PENINSULA RESILIENCE PLANNING PROJECT

BURLINGAME
VULNERABILITY ASSESSMENT SUMMARY

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Public Draft

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Introduction

There are nine jurisdictions in San Mateo County working collaboratively on the Peninsula Resilience Planning (PREP) project: San Mateo County; the Town of Atherton; and the cities of Belmont, Brisbane, Burlingame, East Palo Alto, Half Moon Bay, Pacifica, and San Bruno. This is a coordinated effort to identify the hazards facing communities across San Mateo County, evaluate how these hazards may transform with the changing climate, recognize the communities and community features that are most vulnerable, and develop strategies for improving community safety and resilience.

What Is a General Plan?

A general plan is each local government's blueprint for meeting the community's long-term vision for the future, with goals, policies, and actions for achieving the vision. All cities and counties in California are required to have general plans with, at minimum, eight chapters, or elements: land use, circulation, housing, conservation, open space, noise, safety, and environmental justice (if applicable).

Source: Governor's Office of Planning and Research. 2017. *State of California General Plan Guidelines.*

As a participant in PREP, the County is conducting a comprehensive update of its Safety Element. As part of the technical background work for the update to the San Mateo County Safety Element, the PREP team prepared an updated Climate Change Vulnerability Assessment to analyze how climate-related hazards may harm the community. California law requires that, as part of the need to assess and protect against hazards, safety elements analyze climate vulnerability, which is the degree to which people, nature, the built environment, and other systems are susceptible to harm from climate change and associated hazards. This includes physical and mental injuries, property damage or destruction, environmental harm, economic damage, and other factors.

The Vulnerability Assessment helps community members, City staff, and decision makers understand how climate change hazards may alter community conditions and what parts of the community (people and places) should be prioritized for adaptation and resilience. The Vulnerability Assessment also informs updates to the Safety Element, which, in combination with the San Mateo County Multijurisdictional Local Hazard Mitigation Plan (MJLHMP) and Climate Action Plan, will help safeguard Burlingame against both current and future hazard conditions, including the changes in hazard events from climate change. The findings from the Vulnerability Assessment process will be used to inform the goals, policies, and actions that will be included in Burlingame's updated Safety Element. This assessment does not include hazards that are present in the community but are not affected by climate change, such as earthquakes.

Community Profile

The City of Burlingame sits on the San Francisco Peninsula, about 10 miles south of San Francisco. The mature, largely built-out community features well-established residential

neighborhoods. The city's Downtown and Broadway neighborhoods are home to numerous local and chain businesses, while Burlingame's shoreline is mostly light industrial facilities, business parks, and hotels. Primary vehicle access to the community is provided by Highway 101, El Camino Real, and Interstate 280. Transit access is provided by SamTrans bus routes, the Burlingame and Broadway Caltrain Stations, and the Millbrae Bay Area Rapid Transit station. The San Francisco International Airport brings domestic and international visitors to the city. The northeastern portion of the city contains industrial uses adjacent to Highway 101 and Rollins Road. Commercial uses are generally in downtown Burlingame, along the Broadway corridor, and in the Burlingame Plaza shopping center.

Burlingame has a diversity of open spaces well distributed throughout the city, consisting of neighborhood parks and playgrounds, a wildlife refuge, hiking trails, recreation facilities, and bayfront open space. Burlingame's diverse ecosystems include wetlands, grasslands, forests, and riparian zones.

Burlingame has a diverse local economy that is driven by hotel, tourism, retail, and airport-related industries. Burlingame's proximity to San Francisco International Airport is key to attracting hotels, logistics, air transportation, and business services companies.

Burlingame's community demographics exhibit several distinct differences when compared to San Mateo County. With a population of approximately 31,000, Burlingame has a greater proportion of children, with 23 percent of residents under the age of 18, compared to 20 percent countywide. In contrast, the proportion of older adults in Burlingame is slightly lower, with 15 percent of residents aged 65 and older, compared to 17 percent in the county.

Burlingame also has a lower proportion of residents who are linguistic isolated* relative to the broader county. Only 13 percent of Burlingame residents are considered linguistically isolated, significantly lower than the county average of 16 percent. Socioeconomically, Burlingame has a slightly lower poverty rate (5 percent) compared to the county rate of 6 percent. However, Burlingame's median household income is slightly lower, at $165,940 versus $175,000 for the county. Additionally, 35 percent of Burlingame households are considered cost burdened, meaning they spend a significant portion of their income on housing, compared to 37 percent of households countywide. Furthermore, Burlingame has a significantly higher proportion of rental households, with 48 percent compared to the county average of 41 percent. **Table 1** shows community demographics in Burlingame compared to all of San Mateo County.

Table 1: Community Demographics for Burlingame and San Mateo County

Demographic	Burlingame		San Mateo County	
	Number	Percentage	Number	Percentage
Population	30,995		754,250	

* Linguistically isolated persons live in households without a member who is fluent in English.

Children (under 18 years old)	7,052	22.80%	150,187	19.90%
Linguistically isolated persons	3,759	12.90%	116,306	16.30%
Older adults (65 years and older)	4,753	15.30%	127,520	16.90%
Persons with disabilities	2,148	7.00%	65,466	8.70%
Persons working outdoors	997	3.26%	41,748	5.44%
Persons in poverty	1,538	5.00%	48,137	6.40%
Unhoused persons	10	-	1,092	-
Number of households	12,260		264,323	
Median household income	165,940	-	175,000	-
Cost-burdened households	4,173	34.72%	94,625	36.55%
Households without a vehicle	453	3.70%	14,752	5.58%
Overcrowded households	824	6.72%	19,366	7.33%
Rental households	5,861	47.81%	106,955	40.46%
Source: American Community Survey. 2022. ACS 5-Year Estimates.				

Climate Hazards

Climate change is the long-term shift in the average weather pattern, including significant alterations in temperature, precipitation, and wind patterns over an extended period—typically decades or longer. Rising global temperatures are causing more frequent and intense heatwaves, storms, floods, droughts, wildfires, and other hazards. These events are frequently concurrent, resulting in cascading impacts that are progressively more difficult to manage, such as droughts amplifying wildfire risk or extreme heat exacerbating water scarcity. This section lays out the major hazards that are affected by climate change in Burlingame, and how these hazards are expected to change in the coming years and decades. These hazards are air quality and smoke, drought, ecosystem pests, extreme heat and warm nights, flooding, human health hazards, landslides and debris flows, sea level rise and groundwater emergence, severe weather, and wildfire.

Air Quality and Smoke

Air quality directly affects the health, well-being, and everyday quality of life for all residents of Burlingame. Poor air quality poses significant health risks, such as respiratory and cardiovascular illness, and these concerns have become especially urgent due to the increasing frequency of wildfires in the region and other climate-related factors.[1] Air pollutants come from mobile sources such as cars and trucks, stationary sources like factories and other industrial sites, dust from construction sites, smoke from wildfires, and other sources. Climate change directly impacts and exacerbates air quality through increased temperatures, severe weather, wildfires, changes in precipitation patterns, and other mechanisms. Ozone forms when pollutants from motor vehicles, industrial emissions, power plants, and refineries react with sunlight and warmer temperatures

speed up these reactions. In Burlingame, particulate matter (PM) from diesel engines is a pollutant of significant concern, especially in neighborhoods east of El Camino Real, although it is also an issue that affects communities on the west side of El Camino Real. Warmer temperatures also lengthen the growing seasons of plants and trees, increasing allergen production. Air quality significantly affects quality of life and can lead to more health issues, strains healthcare, and restricts outdoor activities. Ensuring clean air is vital, especially for frontline communities.

Frontline Communities of Concern

A frontline community of concern refers to groups disproportionately impacted by environmental, social, or economic challenges. Often marginalized, these communities face the most immediate effects of issues like climate change, pollution, and inequality, while having fewer resources to cope. The term emphasizes the need for equitable solutions that prioritize those most affected.

Exposure to air pollutants such as ozone and particulate matter can lead to respiratory conditions, exacerbate asthma, and increase the risks of heart attacks, strokes, and certain types of cancer. The financial burden of poor air quality in the Bay Area is estimated at $32 billion annually, which includes costs associated with premature deaths, healthcare expenses, reduced productivity, and other related issues.[2] The Bay Area Air Quality Management District (BAAQMD) has played a key role in monitoring and improving air quality throughout the region, resulting in notable progress even as population, traffic, and industrial activities have grown.[3] Despite these efforts, air quality hazards, ozone, and particulate matter remain persistent threats in the region.[4]

Wildfire smoke has become an increasingly significant concern for air quality in Burlingame and the broader region. Wildfire smoke contains a complex mixture of gases and fine particulate matter, consisting of tiny particles that can penetrate deeply into lung tissue and impact cardiovascular health.[5] The health risks associated with wildfire smoke are particularly severe for vulnerable populations, including children, older adults, individuals with pre-existing respiratory or cardiovascular conditions, and low-resourced residents, who may experience more severe acute and chronic health effects.[6] The frequency of wildfires continues to rise throughout California, driven by hotter and drier conditions associated with climate change, resulting in more frequent exposure to hazardous air quality conditions for many residents and visitors.

Bay Area Air Quality Management District Programs

The Bay Area Air Quality Management District has several programs to reduce air pollution from multiple sources.

The **Spare the Air Program** issues alerts on days when air quality is expected to be poor due to high levels of ozone or particulate matter. On Spare the Air days, residents are encouraged to limit activities that contribute to air pollution, such as driving, using gas-powered equipment, or wood burning.

Employers with 50 or more full-time employees in the Bay Area are required to provide Commuter Benefits Programs to encourage the use of alternative modes of transportation, such as public transit, vanpool, or biking, to reduce emissions from commuting.

Drought

A drought occurs when conditions are drier than normal for an extended period, making less water available for people and ecosystems. While California normally experiences drought, prolonged drought conditions can harm ecosystems and the regional economy. Although droughts do not typically cause direct loss of life or structural damage, they can result in critical environmental and economic harm, including increased water costs, habitat degradation, and heightened wildfire risks. Water demands, such as population growth and irrigation, exacerbate these impacts, complicating water allocation and potentially leading to restrictions and quality issues.

Decreased groundwater negatively impacts stream flows, particularly in summer. Prolonged drought conditions also increase wildfire susceptibility due to dried vegetation and pest vulnerability.

Climate change is likely to result in more frequent and severe droughts across the state. Overall, precipitation levels are expected to increase slightly in Burlingame from a historical annual average of 21.9 inches to 24.7 inches by mid-century (2035 to 2064) and 27.3 inches by late century (2070 to 2099). However, climate change will likely result in more years with extreme levels of precipitation, both high and low. Reduced winter precipitation levels and warmer temperatures have greatly decreased the size of the Sierra Nevada snowpack (the volume of accumulated snow), which in turn makes less fresh water available for communities throughout California.[7] More intense

Water Delivery in Burlingame

The City of Burlingame purchases all its potable water from the San Francisco Public Utilities Commission Regional Water System. Approximately 85 percent of the water supply originates in the Hetch Hetchy watershed, in the Sierra Nevada Mountains, and flows down the Tuolumne River into the Hetch Hetchy Reservoir. The remaining 15 percent of the water supply originates in the Alameda and Peninsula watersheds, including the San Antonio Creek, Upper Alameda Creek, Arroyo Hondo watershed, San Mateo Creek watershed, and Pilarcitos Creek watershed.

droughts will harden soil and cause aquifer levels to drop due to reduced groundwater recharge. When rains return, more water will run off rather than infiltrating into soils, potentially causing downstream flooding. Higher temperatures will further increase evaporation, worsening drought conditions.

OneWatershed: Building Regional Climate Resilience

OneWatershed is a comprehensive framework that addresses the shared risks of climate change to water infrastructure and resources across San Mateo County, including stormwater, wastewater, and drinking water systems. This innovative approach emphasizes building adaptive capacity for climate impacts, with a particular focus on the county's most vulnerable communities. OneWatershed builds on years of climate resilience planning, harnessing resources and partnerships under a unified program to advance shared goals around overlapping climate risks. By taking a watershed-based perspective, OneWatershed enables coordinated planning and implementation of climate adaptation strategies that benefit both infrastructure systems and the communities they serve. The framework represents phase one of a multi-year strategy to build systematic and transformational change in how San Mateo County approaches integrated watershed management and climate resilience.

Ecosystem Pests

Ecosystem pests are plant and animal species that can harm Burlingame's opens spaces, aquatic habitats, and urban forest. Climate change is expected to worsen pests and diseases by increasing the abundance and range of both native and nonnative pests. Invasive plant species threaten local ecosystems by outcompeting native flora, disrupting habitats, and reducing biodiversity.

Warmer temperatures and shifting precipitation patterns can weaken plants and trees, making them more susceptible to infestations and infections. It also creates favorable conditions for invasive species to establish themselves, as extreme weather events disrupt native communities. In aquatic environments, rising temperatures and drought conditions decrease dissolved oxygen levels, causing harmful algal blooms and allowing invasive species to thrive, complicating management efforts. While Burlingame consists of an urban and built-up environment, ecosystem pests could still result in lasting damage to the urban tree canopy that helps reduce the urban heat island effect, as well as to the Burlingame Lagoon and Anza Lagoon that help protect Burlingame from sea level rise and flooding.

Extreme Heat and Warm Nights

Extreme heat poses an increasingly serious issue for Burlingame, threatening public health, infrastructure, and the environment. Cal-Adapt, the California database for climate projections, defines extreme heat days as temperatures exceeding 98 percent of historical highs, and climate change causes these events to become more frequent and intense. Extended periods of extreme

heat, known as heat waves, threaten community safety, drive up energy costs, and exacerbate the risks of wildfires and water shortages. An extreme heat day in Burlingame occurs when the maximum temperature soars above 87.4 degrees Fahrenheit. As shown on **Figure 1**[*], climate change is expected to increase extreme heat days in the city from a historical annual average of 4 days per year, to 9 days per year by mid-century (2035 to 2064) and 18 days per year by late century (2070 to 2099).[8,]

When the daily minimum temperatures remain significantly above normal, warm nights worsen extreme heat days because overnight temperatures don't get low enough to provide any relief from high temperatures. A warm night occurs when temperatures remain above 58.6 degrees in Burlingame. As shown on **Figure 2**, climate change is expected to increase warm nights from a historical 7 nights per year, to 41 nights per year by mid-century and 111 nights per year by late century.[9]

Figure 1. Observed and Projected Extreme Heat Days in Burlingame[†]

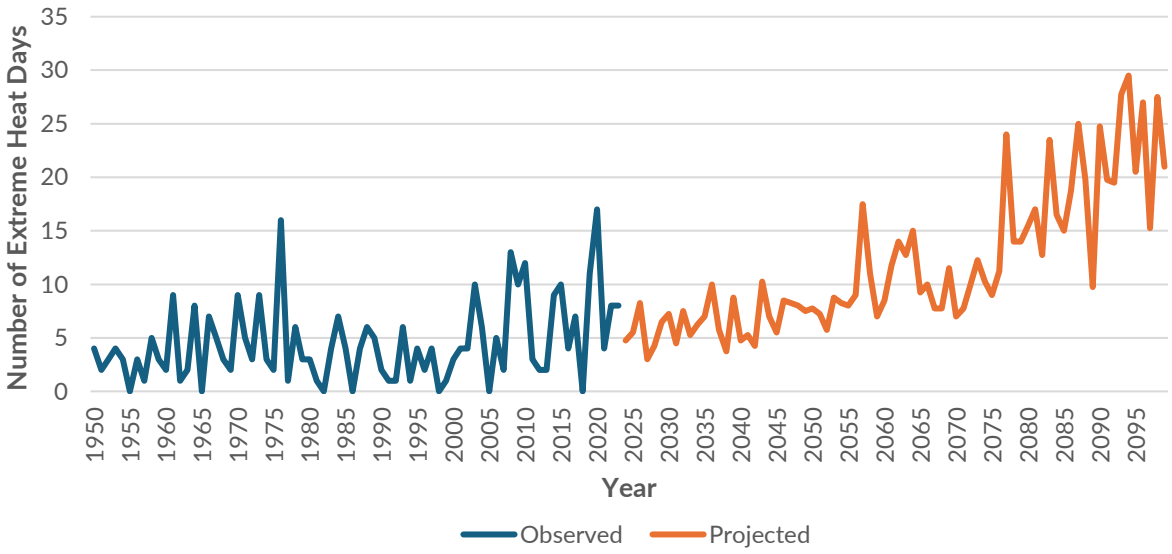
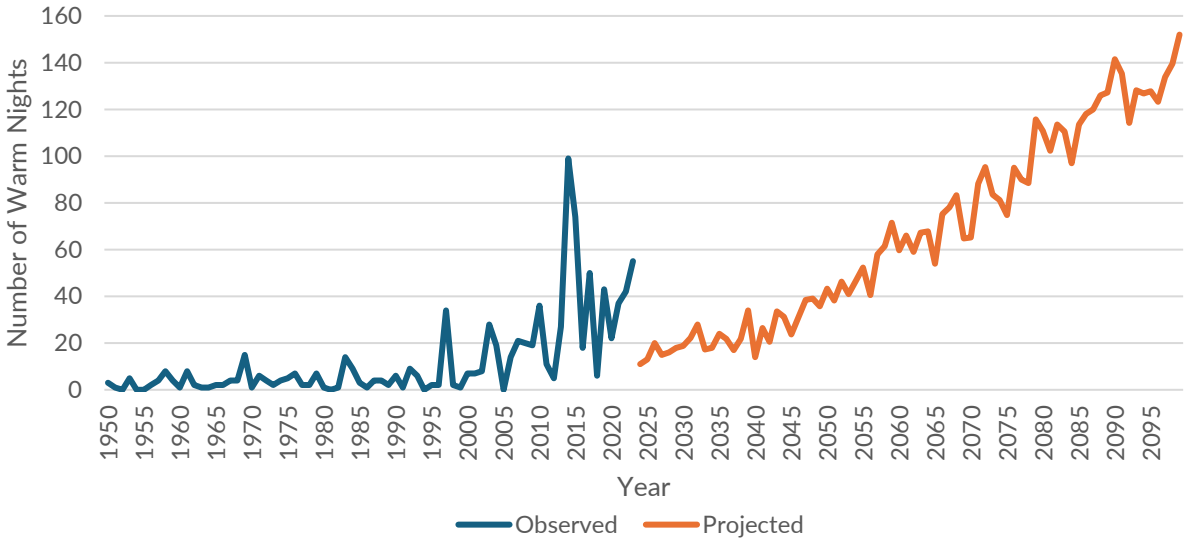


Figure 2. Observed and Projected Warm Nights in Burlingame

[*] The Cal-Adapt database at time of writing uses Representative Concentration Pathways (RCPs) to project future conditions. The projections listed in this report use RCP 8.5, which assumes global emissions continue to increase at least until the end of century, which is consistent with the International Panel on Climate Change Sixth Assessment Report.

[†] Figures 1 and 2 use observed data from the Cal-Adapt database, which provides data from 1950 to 2005, the nearest National Weather Service weather stations, which provides data from 2006 to 2023, and projected data from the Cal-adapt database, which provides data from 2024 to 2099. Due to the different database sources, the observed and projected data may not match.

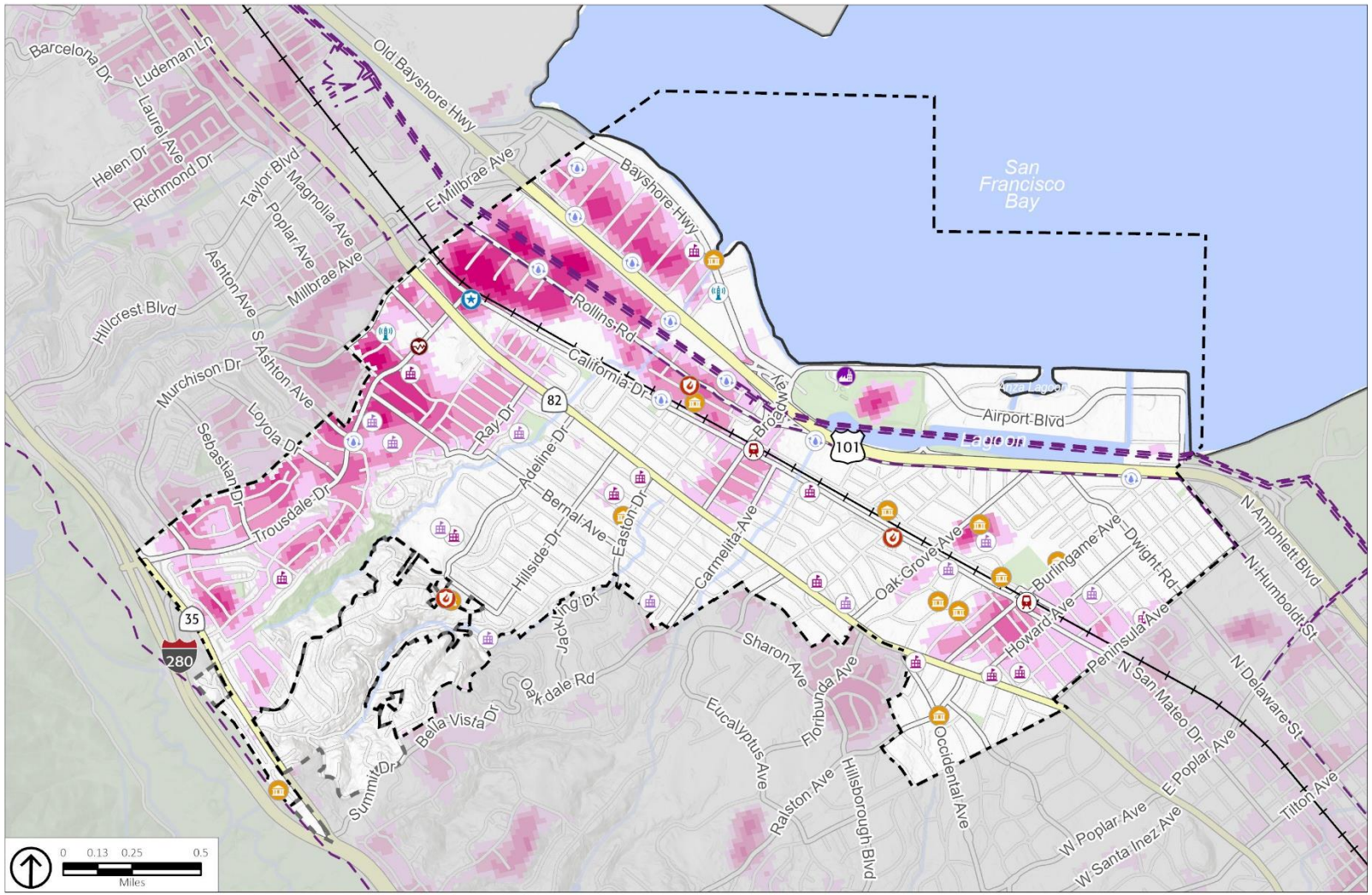


Extreme heat ranks as one of the deadliest climate-related hazards nationwide; the Centers for Disease Control and Prevention note a rise in heat-related deaths—from 297 in 2004 to over 2,300 in 2023.[10, 11] These numbers are likely a significant undercount, as they do not include deaths caused by other factors that are exacerbated by extreme heat. The rising frequency and intensity of extreme heat events pose significant public health concerns, especially in areas like Burlingame that have historically experienced milder temperatures and have residents without access to climate-controlled environments. Warmer temperatures and the urban heat island effect exacerbate extreme heat impacts in densely populated areas, especially those that have limited tree canopy. **Figure 3** shows the areas of Burlingame that may experience higher temperatures on extreme heat days due to limited shade cover and presence of heat absorbing materials. Areas most at risk include those along the bayfront, commercial areas south of Highway 101, and residential neighborhoods adjacent to Trousdale Drive.

Even slight increases in temperature can overwhelm a community's ability of community members to cope with extreme heat and warm nights, straining public health systems and infrastructure. This leads to heightened risks of dehydration, heat-related illnesses, and respiratory issues, disrupting daily life and economic activity.[12] Extreme heat also stresses infrastructure because heightened air conditioning demand risks overloading the power grid and causing outages, and very high heat can degrade transportation systems, leading to delays and damage. Additionally, rising temperatures harm local ecosystems by increasing water temperatures in local lakes and streams, harming fish and plant species.

Downtown Burlingame Avenue shopping area. Source: City of Burlingame

Figure 3. Heat Severity Index in Burlingame



Source: ESRI, 2023; County of San Mateo, 2023; PlaceWorks, 2023; The Trust for Public Land, 2019

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- Private Schools (K-12)
- College or University
- Pump Stations

Heat Severity Index
- Severe
- Mild
- Mild to Moderate
- Moderate
- Moderate to High

Flooding

Flooding occurs when water surpasses the capacity of local water bodies to contain it, creeks to carry it, or soil to absorb it, which is a concern for Burlingame particularly for Mills Creek, Easton Creek, Burlingame Creek, and Sanchez Creek. Floods rank among the costliest natural disasters in terms of human hardship and economic loss nationwide, significantly threatening the health and life of community members and causing substantial damage to structures, landscapes, and utilities serving the city. The impacts of increased flooding go beyond immediate property damage. Flooding can cause long-term public health problems by allowing mold and mildew to grow in buildings, displacing communities when homes are destroyed or become uninhabitable, and increasing economic burdens, such as rising home insurance costs.

Atmospheric Rivers

An atmospheric river is a long, narrow band of moisture in the atmosphere moving from the tropics that can cause heavy rain or snow. These storms are responsible for over half of California's water supply, but also the majority of the flooding and mudslide events across the state.

Sources: Emily Mendez. 2024. *A Climate Expert Explains Why Atmospheric Rivers Are Causing Historic Rainfall in California*. Lamont-Doherty Earth Observatory: Columbia Climate School.

Floods are a chronic issue in Burlingame, and climate change is expected to make flood events worse due to fewer yet more intense rainfall events, in the form of atmospheric rivers.[13] For example, what is currently a 200-year storm, or one that has a 1 in 200 chance of occurring each year, by 2100 could increase in frequency by 40 to 50 years (to a 1 in 150/160 chance each year).[14] This means that the 100-year and 500-year floodplains may expand, and the current floodplains may become 40- to 50-year floodplains. Climate change is also likely to increase the frequency and severity of droughts that cause soil to dry out and harden. When precipitation does return, more water runs off the surface than is absorbed into the ground, which can increase flooding downstream.

Floodplains and Flood Recurrence

According to the Federal Emergency Management Agency (FEMA), a floodplain is any area of land that could be flooded by water from any source, but is often next to creeks, lakes, oceans, and ponds. The 100-year floodplain is the area that has a 1 percent (1 in 100) chance of being flooded in any given year. This would also be the area that would flood during a 100-year storm. The 500-year floodplain is the area that has a 0.2 percent (1 in 500) chance of being flooded in any given year due to a 500-year storm.

As shown on **Figure 4** and on the online PREP Map Viewer, several areas in Burlingame are within flood-prone areas, including properties along creeks, as well as areas west of California Drive and the bayside of Highway 101. The Burlingame shoreline is protected by a levee in front of Anza Lagoon. This levee protects a variety of important developments, including major hotels and recreational areas. Flooding also occurs outside of these mapped floodplains, especially in low-lying areas with inadequate drainage, and inundated areas near the bay

shoreline are likely to expand as sea level rises and the tide regularly moves farther inland. There is also the risk of flooding in industrial and commercial areas, which could cause the movement of pollution and hazardous materials through the soil and groundwater.

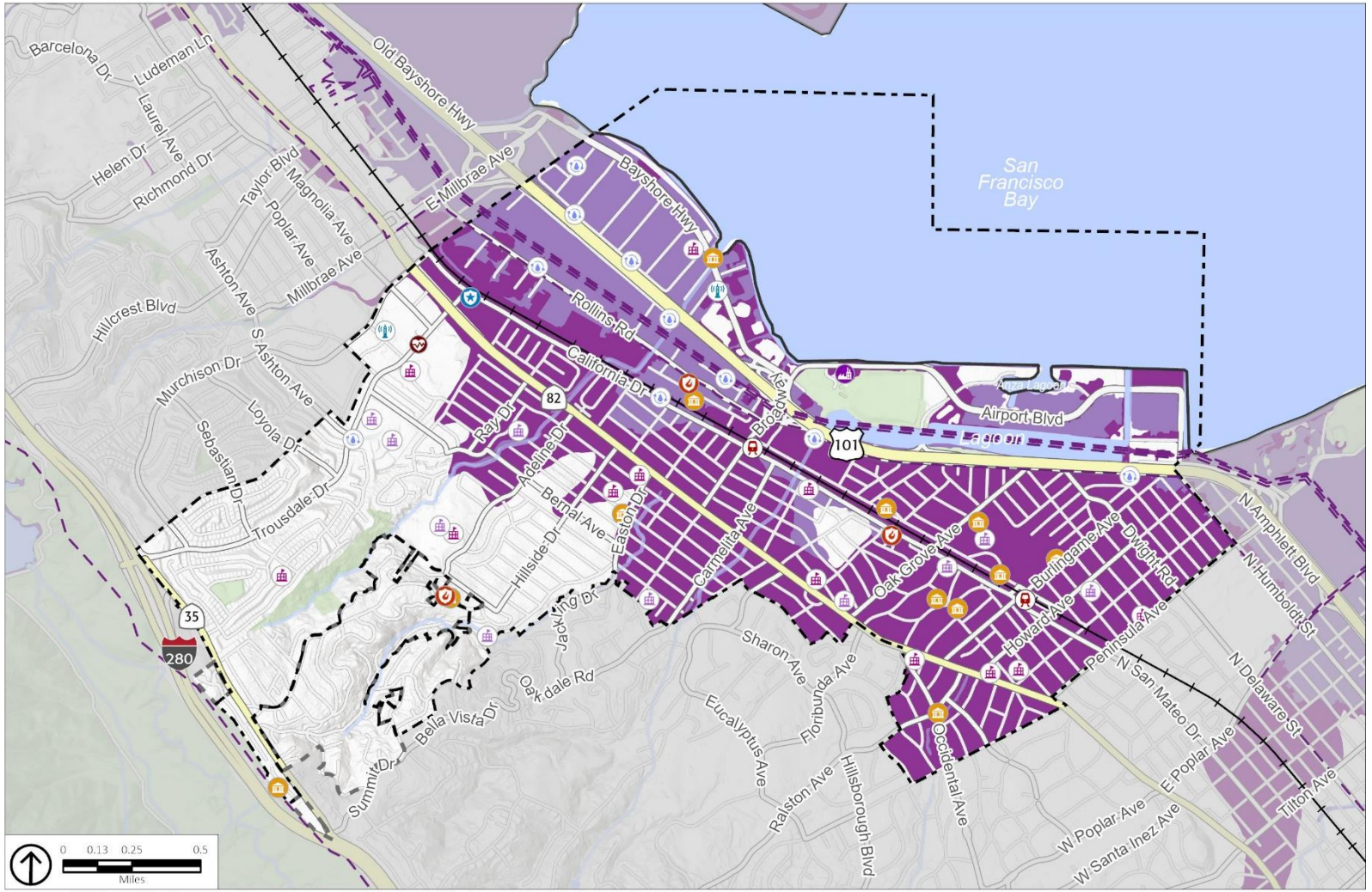
Human Health Hazards

Human health hazards, including bacteria, viruses, parasites, and other pathogens, pose significant concerns in Burlingame. These conditions can result in physical injuries, fatalities, and mental health issues and exacerbate pre-existing conditions like asthma and allergies. Rats, mice, ticks, and mosquitos are common vectors, meaning that they often spread the pathogens that can cause illness. Rising temperatures and changing precipitation patterns due to climate change promote the proliferation of disease-carrying vectors. Warmer, wetter conditions allow for larger populations of mosquitoes and ticks, extending their geographic range and spreading diseases like West Nile virus, dengue fever, and Lyme disease.[15] As temperatures rise and extreme weather events, such as heavy rainfall, become more frequent, these vectors can spread more broadly, transmitting diseases that threaten public health.[16]

Heat waves, another increasing hazard due to climate change, can directly impact human health by causing heat-related illnesses and deaths and worsening respiratory conditions due to increased air pollution. The combination of these factors suggests that human health hazards will become more pervasive and severe as climate change progresses, making proactive public health measures even more critical. The implications of these health hazards extend beyond individual well-being, placing strain on healthcare systems, increasing economic burdens, and affecting mental health.

Bayfront hotel and creek along the San Francisco Bay. Source: City of Burlingame

Figure 4. Flood Hazard Zones in Burlingame



Source: ESRI, 2023; County of San Mateo, 2023; PlaceWorks, 2023; FEMA; DWR, 2021

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Designated Flood Hazard Zones
- 100 Year Flood Plain (DWR)
- 100 Year Flood Zone (FEMA)
- 500 Year Flood Zone (FEMA)

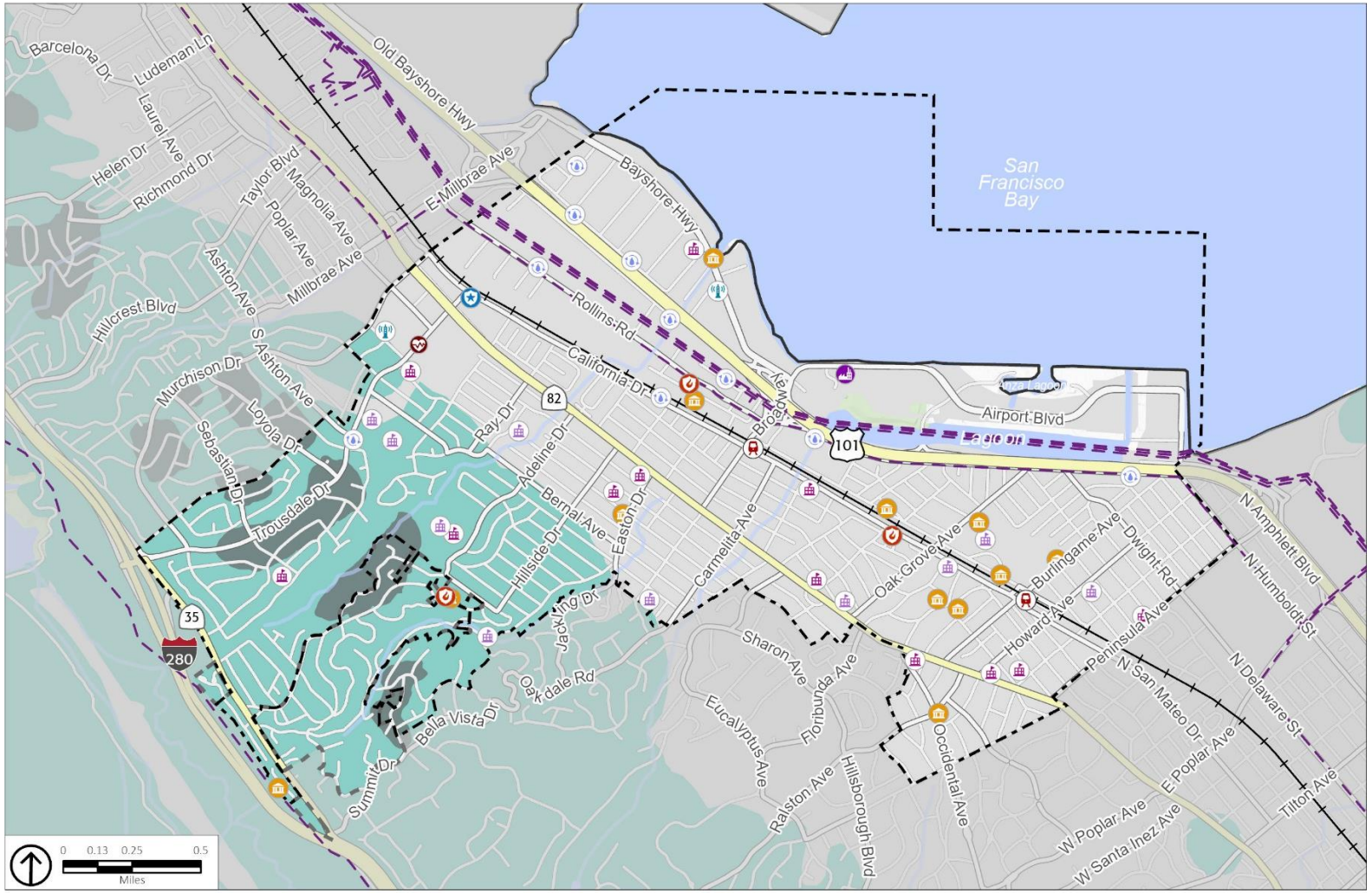
Landslides

A landslide, defined as the movement of rock, soil, or debris down a slope, is often triggered by natural events such as heavy rainfall. In Burlingame, landslides commonly occur during or after intense rainfall, particularly in areas previously affected by wildfires where vegetation loss destabilizes slopes. Landslides can travel significant distances, accumulating debris and amplifying their destructive impact as they move downslope.

As shown on **Figure 5** and on the online PREP Map Viewer, the western area of the city, especially in the hillsides west of Bernal Avenue, which include residential properties and Mills Canyon Park, are in moderate to high landslide risk areas and most susceptible to landslide hazards. These areas have a history of landslide movements, making them susceptible to future sliding from heavy rainfall or seismic activity. Low-risk areas include the central and eastern portion of the city.

Climate change will exacerbate landslide hazards by increasing frequency of wildfires and severe storms and likely elevate the risk of landslides, particularly fast-moving debris flows. Wildfires remove stabilizing vegetation and alter soil properties, making slopes more vulnerable to erosion during and after subsequent storms. As the climate becomes drier, with occasional extreme rainfall events, the city will experience more landslides and mudslides, which pose significant challenges to regional safety. Landslides can displace residents, block emergency routes, and damage critical infrastructure, disrupting daily life and requiring costly repairs.

Figure 5. Landslide Susceptibility Areas in Burlingame



Source: ESRI, 2023; County of San Mateo, 2023; PlaceWorks, 2023; USGS

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Landslide Susceptibility
- Most landslides
- Few landslides
- Surficial deposits

Sea Level Rise and Emergent Groundwater

As global temperatures rise, glaciers and other polar ice melt, causing sea levels to rise. High average temperatures can also cause ocean water to expand, causing further rises in sea levels. According to the 2024 California Ocean Protection Council's *State of California Sea Level Rise Guidance*, sea levels in Burlingame are projected to increase by as much as 0.4 feet (5 inches) by 2030, 1.3 feet (16 inches) by 2050, and 5 feet (78 inches) by 2100. However, sea levels could also rise faster than these projections with storm surge and King Tide events adding an additional 24 to 36 inches of temporary flooding that would move farther inland.[17] Burlingame, and its buildings and infrastructure that line the shoreline, are already vulnerable to damage from shoreline flooding, which will increase as the sea levels rise and move further inland.

As shown on **Figure 6**, and on the online PREP Map Viewer, sea level rise will cause temporary and/or permanent inundation risks in areas adjacent to Highway 101, including areas along the Bayfront. Figure 6 illustrates the spatial data available through the Bay Conservation and Development Commission's Adapting to Rising Tides Initiative, that is closest to the projections listed above, which ultimately shows a conservative estimate of sea level rise. Burlingame's existing shoreline largely consists of a patchwork of raised pathways and shoreline embankments interspersed with short, concrete walls. It is one of the few areas in San Mateo County not protected by natural wetlands or levees. Depending on the severity of sea level rise, an estimated 20 acres of land in the city could be inundated by 2050, increasing to 813 acres by 2100.[18] This inundation could impact up to 2,400 residents, 741 acres of urban land, and more than 900 residential and commercial parcels. Critical infrastructure vulnerable to inundation includes Bayshore Highway, Highway 101, and the City's flooding control systems, stormwater management facilities, energy infrastructure, and emergency response facilities.[19]

Emergent groundwater is a consequence of sea level rise. It occurs when freshwater is pushed upward by denser saline water that travels further inland, causing temporary or permanent inundation.[20] Higher groundwater, even if it does not emerge on the surface, can infiltrate storm drains, destabilize pipes, spread soil or groundwater contamination, undermine building foundations, corrode infrastructure not designed for saline groundwater, and increase liquefaction hazards.[21] Emergent groundwater is expected to rise at the same rate as sea level rise, causing groundwater to emerge at the surface in low-lying areas.[22]

Liquefaction

Liquefaction occurs when water-saturated soils are shaken so violently that the individual grains lose contact with one another and float freely in the water, turning the ground into a puddinglike liquid. Building and foundations lose strength and may sink into what was previously solid ground. Unless properly secured, hazardous materials can be released, causing significant damage to the environment and people.

As shown on **Figure 7**, and on the online PREP Map Viewer, by 2100 emergent groundwater will affect land adjacent to Highway 101, including commercial and industrial uses along the Bayfront, as well as commercial, industrial, mixed-use,

and residential uses to the west of Highway 101. Though the exact level of future sea level rise is uncertain, it is expected to increase the frequency, duration, and magnitude of flood events and push groundwater to emergent level further inland. As sea levels rise and emergent groundwater increases, the number of individuals and properties at risk will increase, which will in turn lead to a higher likelihood of flood damage and other adverse consequences for both coastal and inland areas. Sea level rise and emergent groundwater will interact directly with stormwater from inland sources, causing more severe flooding near creeks and at the outlets of drainage systems.

Bayfront hotel and Bay Trail. Source: City of Burlingame

Figure 6. Sea Level Rise Projections in Burlingame

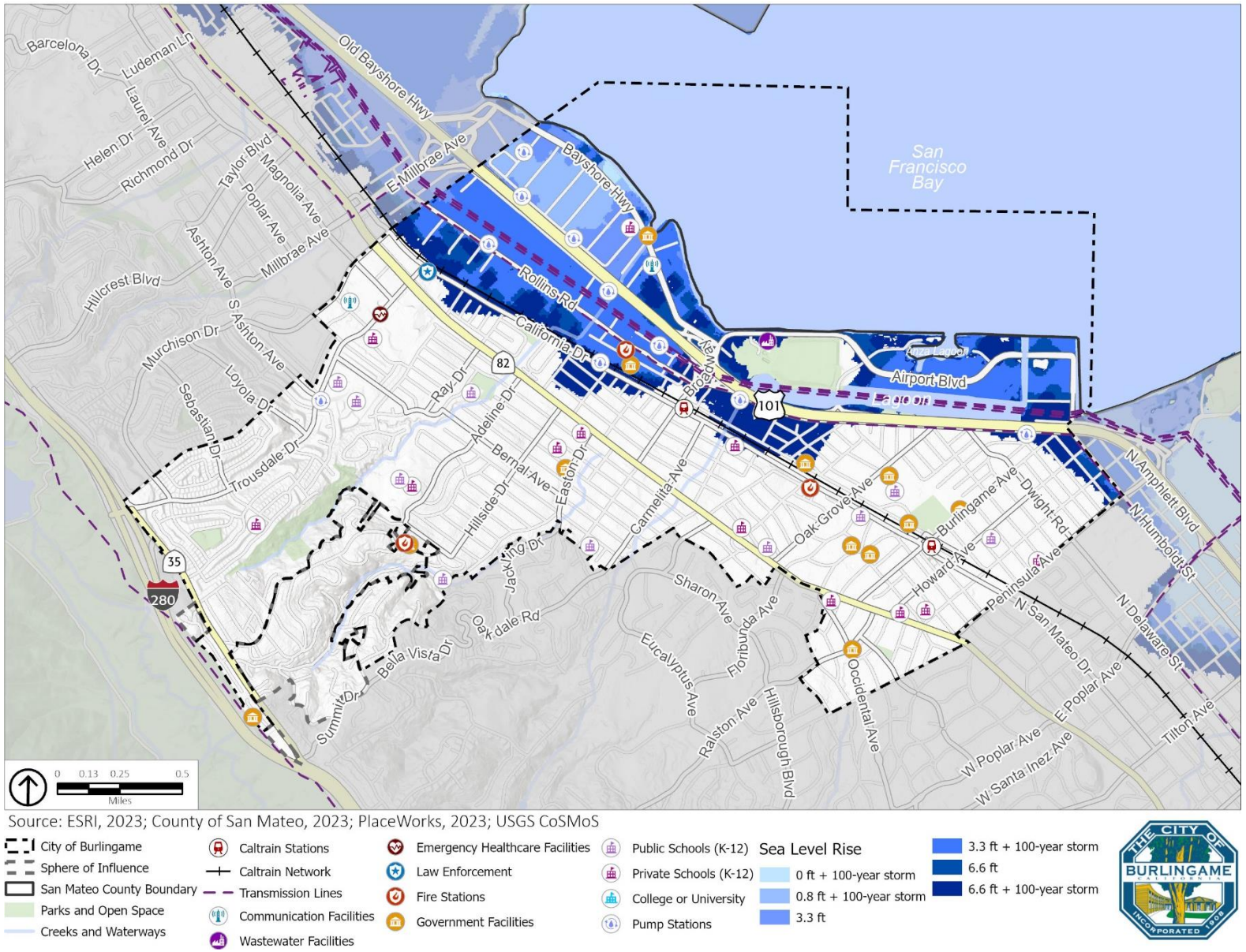
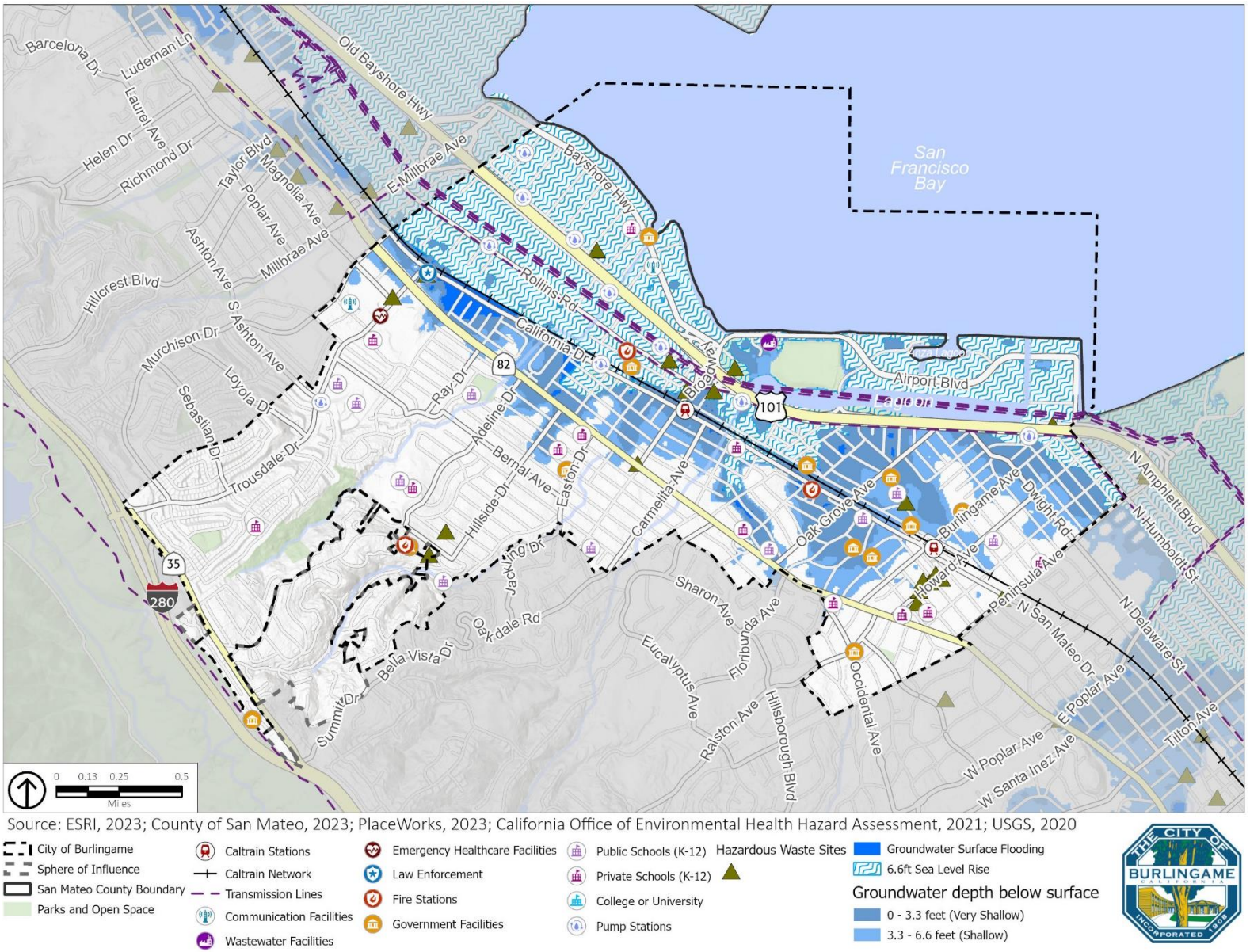


Figure 7. Emergent Groundwater in 2100 in Burlingame



Severe Weather

Severe weather poses a significant threat to Burlingame, disrupting daily life, compromising safety, and affecting infrastructure and ecosystems. The types of dangers posed by severe weather vary widely and may include injuries or deaths, damage to buildings and structures, fallen trees and roads blocked by debris, and fires sparked by lightning. Severe weather, often caused by intense storms, can produce 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. Objects such as vehicles, unprotected structures (like bus stops or carports), fences, electric power and telephone poles, or trees can also be struck directly by lightning, which may cause an explosion or fire. High wind events can also exacerbate the risk of wildfires in the region, which can harm local air quality in the city. The most common severe weather events that have historically impacted Burlingame are heavy rains (usually a result of atmospheric rivers), thunderstorms, and windstorms.

While average annual rainfall may increase only slightly in Burlingame, 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.

Public Safety Power Shutoff events are used as a preventive strategy to reduce wildfire risk during high wind events. Utility companies like Pacific Gas and Electric Company may shut off power lines during severe weather to prevent them from sparking fires causing power outages that may last for extended periods. Without power, communication networks may be disrupted, making it harder for residents to receive emergency notifications and for first responders to coordinate effectively. People who depend on medical devices, such as oxygen concentrators or ventilators, are at greater risk during power outages, as are those who need electricity for refrigeration to keep medication cool.

Wildfire

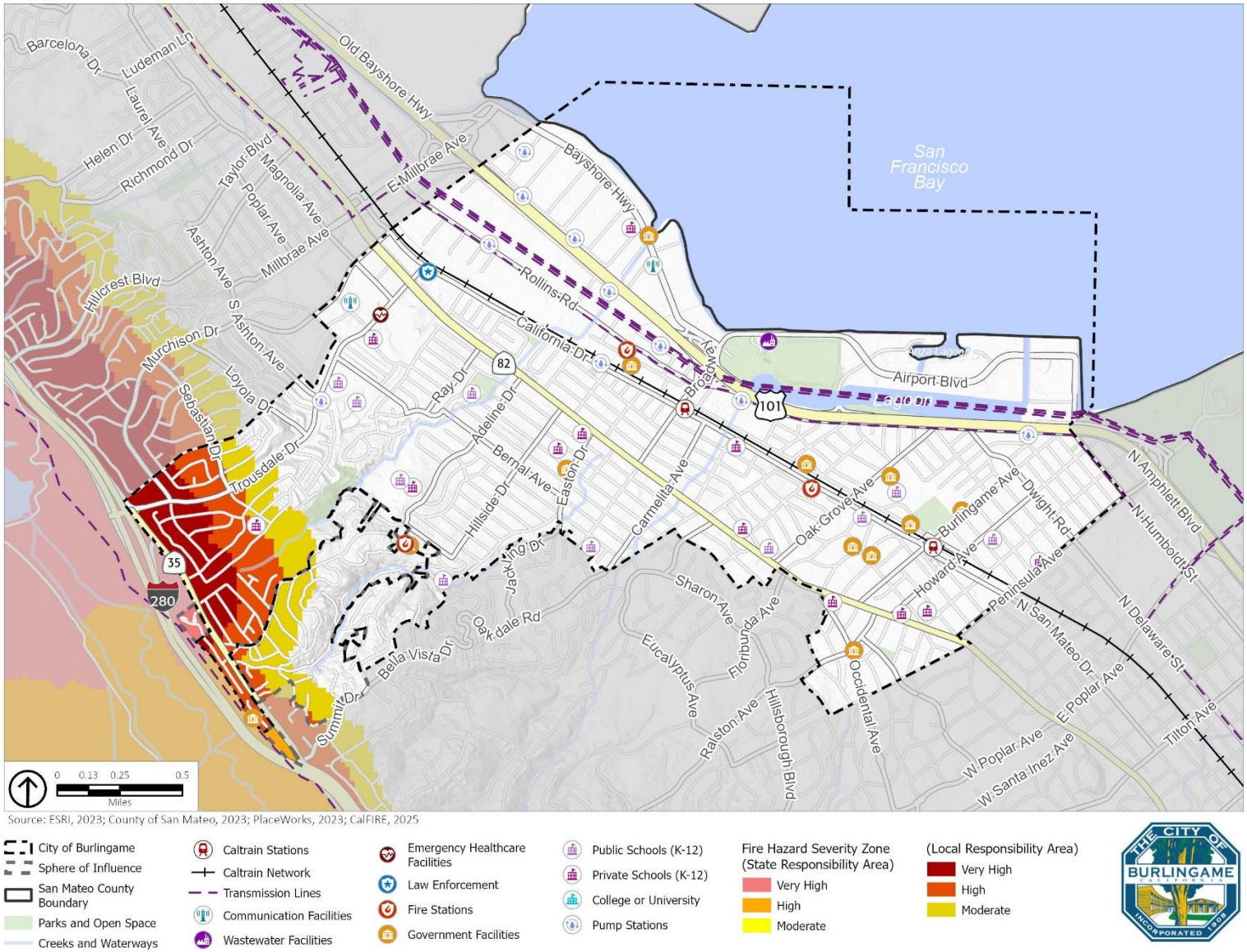
Wildfires pose a significant and growing threat to Burlingame and the greater region. The city's Mediterranean climate, hilly topography, and diverse plant communities create ideal conditions for wildfire. Historically, the fire season extended from early summer through late fall of each year during the hotter, drier months, although it is increasingly a hazard that can occur year-round due to higher temperatures, lower moisture content in the air and plant matter, accumulation of vegetation, and high winds. Rising temperatures and prolonged droughts dry out vegetation, creating abundant fuel for fires. Ecosystem pest outbreaks, such as bark beetle infestations, leave behind weakened and dead trees that serve as additional fuel, while extreme heat and erratic wind conditions make wildfires more unpredictable and harder to control. The fire season is extending beyond historical norms, leaving communities vulnerable for much longer periods.

Historically, an annual average of 16.1 acres burned in Burlingame; however, this is projected to increase by approximately 46 percent to 23.5 acres by mid-century (2035 to 2064) and by 50 percent compared to historical levels to 24.1 acres by late-century (2070 to 2099).[23] As this is an annual average, some years are likely to see little or no wildfires in the city, while other years are likely to see much larger fires.

The California Department of Forestry and Fire Protection identifies recommended fire hazard severity zones throughout the state. These zones are designated as Moderate, High, or Very High. Burlingame has 248 acres designated as a fire hazard severity zones, including 91 acres in the Very High zone. These zones, shown in Figure 8, are all in the hillside neighborhoods near Interstate 280. This includes residential areas, Cuernavaca Park, and parts of Mills Canyon Park.

Single family residential neighborhood in Burlingame. Source: City of Burlingame

Figure 8. Fire Hazard Severity Zones



Key Findings

The following section presents the key findings of the Vulnerability Assessment for Burlingame, highlighting the people and community features that were identified as priority vulnerabilities. Priority vulnerabilities are the people, buildings, infrastructure, economic drivers, ecosystems and natural resources, and key services that should be considered as the City's priorities in adaptation and resilience planning. Identifying a population or a community asset as a priority vulnerability reflects the severity of climate change impacts and level of harm, but also considers other factors such as the size of the population, current and historical injustices and discrimination, the role that the asset plays in maintaining community-wide well-being, and the potential of the population or asset to be impacted by compounding or cascading effects of interacting hazards. Severe weather is responsible for the most priority vulnerabilities in Burlingame, followed by flooding, extreme heat, and sea level rise. In Burlingame, the populations facing the greatest risk from climate change include persons with chronic illnesses and/or disabilities, older adults, low-resourced households, and outdoor workers.

Priority Vulnerabilities

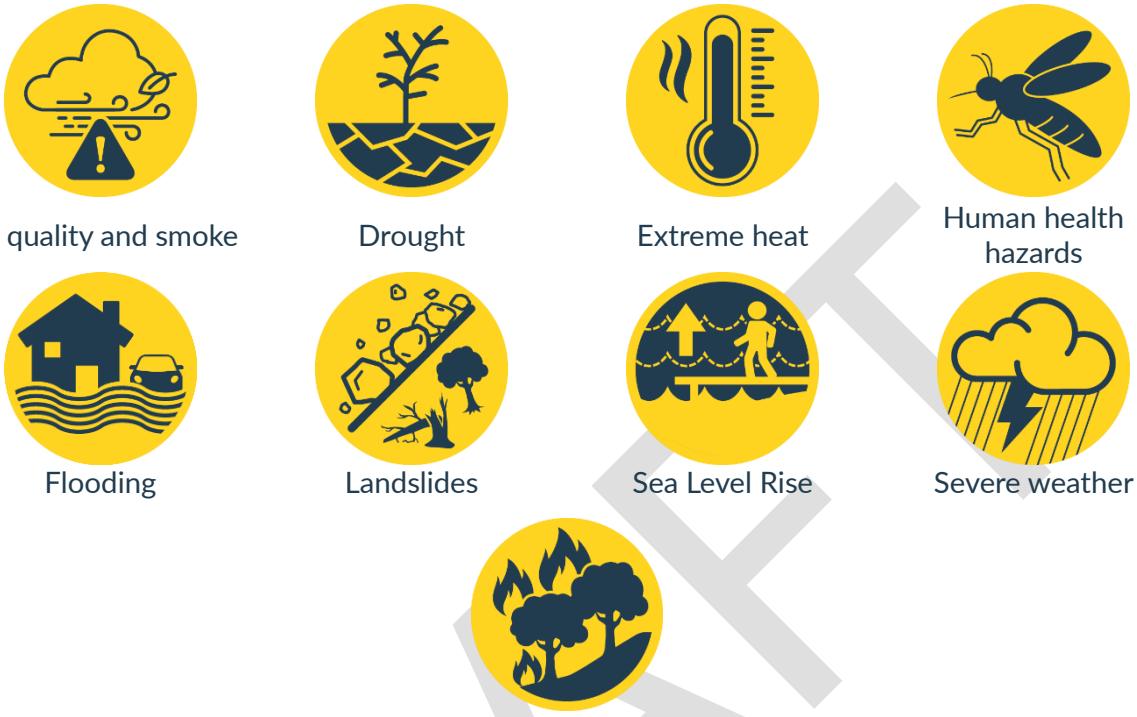
In addition to the severity of impacts from climate change and related hazards, other factors that affect whether a population or asset is considered a priority vulnerability include:

- Size of the population or the importance of the asset.
- Equity considerations and history of marginalization.
- Role in supporting community well-being.
- Community values and concerns.
- Ability to resist and recover from hazards.
- Potential for cascading and compounding impacts.

Climate change is expected to affect everyone and all locations in Burlingame to some degree. This section does not describe all the impacts from climate change and associated hazards. Rather, it identifies the populations and assets who are most frequently designated as priority vulnerabilities. Other populations and assets not listed here may still face significant harm from climate change.

Older Adults

Most Vulnerable To:



Older adults constitute 16 percent of Burlingame's population. Approximately 10 percent of Burlingame households consist of older adults living alone.

Source: American Community Survey. 2022. ACS 5-Year Estimates

Older adults face a distinct set of vulnerabilities during emergencies, and it is essential to understand these challenges to protect this population effectively. Many older adults experience reduced mobility, impaired vision, and hearing loss, which can make it difficult for them to respond quickly to sudden threats such as natural disasters. For instance, attempting to evacuate during a wildfire, or accessing Burlingame's cooling center (Burlingame Community Center) while dealing with mobility impairments or vision issues significantly increases their risk. These impairments mean that it can take longer for older adults to respond, increasing their risk of harm. Furthermore, they are more susceptible to injuries from a hazardous event and may face a more difficult recovery. Older adults are highly susceptible to cascading and compounding impacts from natural hazards, as the interplay of physical limitations, chronic health issues, economic constraints, and limited access to information can converge to place their lives at considerable risk.

Chronic health conditions further exacerbate these vulnerabilities. Conditions such as heart disease, diabetes, and respiratory issues can be significantly worsened during crises, particularly when exposed to wildfire smoke or extreme heat. Additionally, many older adults depend on regular medication, and the unavailability of these medications during disasters can escalate an already dangerous situation into a life-threatening emergency.

Older adults in care homes face additional vulnerabilities, as they rely on caregivers and institutional protocols for emergency response, which may vary in effectiveness, depending on the availability and capability of caregivers or the adequacy of institutional protocols. During emergencies, such as wildfires or extreme weather events, the adequacy of care can be compromised by limited staff availability, as caregivers may also be affected or unable to reach the facility. This situation is particularly concerning during widespread emergencies, where swift evacuations or the provision of necessary care can be severely delayed, increasing the risks faced by these individuals. Older adults in care homes may also have complex medical needs that require specialized attention, and disruptions in care can have severe, potentially life-threatening consequences.

Economic and social factors also compound these risks. Older adults receive, on average, less income than middle-aged adults. While some continue to work in high-income positions or have ample financial resources due to retirement funds or other investments, many have limited, fixed incomes, which hinders their ability to invest in necessary disaster preparedness measures, such as purchasing emergency supplies or making their homes more resilient to natural hazards; this ultimately can increase their vulnerability to hazard events. Many older adults are unable to drive, leaving them dependent on external assistance if they need to evacuate. The digital divide is another key factor given that some older adults may be less familiar with digital technology, making it difficult for them to receive timely alerts and critical information disseminated through smartphones, social media, or emergency apps.

Center for Independence for Individuals with Disabilities provides support services, community awareness, and systems change advocacy to promote full and equal community integration and participation of people with disabilities in San Mateo County.

Peninsula Rides provides seniors and those with accessibility needs in San Mateo County with the resources to stay mobile and get around our community.

Redi-Wheels offered by the San Mateo County Transit District, provides paratransit using Redi-Wheels on the bayside of the county. Paratransit is for persons with disabilities who cannot independently use SamTrans bus service some or all of the time.

Persons With Chronic Illnesses and/or Disabilities

Most Vulnerable To:

Approximately 8 percent of Burlingame's population has some form of disability. Due to limited mobility and financial constraints, persons with chronic illnesses or disabilities may face barriers to receiving emergency alerts, evacuating, obtaining support resources, as well as installing appliances and making retrofits or structural improvements to their homes to improve resilience. They may also have weaker immune systems due to pre-existing conditions or take medications that make it more difficult to fight off new illnesses. Allergens and vector-borne illnesses can exacerbate existing illnesses, which can create difficulties in existing or new treatment. These individuals also experience increased sensitivity to the health effects of heat and may have higher vulnerability to health effects of smoke exposure.

These individuals may be more likely to be injured or become ill due to flooding and may be reliant on medications or medical devices that may be lost, damaged, or rendered inoperable due to a flood. Those who rely on electricity to operate medical devices or store medication may be especially vulnerable in the event of a public

Support from local organizations like the **Center for Independence for Individuals with Disabilities** is vital in helping these individuals prepare for and recover from disasters, providing resources such as emergency kits and backup power options. However, the unique vulnerabilities of these populations demand greater coordination and preparedness to ensure their safety in a changing climate.

safety power shutoff or other loss of power, which may become more likely during periods of extreme heat, severe weather, flooding, wildfire, and landslide.

Low-Resourced Households

Most Vulnerable To:


Air quality and smoke


Extreme heat


Human health hazards


Flooding


Sea Level Rise


Severe weather


Wildfire

Low-resourced households are among the populations most at risk of climate change hazards in Burlingame. This includes cost-burdened households (those that pay more than 30 percent of their income on housing costs), low-income households, overcrowded households (households that have more than one person per room of the home), and households in poverty. These households face numerous challenges, including lower median incomes, higher rates of residential displacement, and limited access to affordable housing options. The pressure of rising housing costs often forces long-time residents to relocate, disrupting established social networks and community cohesion.

Low-resourced households typically lack sufficient resources to invest in home repairs and weatherization improvements, air conditioning and efficient appliances, health care, and other means to prepare for and recover from hazardous events. Limited financial resources may prevent these households from affording adequate

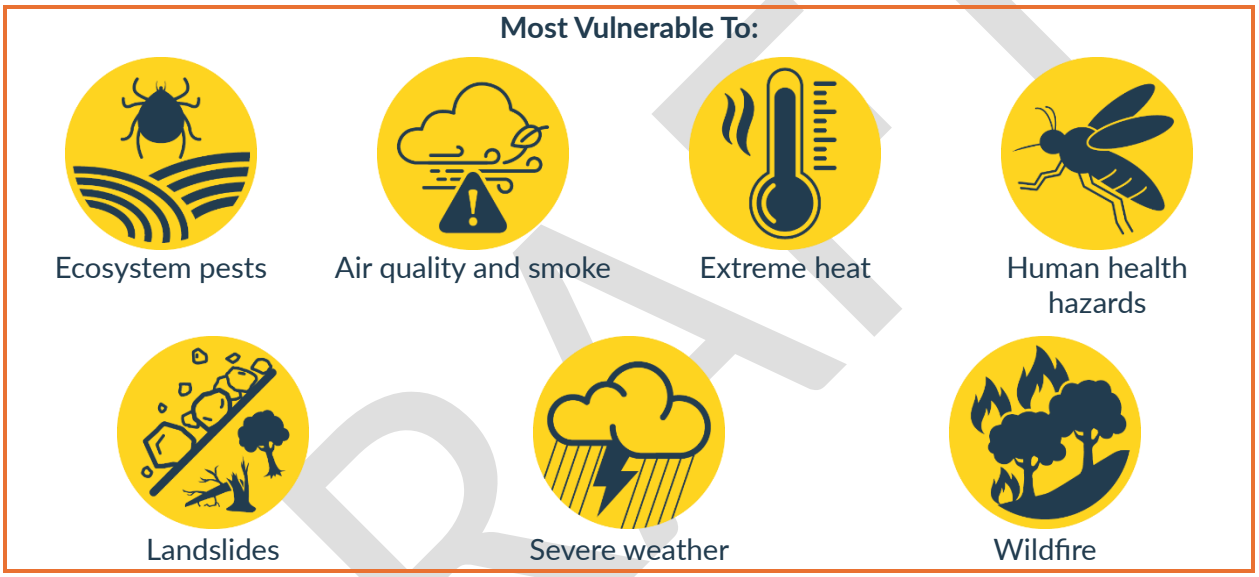
Approximately 4 percent of Burlingame residents earn incomes at or below poverty level. Approximately 7 percent of Burlingame homes are overcrowded.

Source: American Community Survey. 2022. ACS 5-Year Estimates

The Federal Emergency Management Agency provides disaster assistance in the form of grants to help pay for temporary housing, essential home repairs, and other disaster-related needs such as medical and dental expenses, transportation, childcare, and moving expenses. Additionally, emergency alerts are available via SMC Alert and the Genasys Protect citizen site and app, which allows users to receive immediate alerts and stay informed about evolving emergencies.

housing, which means they are more likely to be renters and live in older buildings with poor maintenance, structural damage, or inadequate sanitation. These conditions create an ideal environment for vector-borne pests, which can carry harmful pathogens. Overcrowded households may have limited ability to cope with illnesses caused by vectors, extreme temperatures, or exposure to mold and mildew, because persons living in these households are near others, causing illnesses to spread more easily. These households may be financially strained by medical costs and inability to work due to illness. During drought, low-resourced households may be especially vulnerable to increases in water prices due to existing water affordability concerns and additional water conservation pricing and may be unable to afford water-efficient appliances to reduce water use.[24]

Outdoor Workers



Outdoor workers and individuals experiencing homelessness spend significant time outdoors, which may bring them into direct contact with numerous hazard conditions.

Outdoor workers in Burlingame are most closely tied to landscaping, construction, and recreation. Their jobs often require wearing heavy gear and performing manual labor, which increases their susceptibility to heat-related illnesses during periods of extreme heat. Outdoor workers are often from low-resourced households, including immigrant communities, low-income households, and low-resourced people of color. These jobs often have fewer educational requirements, making them accessible to those facing challenges such as a lack of legal status or language barriers. Additionally, systemic barriers limit access for many people of color to higher-paying, safer jobs, leading to a concentration in low-wage, physically demanding work. These positions are often seasonal or temporary, which further contributes to their economic insecurity. This financial strain can limit access to timely medical care, creating a cycle of vulnerability that is difficult to break.

The cascading vulnerabilities, such as limited healthcare access or economic insecurity, exacerbate the harm from hazards. Poor air quality worsens pre-existing health conditions, and extreme heat can result in heat exhaustion or heatstroke, both of which are particularly dangerous for those with underlying health issues or inadequate shelter.

Transportation Infrastructure, Public Transit, and Emergency Services

The City's transportation infrastructure, including roads, highways, bridges, evacuation routes, transit networks, and services, is crucial for community health, safety, and well-being. Additionally, the San Francisco International Airport (SFO) is considered as part of the City's transportation infrastructure given its influence and proximity to the city. SFO is one of the busiest airports in the United States, and any disruptions to the airport could severely interfere with domestic and international air travel.[25]

Transportation infrastructure in Burlingame, including Highway 101 and the Caltrain railway, connects Burlingame to SFO, which plays a significant role in regional transportation services and mobility. These systems and services are vulnerable to poor air quality, flooding, landslides, sea level rise, severe weather, and wildfire. During normal conditions, damage to transportation infrastructure and services prevents people from going about their daily lives, interrupts many key services, and disrupts freight and shipping, including vital supply chains that support both businesses and households. Damage to transit networks also significantly impacts mobility for those who rely on public transportation, leading to reduced access to jobs, healthcare, and other essential services. During emergency events the potential for harm is even greater, as damaged transportation networks can block evacuations, prevent or delay emergency response, and significantly hinder deliveries of vital supplies.

Roadways can be blocked or damaged by wildfires, landslides, flooding, or severe weather, cutting off major routes like Highway 101 or Interstate 280. Damage to these roads could limit evacuation options and delay healthcare and emergency services. Freight movement is also

impacted, as Highway 101 is essential for the transport of goods across the region. Disruptions to key routes, including Highway 101, Interstate 280, and local roadways not only affect local deliveries but also have broader economic implications for the region.

Many roads in eastern Burlingame are in mapped floodplains, making them vulnerable to damage or blockage from floodwaters, including El Camino Real, California Drive, and Old Bayshore Highway, all key routes for SamTrans buses. Loss of bus access can be particularly disruptive for low-income households, individuals with chronic illnesses or disabilities, and older adults who depend on transit to access goods and services. Additionally, the Caltrain line and Highway 101 in Burlingame are in a mapped floodplain, creating a risk of disruption to regional movement. Damaged or blocked routes can prevent people from reaching work and harm freight shipping, causing economic hardships.

Sea level rise and flooding may damage pavement, potentially increasing road maintenance costs and creating unsafe driving, walking, and biking conditions. These hazards also directly impact transit services, such as buses, Caltrain, and BART, by disrupting access to transit routes and facilities, leading to reduced service reliability and longer travel times. Critical routes such as Highway 101 are within the 100- and 500-year floodplain, and California Drive and El Camino Real are within the 500-year floodplain. Flooding of main access points could make travel to and from Burlingame challenging, while neighborhood roads with poor drainage could experience long-term delays and costly cleanup.

As sea levels rise, the risk of storm surge also increases, threatening critical infrastructure, including airport access roads and public transit connections. By 2050, SFO will be vulnerable to sea level rise during a 100-year storm event. Inundation from sea level rise, storm surges, and inland flooding could overwhelm airport drainage systems, leaving standing water on runways, in terminals, and in other critical infrastructure. Damage to airport facilities could lead to costly repairs, prolonged closures, and significant economic losses for local businesses. Such disruptions could hinder travel to and from the airport, negatively impacting the county's recreation and tourism industries, including attractions, hospitality services, and seasonal events. Disruption of these services due to flooding will have cascading effects throughout the city, impacting daily life, economic stability, and overall resilience, increasing isolation for vulnerable populations and reducing mobility for those relying on public transit.

SFO Shoreline Protection Program

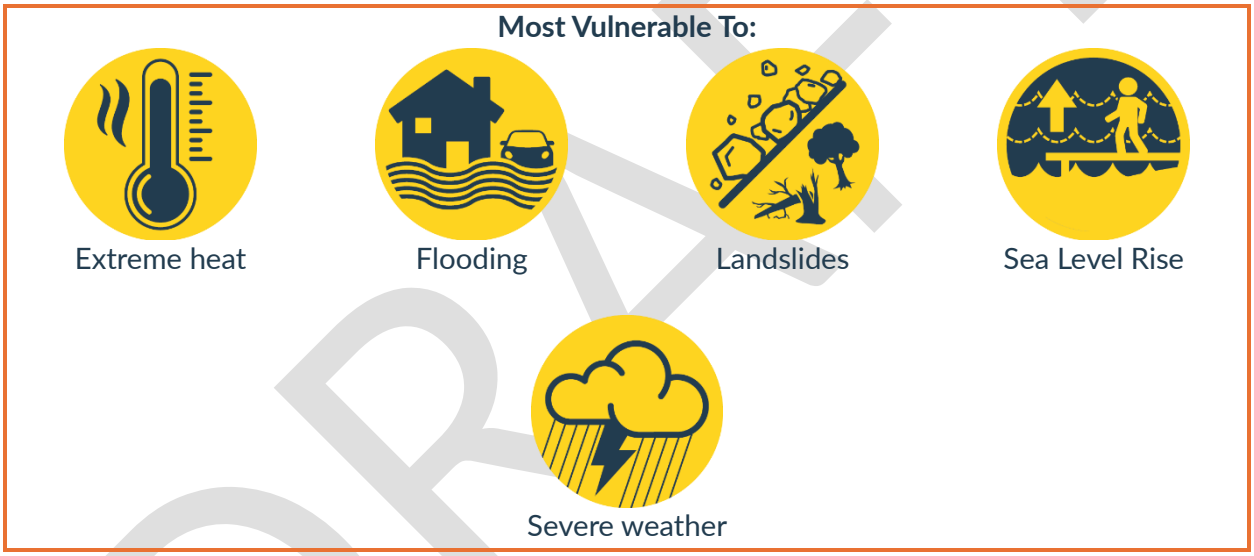
The San Francisco International Airport has implemented the SFO Shoreline Protection Program, which aims to protect the airport's assets and operations from flooding caused by a 100-year storm surge and future sea level rise due to climate change. The program focuses on developing a comprehensive shoreline protection system designed to safeguard travelers, airport workers, and vital assets belonging to both the airport and the City and County of San Francisco. It aims to protect against a 100-year storm event and incorporate measures to address future sea level rise.

Burlingame's emergency services include emergency medical response, fire protection services, and law enforcement response provided

by the Burlingame Police Department and Central County Fire. These services remain critical at all times, including during and immediately after emergency events. However, several climate hazards can disrupt these services and put community members at risk. Poor air quality and extreme heat significantly increase the number of calls for emergency response, stress the services, and potentially lead to a shortage of care providers.

Severe weather also poses concerns for Burlingame's emergency service providers. Strong winds during severe weather can knock down trees and blow debris onto roadways. Heavy rains can cause flooding or even landslides, blocking roadways. If roadways are obstructed, delays in emergency response can occur. This situation is particularly concerning for hillside neighborhoods, which have limited road connections. During major public health emergencies, emergency responders may also face constraints when they experience staffing shortages due to personnel being on medical leave.

Homes



Homes and residential structures play an essential role in every community, and Burlingame, like in other areas of the Bay Area and California, faces a chronic housing crisis fueled by high costs of housing and a limited supply of housing. Climate change has the potential to worsen this crisis. Wildfires, flooding events, landslides during or after heavy rainfall, inundation from sea level rise, and severe storms can damage or destroy houses and apartment buildings throughout the community. Even if initial damage is minor, standing or retained water can cause mold and mildew to grow, causing homes to become uninhabitable. Extreme heat events and poor air quality may not damage the structural integrity of homes and residential structures, but they can create unhealthy indoor air temperatures and quality, leading to dangerous living conditions for occupants. If homes become uninhabitable, residents face displacement and significant challenges in finding alternative housing options, often resulting in prolonged periods of instability or even homelessness.

Hotels and Lodging

Most Vulnerable To:


Air quality and smoke


Extreme heat


Human health hazards


Sea Level Rise


Severe weather

Hotels and lodging are the largest contributor to Burlingame's diverse local economy. The City's hotel and lodging services can suffer a loss of bookings during hazardous conditions, particularly from poor air quality, extreme heat, human health hazards, sea level rise, and severe weather. Hazards such poor air quality, wildfire smoke, and extreme weather can deter tourism, damage key attractions, cause power outages, and block roads, ultimately reducing tourism activities. Disruptions to operations at SFO Airport and related transportation infrastructure can also negatively impact hotel bookings. Furthermore, prolonged exposure to hazardous conditions can lead to a negative perception of the city, which can further diminish visitor numbers and bookings over time.

In addition to these challenges, extreme weather events such as heavy rainfall, tidal flooding, and inland flooding can directly damage hotel facilities, leading to costly repairs and temporary closures. These disruptions can create a ripple effect throughout the hospitality industry, not only affecting the hotels themselves but also the various businesses that rely on tourism. For example, restaurants, entertainment venues, and local attractions may all experience a downturn in revenue due to reduced tourist activity. The cumulative effect of these disruptions can significantly weaken the overall tourism infrastructure, making recovery more challenging.

Burlingame's economy is highly dependent on the hospitality sector, with the Transient Occupancy Tax providing crucial funding for public services and public infrastructure maintenance and upgrades. A sustained decline in hotel bookings or damage to hotel properties and transportation infrastructure can reduce Transient Occupancy Tax revenue, thereby affecting the City's fiscal stability. Reduced funding can impact the City's ability to maintain essential services, invest in infrastructure, and support community programs, which in turn can further affect the attractiveness of Burlingame as a tourist destination. Additionally, hotel guests contribute significantly to the local economy by spending money at restaurants, shops, and attractions throughout Burlingame, supporting jobs and fostering economic growth. The

interdependence of the hospitality industry and the local economy means that any disruption to tourism can have far-reaching consequences, affecting not only hotel operators but a wide range of businesses and residents.

Other Priority Vulnerabilities

Although the following populations and assets do not rank as priority vulnerabilities for as many hazards as those discussed above, they still hold significant importance and concern for the community. Given the potential consequences for harm to these populations and assets, the City recognizes them for community planning and risk assessment efforts. Proactively addressing these priority vulnerabilities can help mitigate their impacts and enhance the city's overall resilience.

Isolated Persons

Isolated persons constitute another group in Burlingame with priority vulnerabilities for many hazards. This includes people who do not speak English, lack access to a personal vehicle or telecommunications, or otherwise lack regular social and technological connections. Although these populations represent a relatively small proportion of the total population, because they are isolated, they often do not receive information about protecting against hazards or responding to imminent or ongoing threats. This includes lifesaving information, such as evacuation orders or the location of cooling centers. Community-based organizations, like El Concilio, which provide services and outreach to marginalized and isolated persons in San Mateo County, work to reduce these vulnerabilities, but they face limitations in capacity and resources.

Energy and Communication and Infrastructure and Services

Residents, visitors, and workers rely on the City's energy and communication infrastructure and services to work, play, and remain healthy and safe. Hazards such as flooding, landslides, sea level rise, severe weather, and wildfire threaten energy delivery and communication infrastructure and services, potentially undermining their foundations or damaging powerlines. This infrastructure supports electricity, natural gas, internet, and phone services for the community.

Sea level rise poses a significant threat to the city's energy and communication infrastructure, especially when combined with extreme storm events. Impacts to transmission could lead to power outages, which would hinder emergency response and coordination during severe events. This loss of power would disrupt daily activities, affect communication networks, and compromise life support systems, putting residents' health and safety at risk.

Landslides, wildfire, and severe weather can down or damage power lines and disrupt natural gas supplies. Downed infrastructure may damage roads and buildings, posing risks to people and potentially requiring road closures. Damaged infrastructure may also create fire hazards due to exposed electrical wires or ruptured gas lines, increasing the risk of ignition in vulnerable areas. Extreme heat can regularly cause power outages due to a combination of mechanical failure of electrical grid equipment, heat damage to the wires themselves, and high demand for electricity because of cooling equipment, all of which causes stress on the grid. The heat also causes more demand for electricity (usually to run air conditioning units), causing further stress on the power lines that may lead to brownouts and blackouts. A power or communication outage could affect emergency medical response and emergency resource services. The loss of power often results in a loss of refrigeration, ruining food in homes and businesses, which disproportionately harms financially constrained households and small businesses.

Water and Wastewater Services

The City of Burlingame Water Division provides water services to Burlingame, which depends on pipelines, pump stations, and treatment facilities for drinking water, cooking, cleaning, recreation, business operations, and medical needs. The City of Burlingame Public Works Department provides wastewater services to Burlingame. These infrastructure and services are at risk from drought, flooding, emergent groundwater, sea level rise, landslides, and wildfires.

Drought conditions can also impact Burlingame's ability to provide reliable water service, which limits the amount of water available to residents and businesses. Drought can reduce sewer flow, making wastewater more concentrated and requiring additional treatment to meet water quality standards, which in turn increases energy use. Reduced flow also decreases the flushing of debris from pipes, reducing system efficacy and potentially leading to infrastructure damage or service disruptions.

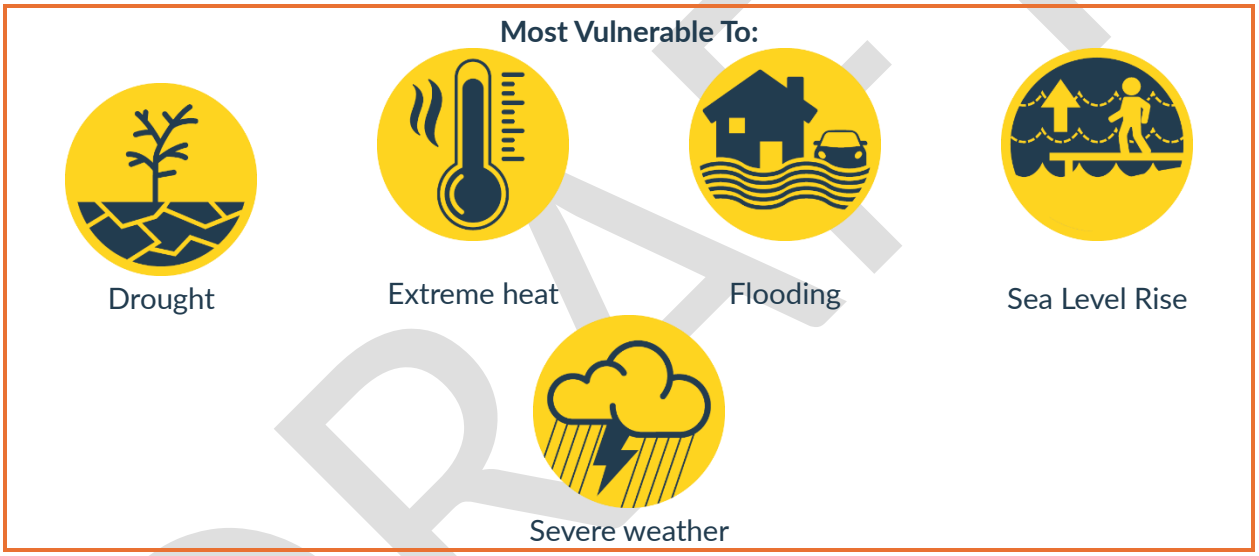
Burlingame's sewer system is vulnerable to flooding, sea level rise, and emergent groundwater, particularly in areas adjacent to Highway 101, including areas along the bayfront. Damage to wastewater systems could have widespread public health impacts if untreated wastewater contaminates the water and soil. Flooding can also disrupt water and wastewater services by overwhelming treatment plants with excess stormwater. If the treatment plant fails, sewage backups could occur, contaminating streams and water systems.

Flooding from heavy rain can damage both water and wastewater pipelines and treatment facilities. Landslides can damage water and wastewater lines, leading to sewer overflows or suspension of water services. The Burlingame Wastewater Treatment Plant is in a 100-year floodplain and is at risk from 3.3 feet of sea level rise combined with a 100-year storm event by 2050, making it particularly vulnerable to inundation and damage. Damage to water and wastewater infrastructure could compromise service availability and expose residents to contaminants, significantly impacting community health and well-being. If the treatment plant fails, sewage backups could occur, contaminating streams and water systems. Pump stations,

which collect sewage, are vulnerable to saltwater intrusion during storm events and sea level rise, potentially causing wastewater to overflow into the environment.

If electrical systems at pump stations are compromised, sewage pumping could be interrupted. A compromised wastewater system can have significant public health impacts due to sewage contamination. Buried water pipelines are also at risk due to changes in soil water content caused by flooding, emergent groundwater, and sea level rise. Saltwater exposure can damage these utilities, often with damage going unnoticed until major failures occur. Damage to the water system could also increase wildfire vulnerability because the system is essential for firefighting efforts, though it is not designed to handle major wildfires. Wildfires can further degrade water supplies if facilities such as San Andreas Lake are contaminated by ash and fire retardants, reducing water availability.

Aquatic Habitat



Aquatic habitats in Burlingame include riparian areas found along Mills Creek, Easton Creek, and Sanchez Creek, wetlands found near the shoreline, east of Highway 101, and Burlingame Lagoon and Anza Lagoon. Wetlands serve as natural buffers that absorb and slow floodwaters, helping to protect the community from flooding from the San Francisco Bay. The dense vegetation in wetlands and lagoons physically slows the movement of water, allowing for gradual absorption and infiltration into the soil. This reduces the speed and intensity of floodwaters. Additionally, lagoons act as holding basins, storing excess water from stormwater runoff or tidal surges, preventing flooding further inland. They play a crucial role in water filtration, removing pollutants and improving water quality for both human and ecological needs. Additionally, these habitats offer critical habitat for diverse wildlife, supporting a variety of plant and animal species, some of which are rare or endangered. Furthermore, these habitats offer recreational opportunities, such as birdwatching, hiking, and educational activities, contributing to the well-being of the community. The health of these ecosystems is essential to protecting built infrastructure and services from sea level rise and flooding.

Several existing factors play a role in the sensitivity of aquatic habitats to changing conditions, such as fragmentation, existing pollution levels, and built structures that may impede the natural adaptive migration of the ecosystems as sea levels rise, drought intensifies, and temperatures increase.

During a drought, riparian areas can dry up and wetlands can become more fragmented, substantially changing the ecosystem's character. Lower water levels in a creek can result in higher water temperatures and lower dissolved oxygen levels, both dangerous conditions for aquatic species During long-lasting droughts, the drier conditions may cause part of the wetland ecosystem to transition to other ecosystems, causing permanent loss of more of an environment that has already been destroyed in much of the state.

Floods and severe weather can cause the opposite problem, eroding the banks of riparian areas and upsetting the balance between freshwater and saltwater in the wetlands. Riparian areas may be overwhelmed by fast-moving stormwater and damaged by debris. Sea level rise similarly threatens Burlingame's tidal wetlands, causing permanent inundation that can damage the ecosystem and contribute to its loss. Wetlands have specific water elevation tolerances, and if the water is too deep due to sea level rise, the area becomes open water rather than a vegetated wetland.[26]

Millbrae and Burlingame Shoreline Resilience Project

OneShoreline is launching the Millbrae and Burlingame Shoreline Resilience Project aiming to protect the shoreline and nearby areas in Millbrae, Burlingame, and San Mateo from sea level rise, extreme storms, and other climate change impacts. The project focuses on coastal flood protection, habitat restoration, and enhancing public access and recreation along the San Francisco Bay shoreline. The project will provide a long-term climate resilience solution for critical infrastructure that is vulnerable to flooding. Several conceptual alternatives are being evaluated, with features like shoreline barriers, tidal lagoon enhancements, and creek management strategies. One key aspect is ensuring that flood protection measures also support public access, ecological sustainability, and recreational opportunities.

Next Steps

The vulnerability assessment is a key technical study needed to update the Safety Element. The vulnerability assessment helps community members, agency staff, and decision makers understand how climate change hazards may alter community conditions and what parts of the community (people and places) should be prioritized for adaptation and resilience. The findings from the climate change vulnerability assessment process will be used to inform the goals, policies, and actions that will be included in the Safety Element.

Glossary

Adaptation: Making changes in response to current or future conditions (such as the increased frequency and intensity of climate-related hazards), usually to reduce harm and to take advantage of new opportunities. [27] [28]

Adaptive Capacity: The combination of the strengths, attributes, and resources available to an individual, community, society, or organization that can be used to prepare for and undertake actions to reduce adverse impacts, moderate harm, or exploit beneficial opportunities. [29]

Cascading or Compounding Effects: Extreme events that link together hazards over days, weeks, or months, resulting in multiplied effects that cause secondary and sometimes tertiary damage, exceeding the damage of the initial hazard event.

Climate Change: A change in the state of the climate that can be identified by changes in the mean, and/or the variability, of its properties, and that persists for an extended period, typically decades or longer.

Community Asset: A valued feature of a community that may be harmed by climate change. Community assets may include buildings, infrastructure, community services, ecosystems, and economic drivers.

Exposure: The presence of people; infrastructure; natural systems; and economic, cultural, and social resources in areas that are subject to harm. [30]

Goal: An ideal future end state related to public health, safety, or general welfare.

Hazard: An event or physical condition that has the potential to cause fatalities, injuries, property damage, infrastructure damage, damage to the environment, interruption of business, or other types of harm or loss. [31]

Impact: The effects (especially the negative effects) of a hazard or other conditions associated with climate change.

Policy: A specific statement that guides decision-making, indicating a commitment of the local legislative body to a particular course of action.

Program: An action, procedure, program, or technique that carries out a general plan policy.

Resilience: The capacity of any entity—an individual, a community, an organization, or a natural system—to prepare for disruptions, to recover from shocks and stresses, and to adapt and change from a disruptive experience. Community resilience is the ability of communities to withstand, recover, and to learn from past disasters to strengthen future response and recovery efforts.

Risk: The potential for damage or loss created by the interaction of hazards with assets such as buildings, infrastructure, or natural and cultural resources.

Vulnerability: The degree to which natural, built, and human systems are susceptible to harm from exposure to stresses associated with environmental and social change and from the absence of capacity to adapt. [32]

Vulnerability Assessment: An analysis of how a changing climate may harm a community and which elements—people, buildings and structures, resources, and other assets—are most vulnerable to its effects based on an assessment of exposure, sensitivity, potential impact(s), and the community's adaptive capacity.

Appendix A: Methods

The Vulnerability Assessment considers the threats from all relevant natural *hazards*, which are events or physical conditions that have the potential to cause harm or loss and will emphasize changes to hazard frequency and severity due to climate change. The Safety Element update addresses natural and human caused hazards, such as seismic hazards and hazardous materials. However, these hazards are not included in the Vulnerability Assessment because climate change does not substantially change their frequency or severity. The Vulnerability Assessment also assesses *populations* and *assets* facing potential harm from the hazards. This includes the risk of physical damage to buildings and infrastructure, social vulnerability of persons likely to be disproportionately harmed by hazards, potential disruption to the city's economic engines, and loss of important services.

The Vulnerability Assessment is based on accurate and up-to-date information, including the Cal-Adapt database, the *California Adaptation Planning Guide* (2020), and the *San Mateo County Multijurisdictional Local Hazard Mitigation Plan* (2021). As outlined in the *California Adaptation Planning Guide*, the Vulnerability Assessment follows a four-step process:

1. **Identify Exposure.** In a vulnerability assessment, *exposure* is the presence of people, infrastructure, natural systems, and resources (economic, cultural, and social) in areas subject to harm. A *hazard*, also called a climate change hazard, is an event or physical condition that has the potential to cause types of harm or loss. This step includes confirming applicable hazards in the city, describing historical hazards, describing how hazards are expected to change, and mapping the hazard-prone areas. The creation and review of this memo is part of this step of the Vulnerability Assessment.
2. **Analyze Sensitivity and Potential Impacts**. *Sensitivity* is the level to which changing climate conditions affect a population or community, species, natural system, government, asset, or resource. Potential *impacts* are the effects of a climate change hazard, or the combination of exposure to the hazard and sensitivity of a population or asset to it. For example, suppose an increase in extreme heat events is the hazard. In that case, the greater risk of heat-related illness in susceptible persons is the exposure, and the sensitivity is the degree of the impact from the exposure. Each population and asset in the City of Burlingame is likely to experience different impacts. The project team will assess the sensitivities and potential impacts to each population or asset from each applicable climate change hazard.
3. **Evaluate Adaptive Capacity.** *Adaptive capacity* is the ability of people and assets to adjust to potential damage from climate change hazards, to take advantage of existing opportunities such as funding, tools, and resources, or to respond to the impacts of climate change. The project team will assess the adaptive capacity of each population or asset for each applicable identified hazard. The City is already implementing several measures to increase adaptive capacity, including the Municipal Code requirements, Capital Improvement Program, and Climate Action Plan.

4. **Conduct Vulnerability Scoring**. *Vulnerability* is defined as the combination of impact and adaptive capacity as affected by the level of exposure to changing climate conditions. Following the process in the *California Adaptation Planning Guide*, the project team will score impact and adaptive capacity for each population and asset affected by each hazard on a scale of low, medium, and high, to identify vulnerability on a scale of one to five and prioritize the most vulnerable populations and assets in Burlingame.

Appendix B: Populations and Assets

The City included the following populations and other assets in the Vulnerability Assessment. Each list includes a description and source of data needed to support the Vulnerability Assessment.

Populations

The City collected population data from the U.S. Census, the California Healthy Places Index, and the San Mateo County Homeless Point in Time Count. These 15 populations are:

1. Children and youth (under 18).
2. Cost-burdened/low-income/overcrowded households: Cost-burdened households are those paying 30% or more of their income towards housing expenses. The State identifies $149,100 as the low-income threshold for a household of four people in San Mateo County in 2023.[33] Four percent of Burlingame residents earn incomes at or below poverty level. Overcrowded households include housing units that have more than 1.0 person per room (excluding bathrooms and kitchens) Approximately 7 percent of Burlingame homes are overcrowded.[34]
3. Households in poverty: households with an income below the poverty line, which is $27,750 for a household of four. [35]
4. Immigrant communities/linguistically isolated persons: Communities consisting of foreign-born populations, including immigrants, refugees, and undocumented persons. Linguistically isolated persons include households without a member who is fluent in English. Spanish and Chinese are the primary languages in Burlingame among households that are not fluent in English.[36]
5. Low-resourced people of color: Persons identifying as a member of a racial and/or ethnic group and facing limited access to resources, such as financial, social, healthcare, or educational assistance.[37,38]
6. Outdoor workers: workers in landscaping, construction, outdoor recreation, etc.[39]
7. Persons experiencing homelessness: 2022 One Day Homeless Count reported ten total persons experiencing homelessness (all unsheltered) within the City of Burlingame.[40]
8. Persons living on single access roads (roads with only a single entry or exit point). Single access roads are located in the western hillside areas of the community.
9. Persons with chronic illnesses and/or disabilities. Approximately 7 percent of Burlingame's population has some form of disability.[41]
10. Persons without a high school degree: Approximately 7 percent of Burlingame's adult population has not obtained a high school degree or equivalent.[42]
11. Persons without access to lifelines: Persons without reliable access to a car, transit, or communication systems. Approximately 4 percent of Burlingame households do not have access to a personal vehicle.[43] Approximately 5 percent of Burlingame households do not have an internet subscription.[44]
12. Renters. Approximately 47 percent of Burlingame housing units are renter-occupied.[45]

13. Seniors (65+). Seniors constitute 16 percent of Burlingame's population.[46] Approximately 10 percent of Burlingame households consist of seniors living alone.[47]
14. University students.
15. Unemployed persons. Burlingame's civilian labor force unemployment rate is approximately 5 percent.[48]

Infrastructure

The City gathered details on infrastructure from state and local GIS data, and the 2021 San Mateo County Multijurisdictional Local Hazard Mitigation Plan. These 7 asset groups are:

1. Energy and communication infrastructure:
    - Transmission Lines: Pacific Gas & Electric (PG&E).
    - Natural gas pipelines and structures: PG&E.
    - Cell towers, radio sites, fiber optic lines, and internet lines.
2. Flood control and stormwater infrastructure.
3. Vehicle fuel stations:
    - Electric vehicle charging stations: 60 public charging stations.49
    - Gas stations
4. Hazardous materials sites: 126 cleanup sites (15 open) identified via the State Water Control Board's GeoTracker database;[50] five toxic substance sites (one open) identified via the State Department of Toxic Substance Control's EnviroStor database,[51] and the closed landfill located on Airport Boulevard.
5. Transportation infrastructure:
    - Freeways: Highways 101 and 280.
    - Local roads: A local road is any road controlled by the local government. Key local roads in Burlingame are: El Camino Real, Burlingame Avenue, Broadway, California Drive, Rollins Road, Old Bayshore Highway, Trousdale Drive, and Hillside Drive.
    - Bridges and culverts: One highway bridge, and six local bridges.
    - Transit facilities: Transit stops and other facilities provided by SamTrans, San Mateo County Transit District, and the Burlingame Bayside Shuttle.
    - Railway: Caltrain, BART.
    - Airports: San Francisco International Airport.
6. Parks and related recreational facilities:[52]
    - Parks and playgrounds: Alpine Park, Bayside Dog Exercise Park, Cuernavaca Park, Heritage Park, Laguna Park, Lorton Park, Paloma Playground, Pershing Park, Primrose Playground, Ray Park, Skyline Park, Trenton Playground, Victoria Park, Village Park, Washington Park, and additional recently-constructed and planned parks.
    - Fields: Bayside Fields, Murray Field.
    - Other: Community Garden at Bayside Fields.
    - Mills Canyon Wildlife Area, Shorebird Sanctuary – Natural Marsh.

- Amenities outside of Burlingame: Coyote Point Recreation Area.

7. Water and wastewater infrastructure: Wastewater Treatment Plant, gravity sewers, lower laterals, force mains, lift stations, pump stations, water storage tanks and regional supply reservoirs not owned by the City (including Hetch Hetchy, Calaveras, San Antonio, Crystal Springs, Pilarcitos, and San Andreas reservoirs).

Buildings

The City collected buildings data from Google Maps, the California School Database, and local agency websites and GIS records. These six assets are:

1. Government and community facilities: Burlingame City Hall, Burlingame Public Library, Burlingame Library Easton Branch, Burlingame Community Center, Parks Yard, Public Works Corporation Yard, Depot, Wastewater Treatment Plant Operations Building, public parking lots and garages.
2. Commercial centers: Downtown Burlingame Commercial District, Broadway Commercial District, Burlingame Plaza, Bayfront commercial area.
3. Medical and care facilities: Mills-Peninsula Medical Center, Palo Alto Medical Foundation Burlingame Center, doctor's offices, and urgent care facilities.
4. Homes and residential structures: Multi-family and single-family residences.
5. Public safety buildings: Central County Fire Department Fire Station 34, Central County Fire Department Fire Station 35, Central County Fire Department Fire Station 36, and Police Department.
6. Schools:

    - Public Schools: Burlingame Intermediate School, Franklin Elementary, Hoover Elementary, Lincoln Elementary, McKinley Elementary, Roosevelt Elementary, and Washington Elementary.
    - Private and Charter Schools: American Advanced Academy, The Avalon Academy, Bridge Point Academy, Children's Creative Learning Center, Mercy High School, Our Lady of Angels School, and St. Catherine of Siena School.

Economic Drivers

The City determined important economic assets based on the 2022 Comprehensive Annual Financial Report and land uses within the city. These eight assets are:

1. Air services, including commercial services, general aviation, and supportive industries.
2. Major employers: American Medical Response, Burlingame Long Term Care, Burlingame School District, California Teachers Association, Guittard Chocolate, Hyatt Regency SF Airport, Lahlouh Inc., Mills-Peninsula Medical Center, Putnam Auto, Safeway.
3. Commercial and retail activity, including sales tax.
4. Education services.
5. Hotels and lodging, including Transient Occupancy Tax (TOT).
6. Medical services.

7. Outdoor recreation.
8. Life sciences industry.

Ecosystems and Natural Resources

The City determined the ecosystems and natural resources based on information from the Healthy People and Healthy Places Element of the General Plan. These four are:

1. Wetlands and lagoons: Dominated by herbaceous plants that are adapted to water and either stand erect above the water or grow at the surface. This ecosystem is found near the shoreline, east of Highway 101. Lagoons include Burlingame Lagoon and Anza Lagoon.
2. Herbaceous: Natural herbaceous plants commonly consist of perennial grasses, annual grasses, and forbs. This ecosystem type is found in scattered areas across the city.
3. Forest: California mixed evergreen forests are characterized by mixes of coniferous and broad-leaved evergreen trees. This ecosystem is found in scattered areas in the northwestern corner of the city. Other forest types are found in scattered areas within the northwest corner of the city.
4. Riparian: Found along stream courses and consist of valuable habitat for wildlife due to presence of water, lush vegetation, and high insect populations. This ecosystem is found along Mills Creek, Easton Creek, and Sanchez Creek.

Key Services

These assets are based on typical services provided in cities throughout California, which are supported by the infrastructure and buildings listed above. Key community services include the operation and functions needed to provide and maintain services. The Vulnerability Assessment assesses the infrastructure and people needed to support them separately. These seven services are:

1. Education services: Burlingame School District, private schools, and childcare.
2. Emergency services: Central County Fire, Burlingame Police Department, Central County Fire – Community Emergency Response Team (CERT), Burlingame Neighborhood Network, San Mateo County Department of Emergency Management, and San Mateo Operational Area Emergency Services Council.
3. Energy delivery and communication services: Peninsula Clean Energy, PG&E, radio, television, cellular and landline phone, and internet.
4. Government administration and community services.
5. Public transit access: SamTrans, Caltrain, Burlingame Bayside Shuttle, San Mateo County Transit District, San Mateo County Transportation Authority, and Peninsula Corridor Joint Powers Authority.
6. Solid waste removal: Recology San Mateo County.
7. Water and wastewater: City of Burlingame, San Francisco Public Utilities Commission, South San Francisco, and Bay Area Water Supply and Conservation Agency.

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