Policy SAF-P3.2 Continue to require development impact fees to fund necessary storm drainage improvements, including drainage detention basins.

Policy SAF-P3.3 Require a storm drainage site-specific plan or storm drainage technical memorandum and calculations to be prepared for new development projects to ensure new development adequately provides for on-site drainage facilities necessary to protect the new development from potential flood hazards, and ensure that potential off-site impacts are fully mitigated.

Policy SAF-P3.4 Require that new development designate storm drainage easements or routes when tentative maps or specific plans are approved.

Policy SAF-P3.5 Prohibit extension of storm drainage infrastructure into the Upper Lagoon Valley that would promote its urban development.

Actions

Action SAF-A3.1 Maintain the City's Storm Drainage Master Plan, which ensures that new development adequately provides for on-site and downstream off-site mitigation of potential flood hazards and drainage problems.

Goal SAF-4 Protect people and property from flood risk.

Policies

Policy SAF-P4.1 Prohibit development within the 100-year floodplain unless mitigation of flood risk is assured.

Policy SAF-P4.2 Require that the lowest floor of any new construction be elevated a minimum of 1 foot above the 100-year flood elevation.

Policy SAF-P4.3 When reviewing proposals for new development in dam inundation areas, consider risks from potential dam failure.

Policy SAF-P4.4 Require that new development mitigate its additional runoff and mitigate removal of any floodplain areas.

Policy SAF-P4.5 Continue to participate in the National Flood Insurance Program (NFIP) at the highest discount rate practicable for the community and provide information to residents and business owners about the NFIP, Federal Emergency Management Agency Flood Insurance Rate Maps, and flood map changes.

Actions

Action SAF-A4.1 Regularly update the Floodplain Management Ordinance to be in accordance with the National Flood Insurance Rate Map regulations.

Action SAF-A4.2 Assist the Federal Emergency Management Agency in updating the Flood Insurance Rate Maps for the Vacaville area and identifying 100-year flood zones.

Action SAF-A4.3 Review and revise the Safety Element concurrently with the adoption of each Housing Element to identify any new housing areas prone to flood hazards.

Action SAF-A4.4 Annually review the Land Use Element to account for new flood information made available during the previous year.

Action SAF-A4.5 Support the efforts of levee owners and regional, state, or federal agencies to design and reconstruct levees that do not meet flood protection standards to bring them into compliance with adopted state and/or federal standards.

Action SAF-A4.6 Regularly amend the Safety Element to ensure that flood hazard zone mapping is comprehensive and up to date.

Action SAF-A4.7 Establish citywide protection priorities for vulnerable communities and their populations identified to be at high risk of displacement from future flooding in the City's vulnerability assessment or the best-available climate science data and use regional funding mechanisms to plan and implement protection measures in these locations or for these populations.

Wildland Fires

This section addresses wildland fires. Additional information and policies regarding urban fires are contained in the Public Facilities and Services Element.

Fire Hazard Areas

Highly flammable vegetation and warm, dry summers create the potential for wildland fires in Vacaville. The risk of wildland fires is related to a combination of factors, including winds, temperatures, humidity levels, and fuel moisture content. Steep slopes also contribute to fire hazards by intensifying the effects of wind and making fire suppression difficult. Where there is easy public access to dry vegetation, fire hazards increase due to greater chance of human carelessness. High hazard areas in Vacaville include outlying residential parcels and open lands adjacent to residential areas.

The wildland-urban interface (WUI) is an area where buildings and infrastructure (e.g., cell towers, schools, water supply facilities) mix with areas of flammable wildland vegetation. The WUI is made up of three distinct zones: the intermix, interface, and influence zones. The intermix and interface zones are the two zones in which significant property loss due to wildfire is most likely, with the influence serving as an additional buffer. The three zones are defined as follows:

- The intermix zone contains housing development or improved parcels interspersed in an area dominated by wildland vegetation subject to wildfire. The intermix zone is often found in rural, exurban, or large-lot suburban developments.
- The interface zone is where dense housing occurs next to vegetation that can burn in a wildfire, but not dominated by wildland vegetation. There is a clear line of demarcation between development and vegetation, which may appear as an abrupt edge between a highly urbanized or suburban neighborhood and a wildland area.
- The influence zone is a buffer area of wildland vegetation up to 1.5 miles away from the interface and intermix zones, which usually lacks development.

Vacaville contains 2,478 residential parcels within the designated WUI zone. With thousands of people living near and visiting wildland areas, the probability of human-caused fires is growing.

In the WUI, efforts to prevent ignitions and limit wildfire loss hinge on hardening structures and creating defensible space through a multifaceted approach, which includes engineering, enforcement, education, emergency response, and economic incentive. Different strategies in the defense and threat zones of the WUI help to limit the spread of fire and reduce the risk to people and property. **Figure SAF-8** shows the WUI in and around Vacaville.

To quantify wildfire risk, the California Department of Forestry and Fire Protection (CAL FIRE) has developed a Fire Hazard Severity Scale that uses three criteria to evaluate and designate potential fire hazards in wildland areas: fuel loading (vegetation), fire weather (winds, temperatures, humidity levels, and fuel moisture contents), and topography (degree of slope). Fire Hazard Severity Zones are designated Moderate, High, or Very High. **Figure SAF-9** shows the Fire Hazard Severity Zones around Vacaville, as designated by CAL FIRE at time of writing. Users should consult the most recent available mapping, available from CAL FIRE's Fire and Resource Assessment Program (FRAP) at https://frap.fire.ca.gov/. Future updates to this Safety Element will incorporate new mapping data as it becomes available.

The MJHMP also analyzes wildfire risk exposure based on the Fire Hazard Severity Zones and the WUI, along with data about tree mortality and utility fire data from the California Public Utilities Commission. **Figure SAF-10** shows this composite risk exposure for Vacaville. In addition to these mapped hazard areas, grass fire threats in open agricultural lands are a significant concern in the growth areas in the eastern portion of the city. Grass fires can travel very fast and threaten nearby residential areas.

Noteworthy wildfires have occurred around Vacaville in recent years. Of these, wildfires in 1961, 2017, and 2020 had the largest impact on the region. The 1961 "Black Saturday" fire destroyed 95,008 acres and 10 homes in the Allendale area. The 2017 Atlas Fire burned 51,624 acres across Solano and Napa Counties and resulted in the destruction of 781 structures and 6 deaths. The 2020 LNU Lightning Complex Fire, immediately west of Vacaville, was a large complex of wildfires that burned during the 2020 California wildfire season across much of the wine country area of Northern California—Lake, Napa, Sonoma, Solano, and Yolo Counties—from August 17 to October 2, 2020. The LNU Lightning Complex Fire burned a total of 363,220 acres and destroyed 1,491 structures. Six people were killed and another five injured. However, the fire did not enter the Vacaville city limits.

Wildfire Smoke

Wildfire smoke is a mix of gases and fine particulate matter from burning vegetation and materials. The pollutant of most concern from wildfire smoke is fine particulate matter ($PM_{2.5}$). $PM_{2.5}$ from wildfire smoke is damaging to human health due to its ability to deeply penetrate lung tissue and affect the heart and circulatory system. Although wildfire smoke presents a health risk to everyone, sensitive groups may experience more severe acute and chronic symptoms from exposure to wildfire smoke, such as children, older adults, people with chronic respiratory or cardiovascular disease, or people experiencing low socioeconomic status. Fires occurring locally or elsewhere in northern California can create dangerously high levels of air pollution in Vacaville.

Fire Mitigation and Response

The Vacaville Fire Department (VFD) is responsible for fire and medical response within the city. VFD is made up of dedicated fire suppression and prevention staff that respond to fire, medical, and emergency calls and conduct building and fire protection system plan reviews and associated inspections, required annual fire and life safety inspections, municipal code enforcement, COV connect neighborhood clean-up programing, and weed abatement to assist in reducing Vacaville's fire risk. VFD responded to 290 fire calls in 2021 and had an average response time of 6 minutes and 53 seconds.[5]

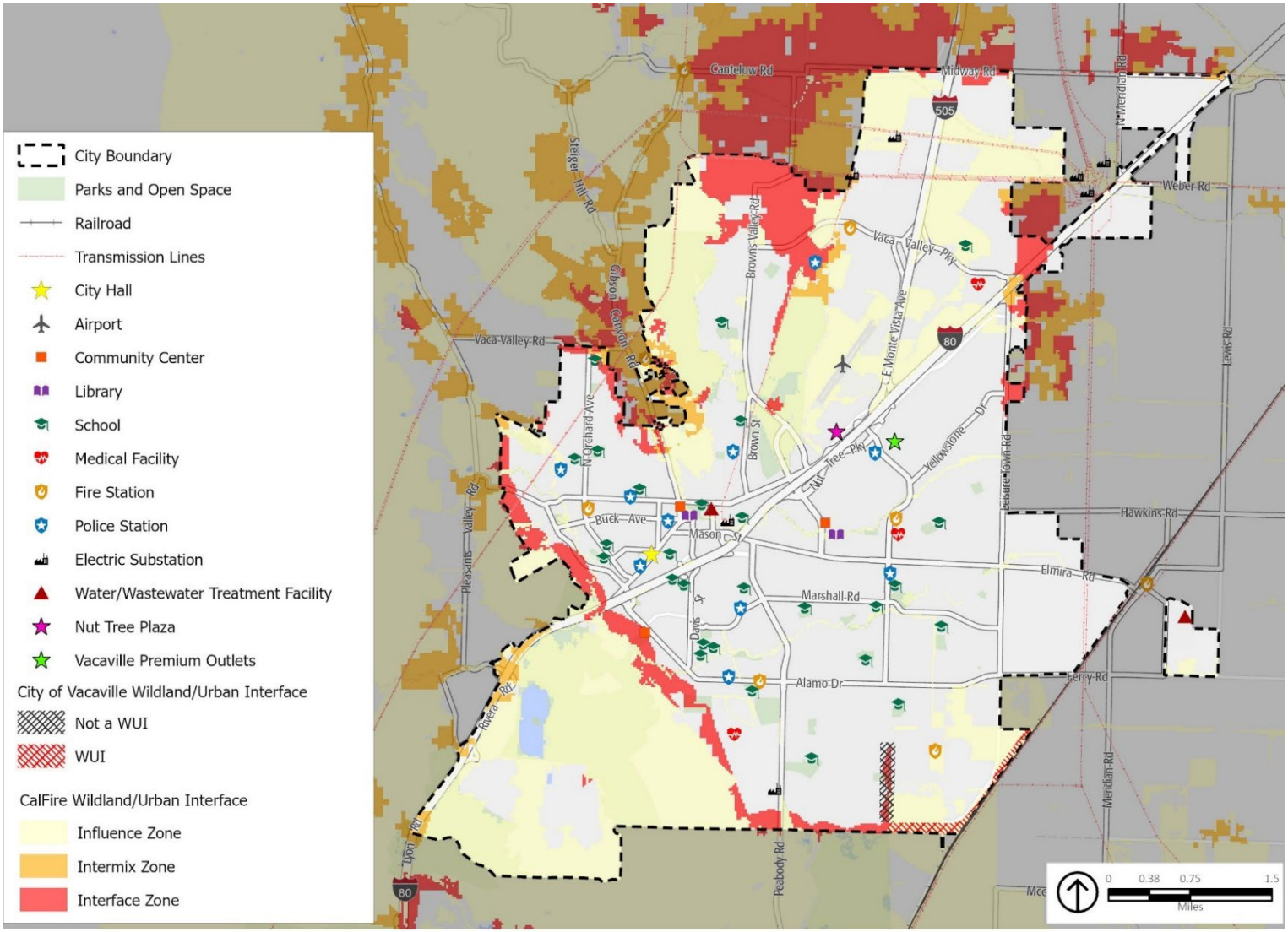
To reduce risks from wildland fires, the City of Vacaville follows the Fire and Building Codes. It also adopted Chapter 14.20.290 of the Municipal Code, Standards for New Construction Adjacent to Open Space Lands Where Wildfire Is a Threat. This chapter provides development standards for new construction adjacent to permanent open space or other open lands where no development is anticipated in the near future (as identified in the General Plan) and where wildfire is a threat. Some of the fire-reduction strategies incorporated in the code include providing for fire access roads and maintaining a defensible space of noncombustible vegetation around structures.

Fuel reduction and weed abatement play significant roles in the City's wildfire mitigation strategy. To mitigate wildfire impacts, the City uses grazing to reduce weeds and other fire fuels within open space areas. Grazing significantly slowed the forward movement of the 2020 LNU Lightning Complex Fire as it spread toward the city, and it allowed for successful containment efforts without the loss of homes within city limits. The City's strict weed abatement ordinance also helps to reduce the accumulation of potential wildfire kindling. The City manages a weed abatement program performed by both in-house City staff and outside contractors to abate over 2,000 acres of designated weed abatement parcels. Municipal Code Chapters 15.20.271, California Fire Code, and 8.04, Abatement of Weeds and Rubbish, establish the City's weed abatement program.

Future Risks and Effects of Climate Change

Changing climate conditions are expected to increase the fire risk in and around Vacaville. Residents most vulnerable to wildfire include those who face potentially high levels of smoke exposure, such as outdoor workers and individuals experiencing homelessness. Those who are highly sensitive to the health effects of smoke, such as those with pre-existing health conditions, seniors, and children, are also highly vulnerable. Financially stressed households in fire hazard areas may struggle to invest in fire resiliency improvements to their homes and to recover from fire damage. Key community infrastructure, such as bridges, energy infrastructure, and major roads traverse wildfire hazard areas. Damage to these systems could significantly impact the residents' and workers' health, safety, and quality of life. Local and regional wildfires could also affect local agricultural lands, water supplies, damage crops and pollute soil and water.

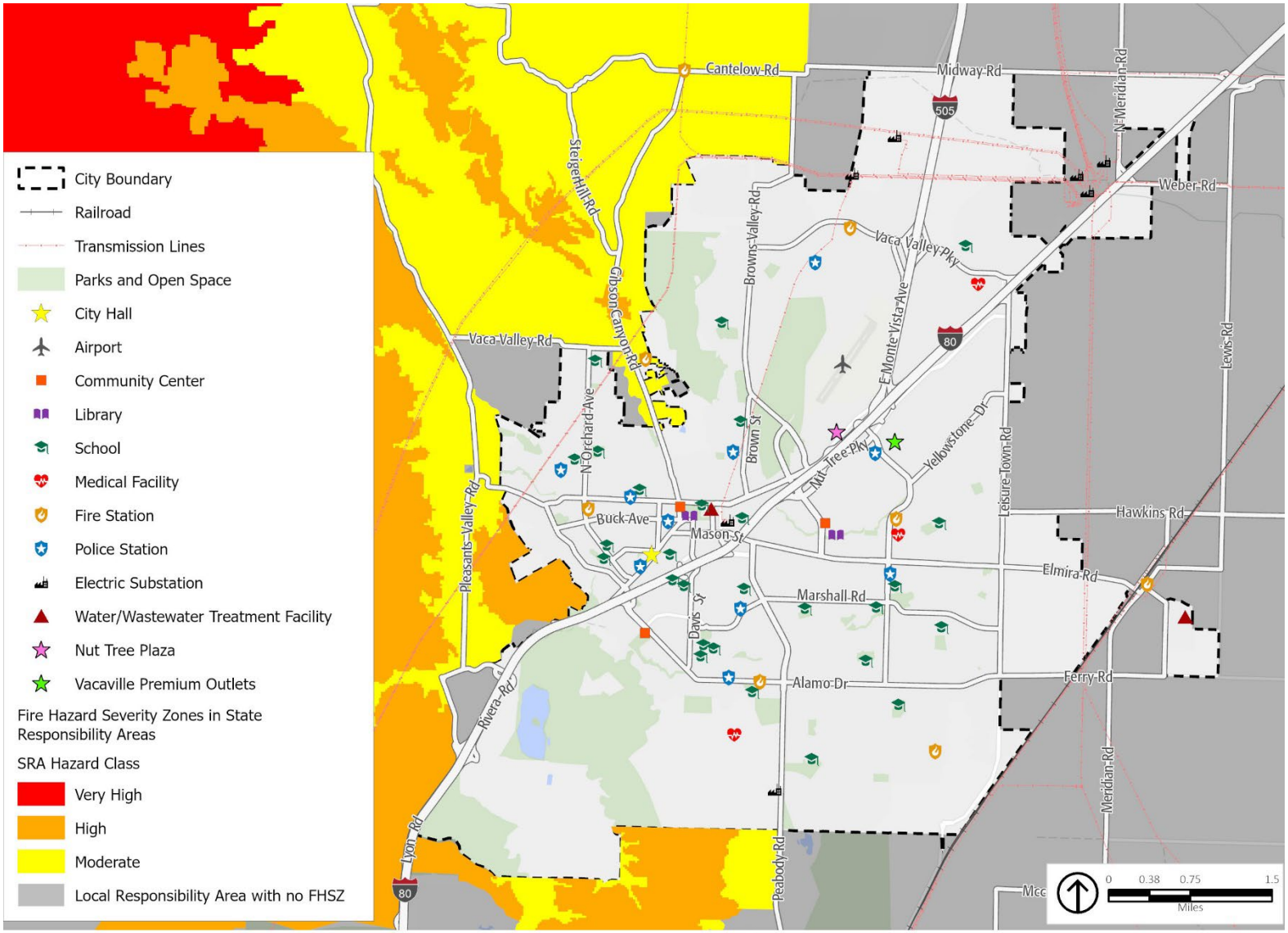
Figure SAF-8 Wildland-Urban Interface



Source: CalFire 2015, PlaceWorks 2022, ESRI

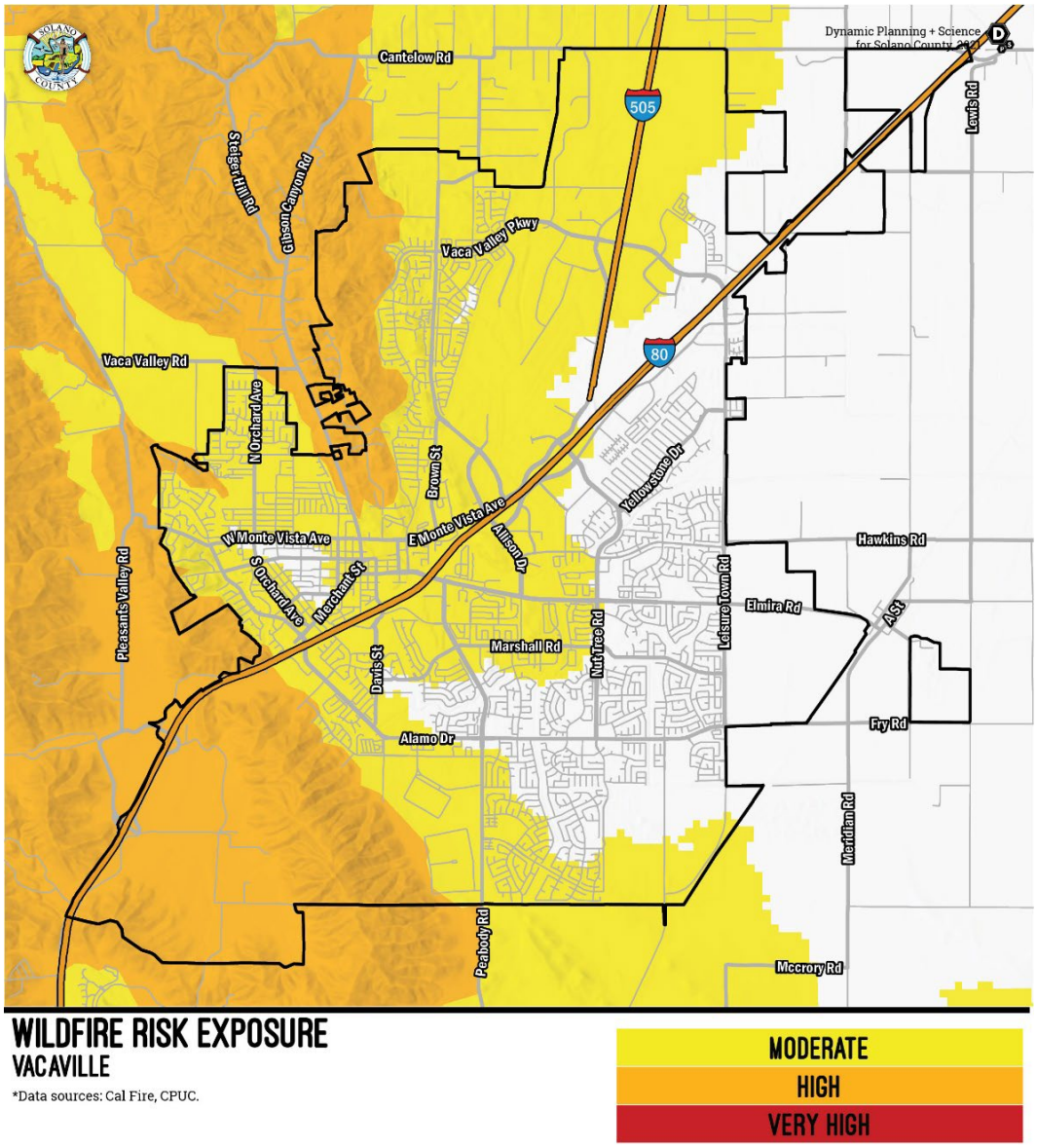
Note: Due to recent development activity, the City of Vacaville believes that the WUI boundaries in southeast Vacaville are different from those mapped by CAL FIRE. The City believes that the area shown in black cross-hatching along Nut Tree Road is no longer a WUI area, while the area shown in red cross-hatching near Leisure Town Road is part of the Interface zone.

Figure SAF-9 CALFIRE Fire Hazard Severity Zones



Source: Cal Fire 2007, Solano County, PlaceWorks 2022, ESRI

Figure SAF-10 Wildfire Risk Exposure



Goals, Policies, and Actions

Goal SAF-5 Protect lives and property from wildland fire hazards.

Policies

Policy SAF-P5.1 Reduce the risk from wildfires by restricting development in the wildland-urban interface, as shown in **Figure SAF-8**.

Policy SAF-P5.2 Require that all development in areas of potential wildland fire hazards, including agricultural areas east of Leisure Town Road, include the following:

- Fire breaks adjoining open space areas.
- Adequate access to adjoining open space areas.
- Clearance around structures and energy infrastructure.
- Fire-resistant groundcover.
- Fire-resistant roofing materials.
- Adequate emergency water flow.
- Adequate road dimension and signage to support the delivery of firefighting services and evacuation.

Policy SAF-P5.3 Work with water service providers and fire protection agencies to promote the long-term integrity of water supplies to meet firefighting needs and ensure that new and existing developments in the WUI have suitable infrastructure to deliver water supplies.

Policy SAF-P5.4 Require that all development adjacent to open agricultural lands or open space comply with state law regarding defensible open space, even if the agricultural lands are designated for future development.

Policy SAF-P5.5 Incorporate drought-resistant and fire-resistant plants in public works projects in areas subject to wildland fires.

Policy SAF-P5.6 Regularly train Vacaville Fire Department staff for wildland firefighting conditions.

Policy SAF-P5.7 Require all development applications to be reviewed and approved by the Fire Department prior to project approval.

Policy SAF-P5.8 Facilitate post-fire recovery by supporting efforts to stabilize slopes, control erosion, and replant with native species.

Policy SAF-P5.9 Encourage the retrofitting of older buildings to current fire safety standards as a part of proposed major remodeling or additions.

Actions

Action SAF-A5.1 Implement standards to address wildfire threat from agricultural areas in the East of Leisure Town Road and Northeast Growth Areas, which are shown in **Figure LU-3**.

Action SAF-A5.2 Amend Chapter 15.20 of the Vacaville Land Use and Development Code, Standards for New Construction Adjacent to Open Space Lands Where Wildfire is a Threat, to be consistent with state law.

Action SAF-A5.3 Continue to develop standards setting requirements for road design, signage design and placement, water supply provision, and fire-safe landscaping in the wildland-urban interface, consistent with the California Fire Code.

Action SAF-A5.4 Coordinate with energy service providers to underground power lines, especially in the wildland-urban interface.

Action SAF-A5.5 Work with energy service providers to ensure access to needed power supplies for vulnerable populations during planned power shutoffs.

Action SAF-A5.6 Following a large fire, evaluate the feasibility and resilience of redevelopment, and consider changes to building or development standards to improve resilience.

Action SAF-A5.7 Apply for grants and other funding mechanisms to retrofit ventilation systems at City buildings to provide refuge for residents during periods of unhealthy air quality caused by excessive wildfire smoke.

Hazardous Materials and Waste

Background Information

Products as diverse as gasoline, paint solvents, film processing chemicals, household cleaning products, refrigerants, and radioactive substances are categorized as hazardous materials. What remains of a hazardous material after use or processing is considered to be a ***hazardous waste***. The handling, transportation, and disposal of such waste is a concern to all communities. Improper handling of hazardous materials or waste may result in significant impacts on human health and the environment.

Many businesses and residents in Vacaville use hazardous materials and generate some amount of hazardous waste. Common hazardous waste is generated from gasoline service stations, dry cleaners, automotive mechanics, auto body repair shops, machine shops, printers and photo processors, and agriculture. Most of these wastes are petroleum-based or hydrocarbon hazardous waste and include cleaning and paint solvents, lubricants, and oils. However, medical wastes, defined as potential infectious waste from sources such as laboratories, clinics, and hospitals, are also included among the hazardous wastes found in Vacaville.

The State Water Resources Control Board's GeoTracker database (https://geotracker.waterboards.ca.gov/) tracks the status of sites that impact, or have the potential to impact, water quality in California, with emphasis on groundwater. GeoTracker contains records for sites that require cleanup, such as Leaking Underground Storage Tank (LUST) Sites, Department of Defense Sites, and Cleanup Program Sites. As of November 9, 2022, the database identifies 99 sites in Vacaville, consisting of both LUST and military sites. Cleanup has been completed at 82 of the sites.

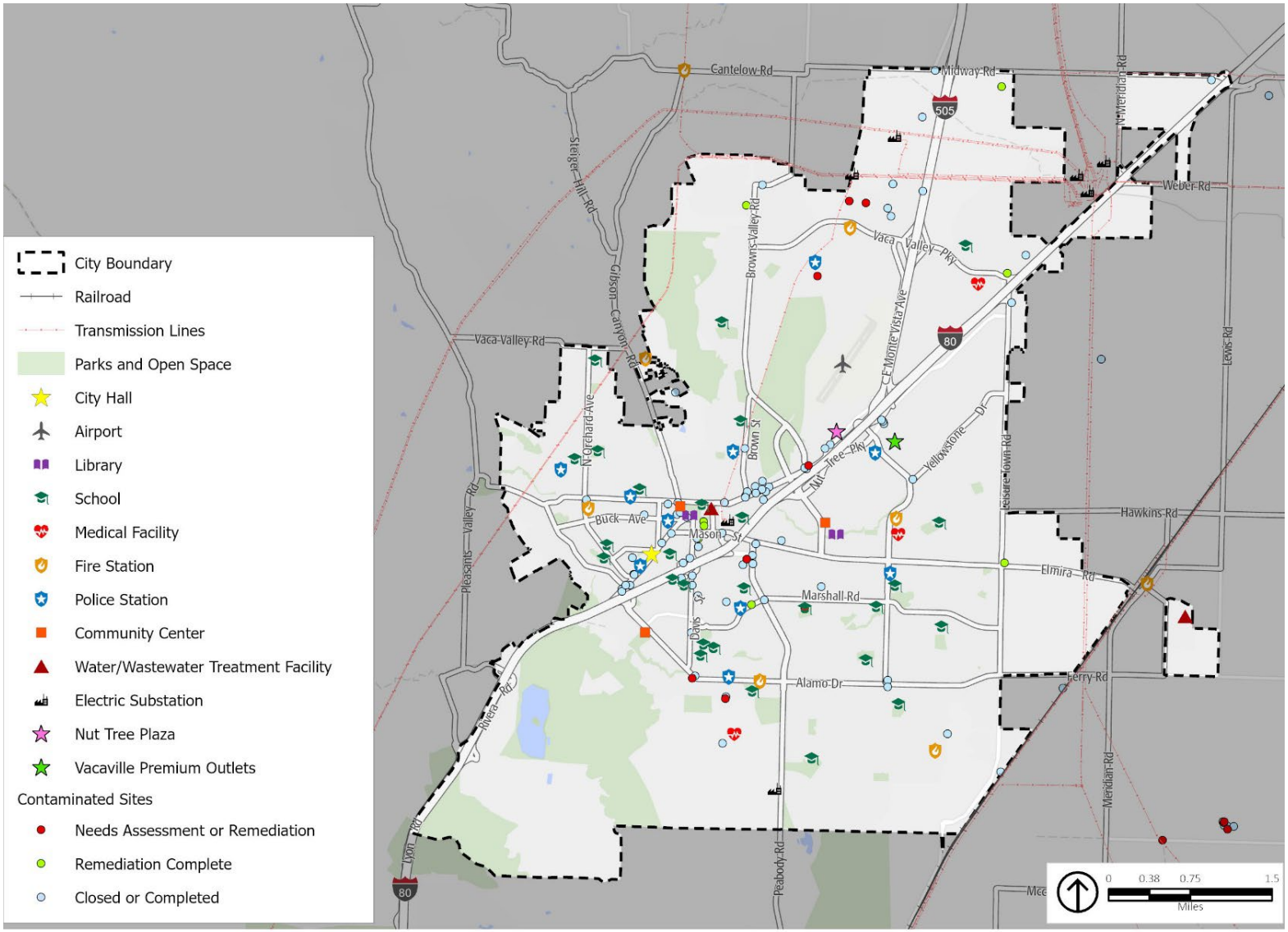
The Department of Toxic Substances Control's hazardous waste EnviroStor database (https://www.envirostor.dtsc.ca.gov/public/) tracks the cleanup, permitting, enforcement, and investigation of hazardous waste facilities and sites with known contamination or sites where there may be reason to investigate further. As of November 9, 2022, the EnviroStor database shows 13 hazardous materials sites within Vacaville, 10 of which are closed or inactive. The city contains 6 plugged oil wells.

Figure SAF-11 shows the hazardous material sites listed in the GeoTracker and EnviroStor databases. Hazardous materials sites are subject to state and federal cleanup requirements. Policies within this Safety Element are intended to address and abate the risks associated with potential exposure to or development within the vicinity of existing hazardous material sites, and to clarify the City's role in coordinating with external agencies on these issues.

Hazardous Materials Incidents Mitigation and Response

Hazardous materials and hazardous wastes in Vacaville are heavily regulated by a range of federal, state, and local agencies. One of the primary hazardous materials regulatory agencies is the California Environmental Protection Agency, Department of Toxic Substances Control (DTSC). DTSC is authorized by the US Environmental Protection Agency (EPA) to enforce and implement federal hazardous materials laws and regulations.

Figure SAF-11 Hazardous Materials Sites



Source: CalOES 2021, Solano County 2021, PlaceWorks 2022, ESRI

Solano County has taken the lead in preparing and adopting a hazardous waste management plan for all waste projected to be generated in the county. State law requires all businesses to prepare an inventory of hazardous materials they use and store. The County's Department of Environmental Management receives this information and distributes it to local fire protection agencies. The Solano County Inter-Agency Hazardous Materials Team, part of Solano County's Office of Emergency Services, has responsibility for responding to hazardous materials incidents.

In Vacaville, limited quantities of household hazardous waste may be transported to and dropped off at a recycling center. Local small businesses may also contract with the waste collection service provider to regularly dispose of larger quantities of waste.

Goals, Policies, and Actions

Goal SAF-6 Minimize risks from the harmful effects of hazardous materials and waste.

Policies

Policy SAF-P6.1 Work with Solano County and other public agencies to inform consumers about household use and disposal of hazardous materials and to facilitate the safe disposal of hazardous materials and waste.

Policy SAF-P6.2 Cooperate with Solano County on implementation of the Hazardous Waste Management Plan, and review development proposals involving hazardous waste facilities to ensure consistency with that plan.

Policy SAF-P6.3 Require industrial uses that rely extensively on the use of hazardous materials to adopt or have in place an acceptable use, storage, disposal, and emergency response program that has been approved by appropriate agencies.

Policy SAF-P6.4 Require adequate separation between areas where hazardous materials are present and sensitive uses such as schools, residences, and public facilities.

Policy SAF-P6.5 In areas historically used for commercial or industrial uses, require that developers conduct an environmental investigation to ensure that the site was not contaminated by the previous use.

Policy SAF-P6.6 Promote the safe transport of hazardous materials through Vacaville by implementing the following measures:

- Maintain formally-designated hazardous material carrier routes to direct hazardous materials away from populated and other sensitive areas.

- Prohibit vehicles transporting hazardous materials from parking on City streets.
- Require that new pipelines and other channels carrying hazardous materials avoid residential areas and other immobile populations to the extent possible.

Actions

Action SAF-A6.1 Amend the Land Use and Development Code to specify development standards for properties where hazardous materials are present, including adequate separation and buffers from sensitive uses such as schools, residences, and public facilities.

Disaster and Emergency Preparedness

Vacaville Disaster and Emergency Response

The City of Vacaville police and fire departments help the community prepare for and respond to disasters and emergencies. The Vacaville Police Department (VPD) participates in a regional Office of Emergency Services mutual aid agreement. This mutual aid agreement is administered through the State of California Office of Emergency Services and is managed at a local level through Solano County. By participating in this mutual aid agreement, VPD commits staff and other resources to assist with disasters throughout the state. In return, VPD receives assistance from outside entities should a significant emergency occur in Vacaville.

VFD maintains agreements with Dixon, Fairfield, and the Vacaville Fire Protection District to provide automatic aid responses in designated areas. In addition to these automatic aid agreements, VFD also participates in a mutual aid plan with other fire departments in Solano County. Together, the departments have developed a shared alarm matrix that identifies which agencies and units should respond, depending on the size and nature of the incident. VFD also participates in the Statewide Mutual Aid Program.

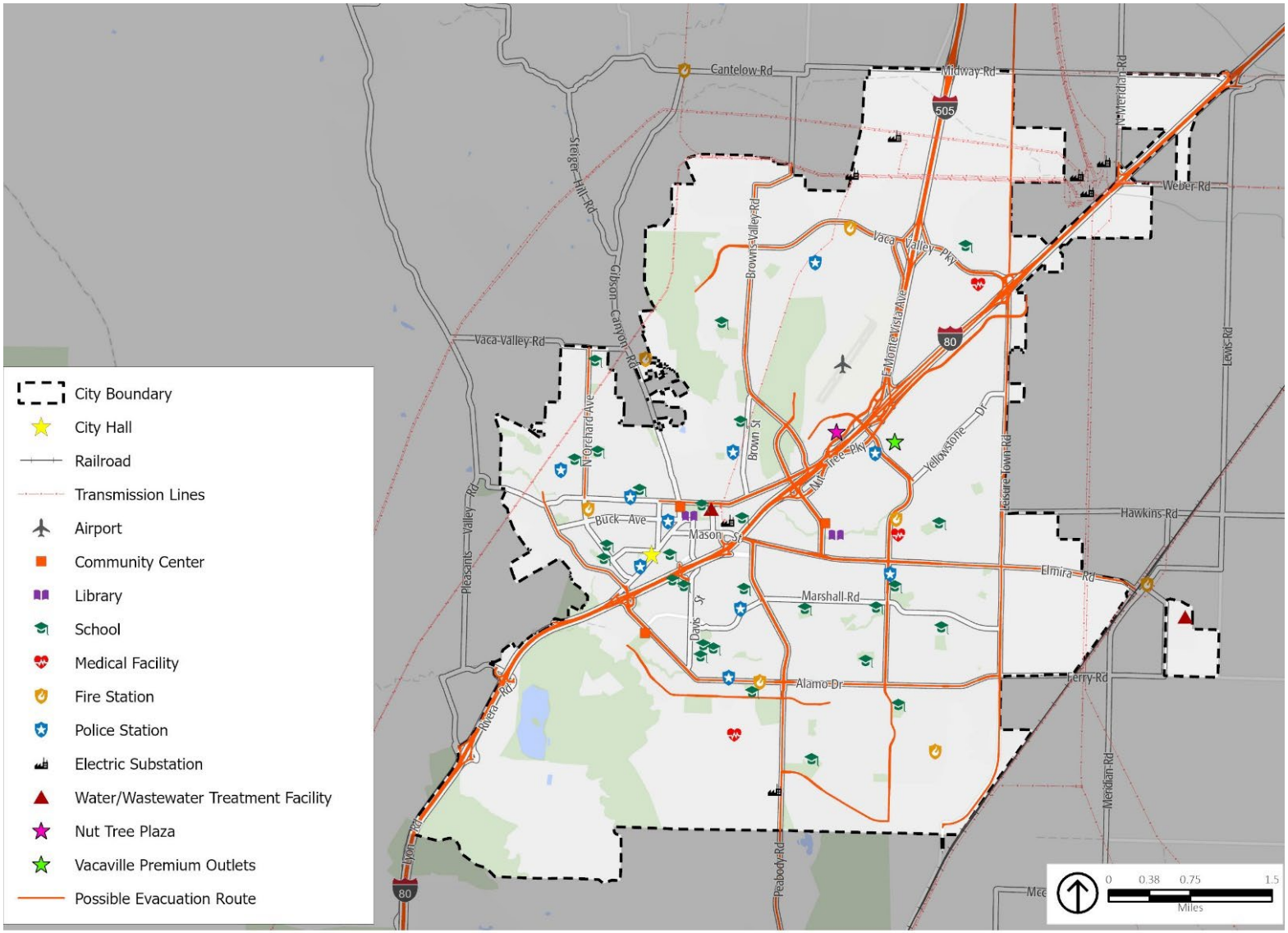
Vacaville works with the Solano County Office of Emergency Services (OES) to help prevent and respond to emergency events. Solano County OES maintains the Solano County Emergency Operations Plan and the Solano County Multi-Jurisdictional Hazard Mitigation Plan, which has an annex for Vacaville-specific hazards and is incorporated by reference into this document. Vacaville uses Alert Solano to notify residents and businesses within Solano County that are impacted by or in danger of being impacted by an emergency. Alert Solano provides basic information about incidents and what specific protective actions are necessary to protect life and health (shelter in place, lockdown, evacuate, avoid the area, etc.).

Emergency Evacuation

With advanced warning, evacuation can be effective in reducing injury and loss of life during a catastrophic event. The primary evacuation routes serving Vacaville include Interstate (I-) 80, Leisure Town Road, and Browns Valley Road. Leisure Town Road is identified as a reliever road for I-80 because I-80 may become backed up during a large evacuation. **Figure SAF-12** shows the major roadways serving Vacaville that could act as potential evacuation routes—I-80, I-505, Vaca Valley Parkway, Browns Valley Parkway, Nut Tree Parkway, Orange Drive, North Orchard Avenue, East Monte Vista Avenue, Allison Drive, Elmira Road, Alamo Drive, California Drive, and Peabody Road.

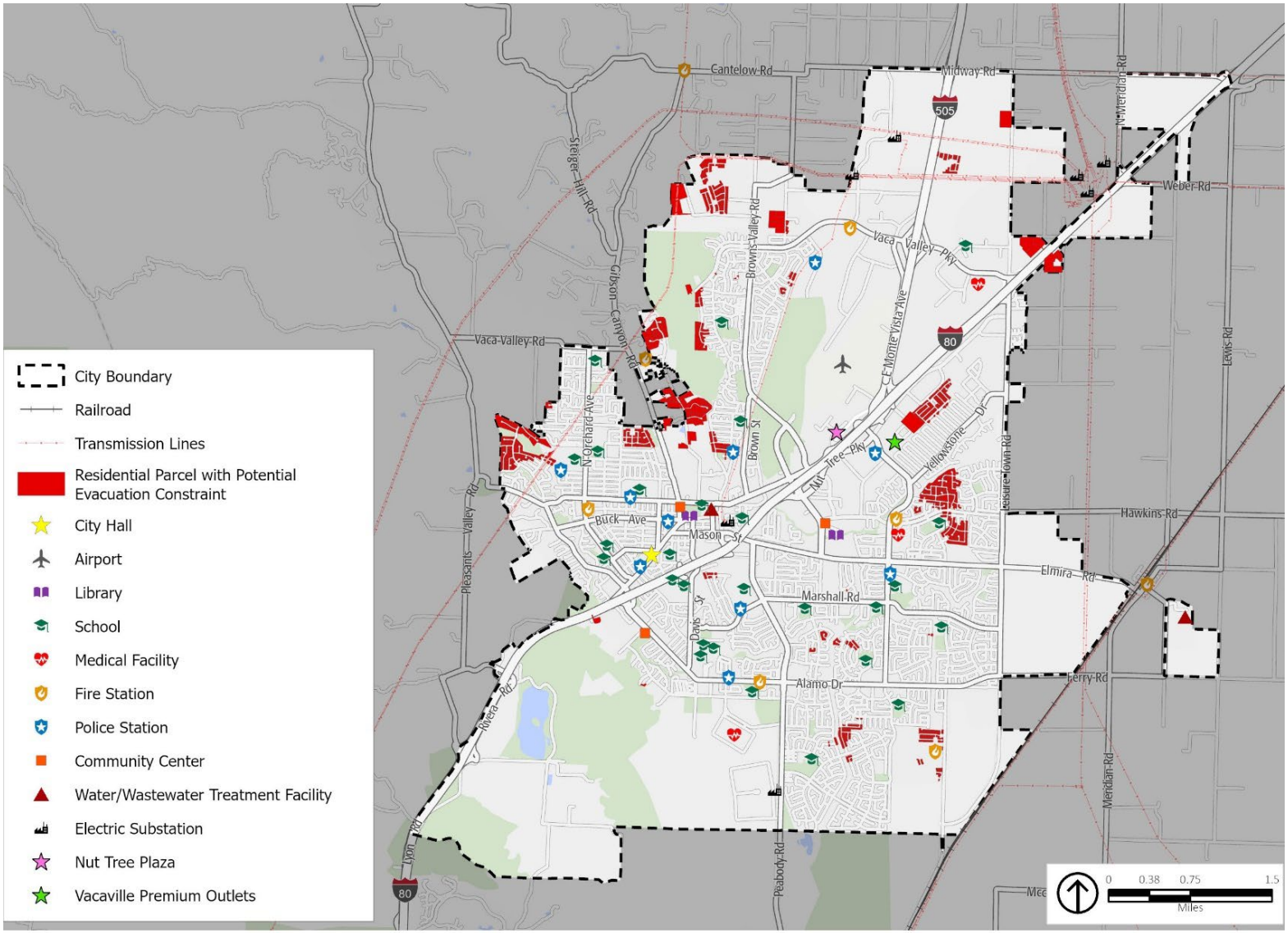
Figure SAF-13 shows residential parcels with evacuation constraints, meaning that these parcels are at least half a mile from a major roadway. Limited points of access may create bottlenecks and further complicate evacuation efforts. The city is currently working to improve evacuation conditions via the Jepson Parkway Concept, which is designed to provide a four-lane roadway from the I-80/Leisure Town Road interchange in Vacaville to the State Route 12/Walters Road intersection in Suisun City.[6] At the time of writing, the City is also currently working with Solano County on the development of a Community Wildland Preparedness Plan, which will include development of evacuation zones and evacuation planning.

Figure SAF-12 Potential Evacuation Routes



Source: Solano County 2021, PlaceWorks 2022, ESRI

Figure SAF-13 Evacuation-Constrained Parcels



Source: Solano County, PlaceWorks 2022, ESRI

Goals, Policies, and Actions

Goal SAF-7	Reduce risk to life and property associated with emergencies and natural and human-made disasters.

Policies

Policy SAF-P7.1 Promote public awareness of potential disaster scenarios for Vacaville and encourage community preparedness.

Policy SAF-P7.2 Provide education and support to neighborhood- or block-level efforts to prepare for disasters, ensuring that all training and educational material is available in multiple languages and in formats for persons with access and functional needs.

Policy SAF-P7.3 Maintain an adequate level of disaster response preparedness through careful review of proposed developments and through staff training in and exercise of the local hazard mitigation plan.

Policy SAF-P7.4 Identify and fund needed infrastructure improvements to increase the effectiveness of potential evacuation routes.

Policy SAF-P7.5 Maintain comprehensive Emergency Response Plans.

Policy SAF-P7.6 Locate critical facilities outside of the wildland-urban interface and 100-year flood zone whenever possible, accounting for how climate change may increase frequency and intensity of hazards. If critical facilities must be in hazard areas, ensure these facilities and their access routes are protected from the hazard risks inherent to each location.

Policy SAF-P7.7 Require new developments of at least 10 dwelling units in the wildland-urban interface or a 100-year floodplain to have access to at least two emergency evacuation routes.

Policy SAF-P7.8 Encourage existing development that is in the wildland-urban interface or a 100-year floodplain to have access to at least two emergency evacuation routes.

Policy SAF-P7.9 Coordinate with transit agencies to assist with evacuation efforts and ensure that evacuation services are made available to people with limited English proficiency and access to transportation, communication, and other lifeline resources and services.

Policy SAF-P7.10 Coordinate with school districts, park and recreation, and community-based organizations to ensure adequate emergency shelters and alternate care sites are available when natural disasters and other highly hazardous conditions occur.

Policy SAF-P7.11 Ensure that the City government continues to operate during and after hazard events and is able to provide resources and guidance to people and institutions in Vacaville to aid them in recovery and reconstruction following the end of the hazard event.

Policy SAF-P7.12 Ensure that communication systems used by emergency responders and key City staff have sufficient redundancy and resiliency to meet City needs during and after a hazard event.

Policy SAF-P7.13 Incorporate the current Solano County Multi-Jurisdictional Hazard Mitigation Plan and all relevant annexes, as approved by the Federal Emergency Management Agency, into this Safety Element by reference as permitted by California Government Code Section 65302.6.

Actions

Action SAF-A7.1 Adopt a comprehensive disaster response plan in coordination with adjoining communities. The plan should include procedures, including teaming and mutual aid, to follow during and after a major earthquake, wildland fire, hazardous substance release, or other catastrophic event.

Action SAF-A7.2 Cooperate with the Solano Transit Authority, Solano County Office of Emergency Services, Caltrans, and others as necessary to identify their capacity, safety, and viability of evacuation routes under different hazard scenarios, as well as emergency vehicle routes for disaster response, and where possible, alternate routes where congestion or road failure could occur. Update as new information and technologies become available.

Action SAF-A7.3 Conduct periodic drills using emergency response systems to test the effectiveness of City procedures.

Climate Change Adaptation

Climate change will affect nearly all of the hazards that affect life and work in Vacaville. This section focuses on hazards associated with climate change that may affect human health that have not been extensively addressed in previous Safety Element updates. Additional information and policies to reduce greenhouse gas emissions are contained in the Conservation and Open Space Element.

Background Information

As discussed in the Conservation and Open Space Element, greenhouse gas emissions from human activities are contributing to a concentration of these gases in the atmosphere, and have led to a trend of unnatural warming of the Earth's climate, which is known as global warming or climate change. The climate and natural resources in California will be adversely affected by climate change. Droughts and wildland fires are expected to become more severe. Sea-level rise and changes in precipitation patterns could increase flooding, saltwater intrusion, and degradation of wetlands. Mass migration and/or loss of plant and animal species could also occur. Climate change is also expected to cause increases in heat waves and heat-related stress, severe weather, and increased levels of air pollution.

Agricultural and Ecosystem Pests

Agricultural pests and diseases can affect crop plants, orchards, and nurseries throughout and surrounding the City of Vacaville. Pests and diseases can slow the growth of plants, inflict damage, or lead to fatalities. Pest activity is likely to increase as higher temperatures caused by climate change allow insects to reproduce more rapidly and increase the activity window for pests and diseases. Row crops can be affected by fungal pathogens and invasive disease vectors as temperatures continue to rise, affecting the quality and viability of crops. Pesticides and herbicides can help crops resist pests and diseases and new crop varietals may be pest-resistant; however, quickly evolving pests may make it difficult for some plant species to survive; changing crop varietals can also be expensive for farm owners. Solano County operates a comprehensive pest exclusion and detection program.

Climate change facilitates pest reproduction and expands the window of time and geographical range over which many pests are active. Increases in pest activity would have the largest impacts on the agricultural community, including the quality of agricultural products and the job security of agricultural workers. Local natural ecosystems and parks would also be affected.

Drought

A drought is an extended period when precipitation levels are well below normal. Drought is a normal part of the climate cycle. Drought may cause losses to agriculture; affect domestic water supply, energy production, public health, and wildlife; or contribute to wildfire. Like most of California and the western United States, Vacaville chronically experiences drought cycles. Drought impacts the city's water supply, which may, in severe instances, ultimately makes less water available for people, businesses, and natural systems.

Major droughts have occurred periodically in the Solano County region. Recent major droughts have taken place between 1975 and 1977, in 1991, in 2004, between 2006 and 2009, and between 2012 and 2015. During the 2012 to 2015 drought, the State imposed water conservation standards throughout the state, which required that the City of Vacaville reduce its water use by 32 percent. This regulation triggered the City to implement its Urban Water Shortage Contingency Plan Stage 3 response, wherein the City Council established residential household allocations; specified watering days for residential and commercial, industrial, and institutional customers; and implemented penalties for water use in excess of established allocations. The dry conditions damaged park, setback, and private landscaping that relies on potable water. Dry conditions in the surrounding open space areas increased wildfire danger. Another drought period began in 2020. As of September 2022, western Solano County, including Vacaville, was classified as being in "severe" drought and eastern Solano County was classified as being in "extreme" drought.

The City has taken a number of steps to manage its water supply in response to drought. The city has a high level of redundancy in its water supply sources, with surface water from the Solano Project and State Water Project, and groundwater from local production wells. This diversity increases the city's resilience to the impacts of climate change. The City is also planning to develop recycled water as a future supply for irrigation and industrial uses.

The City of Vacaville has adopted Municipal Code Chapters 13.20 (Water Conservation in Normal, Drought, and Emergency Conditions) and 14.27 (Water Efficient Landscaping) to promote water conservation and mitigate the severity of drought conditions. The City of Vacaville's 2020 Urban Water Shortage Contingency Plan contains actions to implement and enforce regulations and restrictions for managing a water shortage when it declares a water shortage emergency under the authority of the Water Code.

Although droughts are a regular feature of California's climate, scientists expect that climate change will lead to more frequent and intense droughts statewide. There are projected to be more years with extreme levels of precipitation, both high and low, as a result of climate change. This is expected to cause more frequent and intense droughts—compared to historical norms—that cause soil to dry out and become hard. When precipitation does return, more water runs off the surface than is absorbed into the ground, which can lead to floods. Higher air temperatures are expected to increase evaporation, causing more water loss from lakes and reservoirs, exacerbating drought conditions.

Agricultural operations, aquatic and semi-aquatic ecosystems, and local water supplies could all be significantly impacted by drought. Increases in water prices or constraints on water usage could have detrimental impacts on outdoor workers, financially stressed households, and pollution-burdened communities.

Extreme Heat

While there is no universal definition of extreme heat, California guidance documents define extreme heat as temperatures that are hotter than 98 percent of the historical high temperatures for the area, as measured between April and October of 1961 to 1990. Days that reach this level are called extreme heat days. In Vacaville, the extreme heat threshold is 102.5 degrees Fahrenheit (°F). An event with five extreme heat days in a row is called a heat wave. The warmer temperatures brought on by climate change are likely to cause an increase in extreme heat events.

Health impacts are the primary concern with extreme heat. People exposed to extreme heat can suffer heat-related illnesses, including heat cramps, heat exhaustion, and (most severely) heat stroke. Elderly persons, small children, chronic invalids, those on certain medications or drugs, and persons with weight and alcohol problems, are particularly susceptible to heat reactions. Indirectly, extreme heat puts more stress on power lines, causing them to run less efficiently. The heat also causes more demand for electricity (usually to run air conditioning units), and in combination with the stress on the power lines, may lead to brownouts and blackouts. The City of Vacaville has helped the public cope with previous extreme heat events by operating cooling centers.

Human Health Hazards

Human health hazards are bacteria, viruses, parasites, and other organisms spread by pest animals such as mice and rats, ticks, and mosquitos that can cause diseases and illness in people. Some of these diseases may cause only mild inconvenience, but others are potentially life threatening. Warmer temperatures and high levels of precipitation can lead to increased populations of disease-carrying animals, creating a greater risk of disease and increased rates of infection. Populations most vulnerable to human health hazards are those who spend a disproportionate amount of time outdoors, those with fragile immune systems or existing illnesses, and those who may live in sub-standard housing or not have access to health insurance and medical care. These persons may be living in conditions that increase their chances of catching vector-borne illnesses, lack the ability to fight off infections that may occur, or lack the financial resources to seek timely medical care.

Isolated incidents of West Nile Virus and Lyme Disease have been a perennial concern within Solano County. However, there are no records of recent widespread disease incidents. Increases in average temperature and changes in precipitation patterns favoring larger precipitation events

may facilitate the growth and activity of disease-carrying vectors. Overall risk of human health hazards is thus expected to increase. Financially stressed households may struggle to obtain medical care in the event of illness, and those with sensitive or compromised immune systems may be especially vulnerable. Those living or working in crowded conditions may be especially susceptible to contagious diseases.

Severe Weather

Severe weather is generally any destructive weather event and can occur in the form of heavy rain, hail, thunderstorms, and strong winds. Severe weather is usually caused by intense storm systems, although types of strong winds can occur without a storm. The types of dangers posed by severe weather vary widely and may include injuries or deaths, damage to buildings and structures, fallen trees, roads and railways blocked by debris, and fires sparked by lightning. Severe weather often produces high winds and lightning that can damage structures and cause power outages. Lightning from these storms can ignite wildfires and structure fires that can cause damage to buildings and endanger people.

The greater Solano County area is subject to periodic extreme weather events, most frequently in the form of heavy rain, high wind, thunderstorms, and fog. In January 2021, an atmospheric river event caused heavy rain and high winds across Northern California. Thousands of Vacaville residents lost power, and rockslides, flooding, road closures, and downed trees occurred across the region.[7] Heavy rains also occurred in October 2021, triggering road closures, downed trees, and flooding across Solano County, including Vacaville.[8]

Climate change is expected to cause an increase in intense rainfall and strong storm systems, which is usually associated with strong storm systems. This means that Vacaville could see more intense weather resulting from these storms in the coming years and decades, although such an increase may not affect all forms of severe weather. While average annual rainfall may increase only slightly, climate change is expected to cause an increase in the number of years with intense levels of precipitation. Heavy rainfall can increase the frequency and severity of other hazards, including flooding.

Financially stressed households or those without access to stable and secure housing, including households in poverty, those living in mobile homes, and individuals experiencing homelessness, may not have the resources to invest in increasing their resiliency or decreasing their exposure to severe weather. Severe weather may also damage or block roads and bridges and interrupt electricity delivery, which would inhibit community connectivity and interfere with the delivery of emergency services.

Goals, Policies, and Actions

Goal SAF-8	**Improve Vacaville's ability to adapt and respond to the impacts of climate change.**

Policies

Policy SAF-P8.1 Promote awareness of climate change, including its causes, impacts, and the latest best practices regarding climate change mitigation and adaptation.

Policy SAF-P8.2 Collaborate regionally to prepare for the effects of climate change.

Policy SAF-P8.3 Prioritize efforts to protect vulnerable communities and community assets from the impacts of climate change, including through improving community capacity and meaningfully involving community members in decision making.

Policy SAF-P8.4 Coordinate with public agencies, utilities, and community-based organizations to provide community resilience centers distributed throughout the city during extreme heat events, severe weather events, and other highly hazardous conditions. Work to ensure that these facilities are in highly accessible areas and that information about their availability is widely distributed, especially to vulnerable populations.

Policy SAF-P8.5 Coordinate with Solano County Transit and Vacaville City Coach to increase shading and heat-mitigating materials on pedestrian walkways and transit stops.

Policy SAF-P8.6 Work with energy service providers to promote programs encouraging reduced energy use during extreme heat events.

Policy SAF-P8.7 Encourage new developments and existing property owners to incorporate water and energy efficiency and conservation features, renewable energy, and energy storage on-site to reduce energy and water demands and improve on-site resilience. Support financing efforts to increase community access to these features.

Policy SAF-P8.8 Promote and expand the use of drought-tolerant green infrastructure, including street trees and landscaped areas, as part of cooling strategies in public and private spaces.

Policy SAF-P8.9 Use natural resources and infrastructure to absorb the impacts of climate-related hazards and associated natural hazards, as feasible.

Policy SAF-P8.10 Coordinate with the Solano County Water Agency, Solano Irrigation District, and Solano Collaborative to prepare for a reduced, long-term water supply resulting from more frequent and severe drought event and implement extensive water conservation measures to ensure sustainable water supply.

Policy SAF-P8.11 Look for opportunities to ensure that workers in outdoor industries have the training and resources to be adequately protected from environmental hazards, including extreme heat, poor air quality, and diseases.

Policy SAF-P8.12 Update the Climate Change Vulnerability Assessment with new climate-projections and data from Cal-Adapt and the California Climate Change Assessment during each update to the Safety Element.

Actions

Action SAF-A8.1 When the Energy and Conservation Action Strategy is next updated, develop a Climate Change Preparedness Plan that will prepare for the impacts of climate change on the city's economic and natural systems and provide a climate-resilient community.

Action SAF-A8.2 Update the capital project planning and budgeting processes to account for anticipated effects of climate change hazards on City capital improvements, including buildings and infrastructure, either by integrating the findings from the City's vulnerability assessment or the best-available climate science data related to impacts, risks, sensitivities, adaptive capacities, and vulnerabilities.

Action SAF-A8.3 Establish a regional climate change working group to share information and foster cooperation between Vacaville, neighboring communities, and regional agencies.

Action SAF-A8.4 Identify and map existing community facilities, such as libraries, gymnasiums, community centers, and auditoriums, that can serve as community resilience centers and support people with access and functional needs during hazard events. Work with the appropriate agencies to identify and implement facility upgrades, prioritizing facilities in vulnerable communities.

Action SAF-A8.5 Install backup power and water resources at critical City facilities, emergency shelters, community resilience centers, and cooling centers in case of power and water outages. Encourage privately-owned medical facilities, schools, County buildings, and businesses to install backup power and water resources.

Action SAF-A8.6 Coordinate with transit providers to identify and advertise ways for individuals with restricted mobility to reach resilience centers, cooling centers, and alternate care sites.

[1] California Governor's Office of Emergency Services. 2020. "California Adaptation Planning Guide." https://www.caloes.ca.gov/wp-content/uploads/Hazard-Mitigation/Documents/CA-Adaptation-Planning-Guide-FINAL-June-2020-Accessible.pdf#search=adaptation%20planning%20guide, accessed November 9, 2022.

[2] USGS. 2018. "A New Map of Rodgers Creek Fault in Sonoma County, California." https://www.usgs.gov/programs/earthquake-hazards/science/new-map-rodgers-creek-fault-sonoma-county-california, accessed May 27, 2022.

[3] Solano County Office of Emergency Services. 2022. "Solano County Multi-Jurisdictional Hazard Mitigation Plan." https://www.dropbox.com/s/qhxg7tmobn0kk9t/Solano-MJHMP-VOL-1-FEMA_Approval_and_Adoptions.pdf?dl=0, accessed November 9, 2022.

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[5] Vacaville Fire Department. 2022. "Vacaville Fire Department Annual Report." https://www.ci.vacaville.ca.us/home/showpublisheddocument/20129/637852752233700000, accessed May 27, 2022.

[6] Solano Transportation Authority. 2014. "Jepson Parkway Concept Plan." https://sta.ca.gov/wp-content/uploads/2019/01/JepsonParkwayConceptPlan_2014.pdf, accessed May 27, 2022.

[7] Rogers, P. 2021. "Bay Area weather: Atmospheric river storm delivers heavy rain, high winds, power outages, flash floods." *The Mercury News*. https://www.mercurynews.com/2021/01/26/flood-warnings-evacuations-precede-arrival-of-atmospheric-river/, accessed June 1, 2022.

[8] Sestanovich, N. 2021. "Solano County weathers weekend storm." *The Reporter*. https://www.thereporter.com/2021/10/25/solano-county-weathers-weekend-storm/, accessed June 1, 2022.