SacAdapt

SACRAMENTO'S TRANSPORTATION INFRASTRUCTURE ADAPTATION PLAN

FINAL APPROVED PLAN | APRIL 2026

City of SACRAMENTO

SACRAMENTO REGIONAL TRANSIT

TABLE OF CONTENTS

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1. INTRODUCTION

Sacramento's transportation network moves tens of thousands of people throughout the city every day. As the climate changes, the city's transportation system will face increasing stress from rising temperatures, more intense storms, and other climate-driven hazards.

The City of Sacramento (City) manages over 3,100 lane miles of streets, over 800 traffic signals, more than two dozen floodgates, over 160 bridges, and over 80 miles of shared-use walking and bicycling paths. As the largest transit provider in the Sacramento region, the Sacramento Regional Transit District (SacRT) operates 53 light rail stations carrying approximately 14,600 passengers per day and manages 3,200 bus stops servicing approximately 21,000 bus passengers per day. Climate change is already affecting these transportation assets with extreme heat, intense storms, and other climate-driven hazards, and the impacts are projected to worsen in the coming decades.

The Sacramento Transportation Infrastructure Adaptation Plan (SacAdapt or Plan) is a collaborative planning effort between the City and SacRT to prepare Sacramento's transportation assets for projected climate change impacts. This interagency collaboration reflects the interconnected nature of the transportation assets that each agency manages.

SacAdapt brings together local expertise, the latest climate science, and extensive community input to guide strategic and targeted implementation to strengthen long-term resilience. Preparing these systems today supports a safer and more accessible Sacramento tomorrow and can reduce overall costs in the long term.

SacAdapt builds on the City's adopted foundational planning documents, including the General Plan 2040, Climate Action & Adaptation Plan (CAAP), Sacramento Urban Forest Plan (SUFP), Comprehensive Flood Management Plan (CFMP), and Local Hazard Mitigation Plan (LHMP). The Vulnerability Assessment from the City's CAAP is an important guiding document for SacAdapt, although the methodology and datasets used in this Plan to estimate the future impacts of climate change were updated to incorporate more recent data where possible.

In addition, SacAdapt is grounded in a thorough review of existing SacRT plans to ensure continuity and provide essential background on agency goals and technical analyses, including the Transit Asset Management (TAM) Plan, Zero-Emission Bus (ZEB) Rollout Plan, Bus Stop Improvement Plan (BSIP), and Facilities Transition Plan. These studies created a foundation to begin identifying established priorities, constraints, and opportunities. Additionally, these documents brought credible data and recommendations to ensure that SacAdapt reflects both long-term vision and practical, evidence-based guidance.

A literature review with relevant plans, strategies, and data to document the work that has already occurred in the region is available in **Technical Appendix A: Literature Review**.

This Plan focuses on all of the City's and SacRT's transportation assets within the City of Sacramento, in addition to SacRT light rail infrastructure and SacRT maintenance facilities outside of City of Sacramento boundaries (**Figure 1-1**).

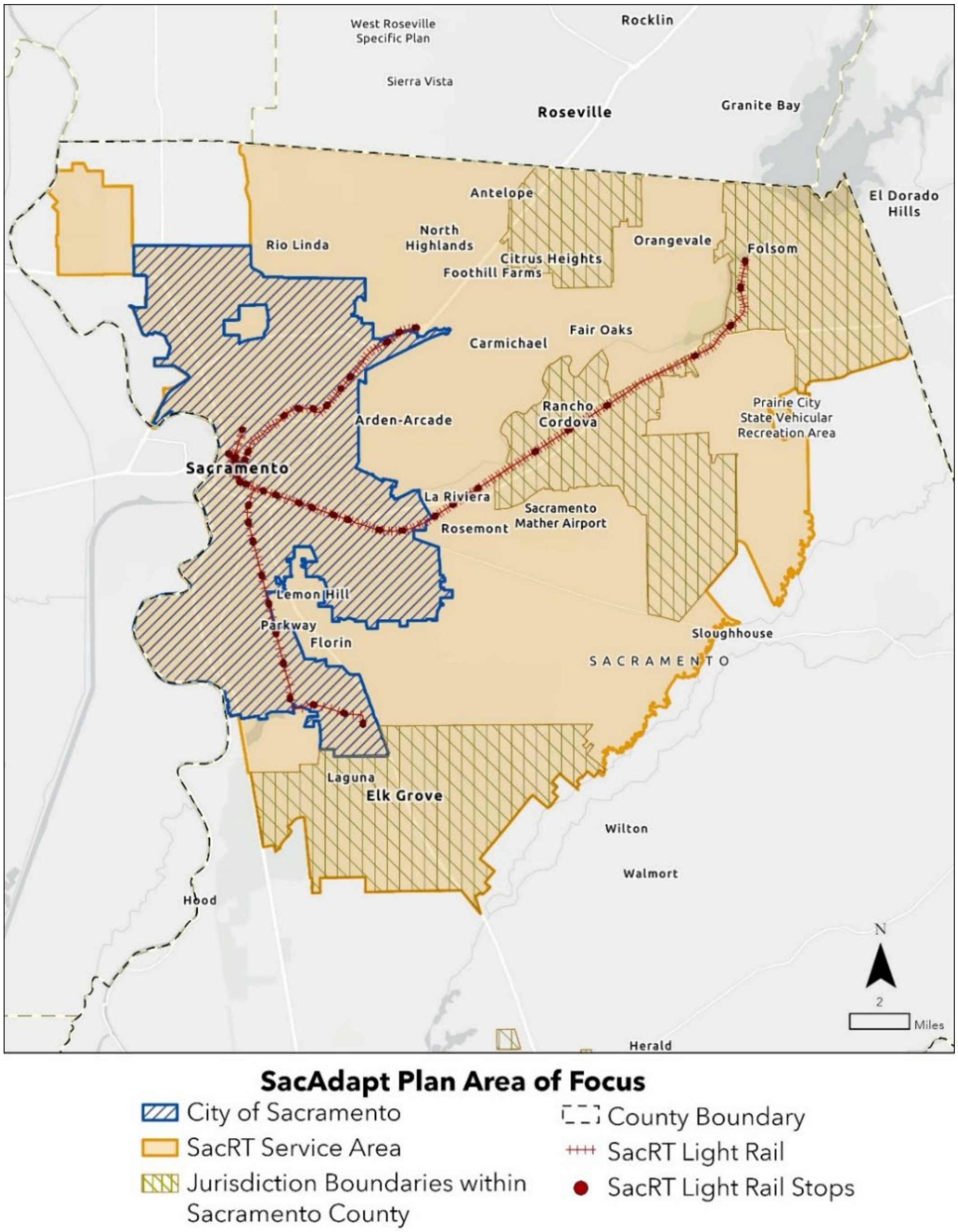


FIGURE 1-1. SACADAPT PLAN AREA OF FOCUS

SacAdapt was developed through a collaborative process guided by technical experts, agency staff, and community members. The SacAdapt Project Team was led by the City's Office of Climate Action & Sustainability and SacRT's Planning Department, with support from the WSP consultant team. The Project Team engaged technical experts from the City and SacRT through in-depth interviews and a technical advisory committee (TAC) that met throughout the planning process to shape the analysis and ensure the Plan reflects operational realities.

Community input played an essential role in the development of the Plan. Through surveys, pop-up events, and targeted engagement, members of the community shared how extreme weather affects their daily travel and what improvements would make a difference in their lives. Community engagement efforts and feedback are summarized in **Section 1.1**.

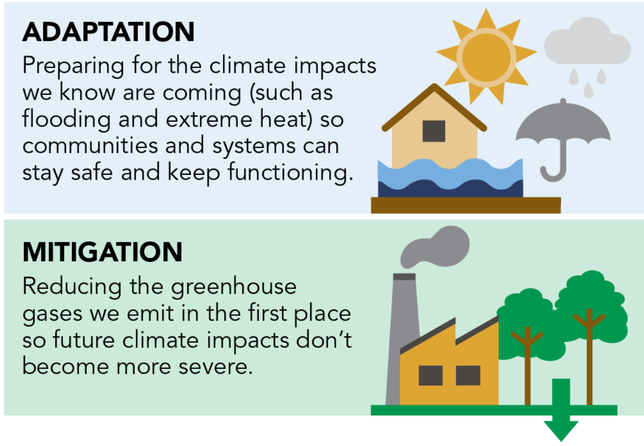


FIGURE 1-2. DEFINITIONS OF CLIMATE ADAPTATION AND MITIGATION

The technical analysis incorporates the most up-to-date climate projections available for the state of California to analyze future conditions and potential impacts to the City's transportation network. This information was used to evaluate vulnerability, risk, and develop a list of adaptation strategies to address identified vulnerabilities.

The Plan follows the same structure as the development process as shown in **Figure 1-3**, beginning with the analysis of climate data for vulnerability and risk assessments, and concluding with a set of strategies and implementation guidance tailored for the City and SacRT.

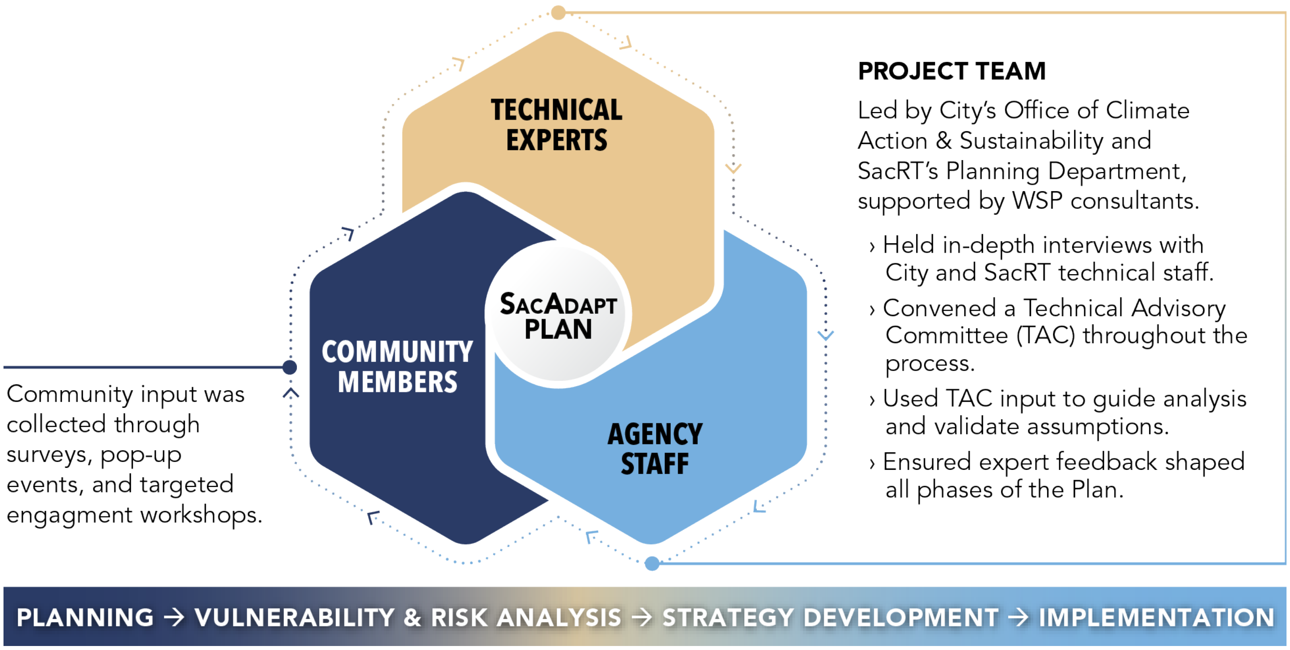


FIGURE 1-3. PLAN DEVELOPMENT STEPS

1.1 COMMUNITY ENGAGEMENT

The development of SacAdapt was rooted in a comprehensive public engagement strategy that emphasized clear branding, easy access to information, technical guidance, purposeful engagement, and robust community input throughout the project lifecycle.

While community engagement was continuous, there were three core phases focused on distinct objectives.

- **Initial Engagement**: Prioritized building recognition for SacAdapt through branding and introductory events while identifying the climate change impacts Sacramento's public transportation system already experiences.
- **Priority Setting**: Centered on gathering input from residents to help prioritize the transportation and climate adaptation challenges.
- **Draft Plan Review and Feedback**: Offered opportunities for residents to review the draft Plan and share final feedback. This included access to the Plan via the website, interactive webinars, and additional events to ensure that the public could understand and influence the Plan's direction before its completion.

By integrating consistent branding, a robust online presence, expert guidance, thoughtfully selected events, and meaningful opportunities for input, SacAdapt's development was shaped by an inclusive and transparent process.

1.1.1 SACADAPT BRANDING

Early in the project, the Project Team created a unified visual identity for SacAdapt, ensuring all materials including postcards, rack cards, posters, and social media graphics were easily recognizable and consistent. The Project Team ensured all materials and communications adhered to ADA (Americans with Disabilities Act) requirements to provide equitable access. Engagement materials were designed with high-contrast colors, large fonts, and clear layouts to enhance readability. This branding helped foster project visibility and credibility, making it easier for community members and stakeholders to identify and engage in the planning and feedback process for SacAdapt.

1.1.2 PROJECT WEBSITE

Central to the engagement strategy was the launch and ongoing maintenance of the project website. Serving as the main hub for project information, updates, and engagement opportunities, the website provided the Sacramento community with reliable, up-to-date access to information and materials throughout the planning process. The site was continually refreshed with event details, draft documents, and opportunities for feedback, allowing for ongoing community involvement regardless of phase.

1.1.3 TECHNICAL ADVISORY COMMITTEE GUIDANCE

The Technical Advisory Committee (TAC) was established to guide the development of the SacAdapt planning effort. The TAC was comprised of key representatives from the City of Sacramento including the Public Works Department, Department of Utilities, Community Development Department, Fire Department, Police Department, and the Office of Emergency Management, as well as key representatives from Sacramento Regional Transit (SacRT), including the Planning, Light Rail Wayside and Maintenance, Facilities, Environmental Health and Safety, and Engineering divisions. The TAC also included subject matter experts from WSP, Sagent, Caltrans, SMUD, the Sac Metro Air District, and the Sacramento Area Council of Governments (SACOG). The TAC met a total of six times.

The TAC played a key role throughout the project by offering subject-matter insights, shaping engagement strategies to ensure that technical analysis reflected operational realities, and helping interpret community feedback. This active involvement meant that public input was translated into practical, achievable strategies.

1.1.4 COMMUNITY ENGAGEMENT EVENTS

To connect with Sacramento's diverse communities, the SacAdapt team strategically selected events, workshops, and meetings to reach a broad cross-section of the population. Locations were chosen based on access to public transportation, degree of climate change impact, the environmental equity needs of under-resourced neighborhoods, and geographic coverage.

Recognizing the city's linguistic diversity, Spanish, Vietnamese, Russian, Hmong, Cantonese, and Mandarin were identified as priority languages for translation. Public-facing materials – including flyers, postcards, and rack cards – were developed in these languages to maximize public participation.

Over the course of the project, the SacAdapt team participated in 33 engagement opportunities, including four public meetings, 26 in-person events, two online workshops, and six presentations to advisory bodies. In total, the Project Team engaged with an estimated 1,500 community members over the course of all engagement opportunities.

The events represented a wide variety of community settings, from light rail pop-ups and community festivals to farmers markets and university gatherings. By focusing on popular venues and transportation hubs, the team was able to distribute branded materials and hold direct conversations with residents about transportation experiences and climate change concerns.

1.1.5 COMMUNITY-BASED ORGANIZATION ENGAGEMENT

Recognizing the vital role of local community-based organizations (CBOs) and trusted community members, the Project Team compiled a list of over 125 different CBOs and sent targeted emails to encourage participation by the CBOs and their networks during each phase of engagement. SacAdapt shared three communication toolkits as part of this CBO outreach, with images, links, and content to facilitate social media and newsletter distribution. Special attention was given to engaging entities that support non-English-speaking residents.

1.1.6 COMMUNITY SURVEY INPUT

Surveys were a cornerstone of SacAdapt's community engagement strategy, reaching members of the community both online and at in-person events. Through these surveys, community members provided valuable input on Sacramento's transportation challenges, climate impacts, and adaptation priorities. In addition to direct engagement at public meetings and events, surveys were distributed via partner organizations to ensure that those unable to attend still had a voice in the planning process.

To maximize participation, the surveys were made accessible in Spanish, Vietnamese, Russian, Hmong, and Traditional Chinese. Surveys were most frequently completed in English (703 responses), followed by Spanish (11 responses).

In total, SacAdapt received more than 860 survey responses across the first two phases of engagement, providing robust, actionable insights that directly informed the adaptation planning process. These community survey responses demonstrated how extreme weather affects people in their daily travels across various modes, shown in **Figure 1-4**.

Survey respondents identified past disruptions, safety concerns, and challenges faced during extreme weather. These lived experiences highlight the human-level impacts of extreme weather, such as discomfort at transit stops in hot weather and flooding due to maintenance-based issues like clogged storm drains.

The public review period for the draft SacAdapt Plan received 160 total comments, emails, and letters. Public comments highlighted strong community support for expansion and protection of urban tree canopy, increasing heat mitigation at bus stops, increased stormwater management for bicycle and pedestrian facilities, evacuation resources for vulnerable communities and individuals without vehicles, and a desire to see funding dedicated to plan implementation. These comments guided final revisions to the SacAdapt Plan.

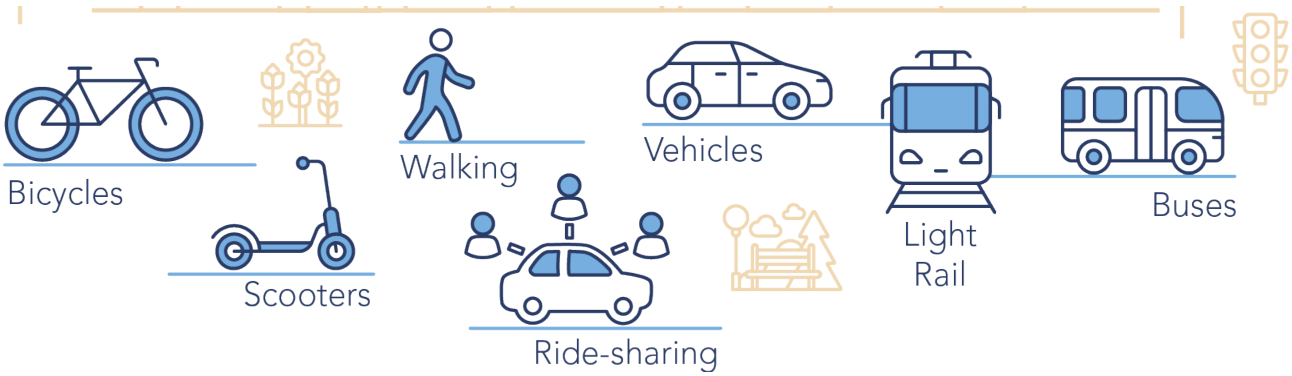


FIGURE 1-4. MODES OF TRAVEL REPRESENTED IN THE COMMUNITY SURVEY

2. HAZARDS, VULNERABILITIES & RISKS

2.1 CLIMATE SCIENCE & PROJECTIONS

Understanding Sacramento's current climate, and how it's projected to change in the future, is essential for maintaining a resilient, reliable transportation network. The most updated climate data shows that extreme heat events will become more frequent and more intense, storms will produce heavier rainfall, and the Sacramento and American rivers will experience higher peak flows. While the exact trajectory of impacts depends on global greenhouse gas (GHG) emissions over the coming decades, the overall direction is clear: **the hazards already affecting Sacramento's transportation network today will continue to intensify throughout the remainder of the century.**

This Plan considered multiple scenarios for how Sacramento's climate may change in the future. These climate scenarios are the outputs of computer models, with variables like temperature and precipitation, that simulate our global climate system. Each scenario assumes a different level of GHG emissions. Some scenarios reflect a world where GHG emissions stabilize, while others depict outcomes where GHG emissions continue to rise.

The latest generation of climate scenarios were used in the most recent United Nations (UN) Intergovernmental Panel on Climate Change (IPCC) Assessment Report and include several different potential technological, socioeconomic, and policy futures for warming and emissions. The climate scenarios analyzed in SacAdapt are:

- **Moderate GHG emissions**:[1] This scenario assumes moderate global action. Warming is limited but still significant.
- **High GHG emissions**:[2] This scenario assumes limited global coordination. There is a higher level of climate stressors, including higher warming.
- **Very high GHG emissions**:[3] This scenario assumes continued growth in fossil fuel use. Given societal developments in the past decade, it is now considered a worst-case scenario.

Additional lower scenarios were not analyzed because they are generally considered by climate scientists to be infeasible. **Figure 2-1** shows the different GHG emissions scenarios analyzed in

[1] This scenario corresponds to Shared Socioeconomic Pathway (SSP) 2-4.5 and Representative Concentration Pathway (RCP) 4.5.
[2] This scenario corresponds to SSP 3-7.0.
[3] This scenario corresponds to SSP 5-8.5 and RCP 8.5.

this Plan. Additional details regarding the SacAdapt climate analysis can be found in **Technical Appendix B: Vulnerability Assessment.**

While climate scenarios are not definitive statements about what types of weather patterns are guaranteed to occur in a particular year, they do provide general guidance on how conditions are expected to change over time. **All climate scenarios that were analyzed for SacAdapt show increasing heat and intensifying extremes**.

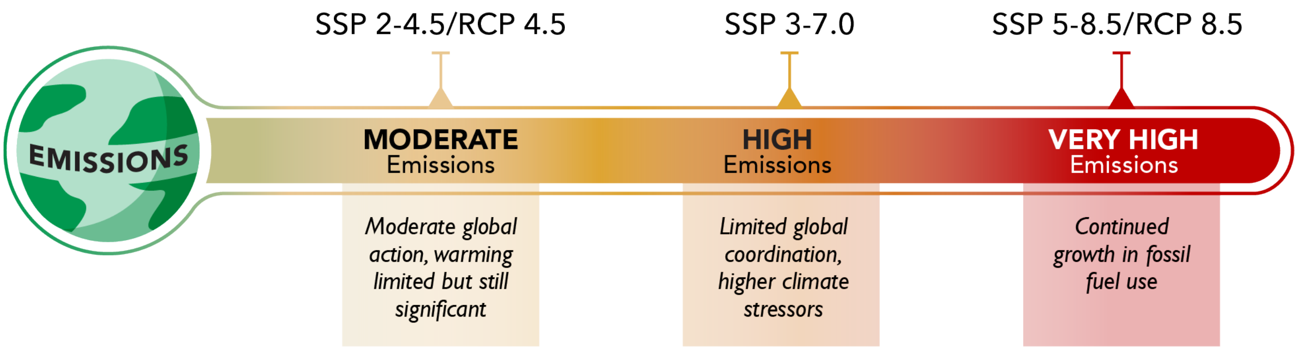
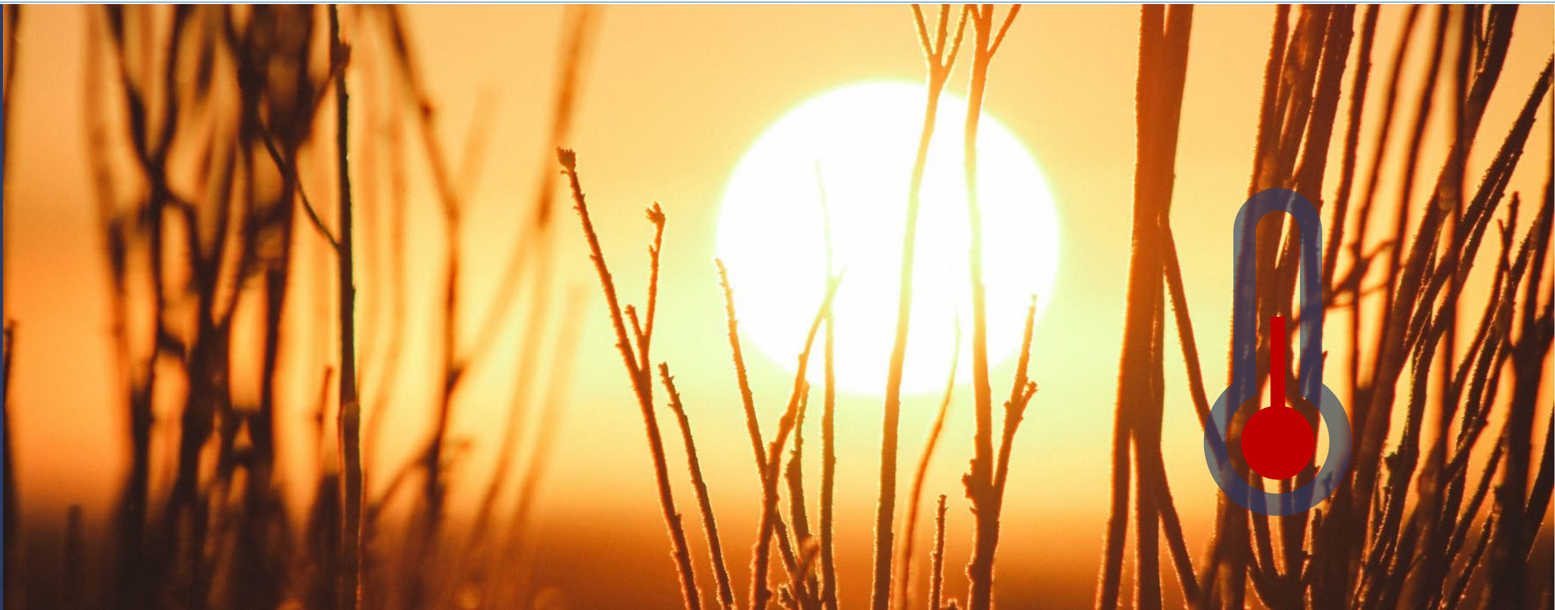


FIGURE 2-1. GHG EMISSIONS SCENARIO PATHWAYS USED IN THIS STUDY

Global climate scenarios were analyzed using the most up-to-date climate data available to California. This makes it possible to understand more localized changes in temperature, humidity, and precipitation patterns, allowing the Plan to assess how conditions such as heat index (the impact of temperature combined with humidity) and extreme storms may evolve. Additional statewide flood modelling for the Sacramento and American Rivers and regional flood analysis provides specific context to the impacts of high river flows.

The following sections discuss the specific impacts that Sacramento will face with increasing frequency and intensity of climate hazards. The high emissions scenario is used to quantify the projected future climate impacts because it represents one of the most feasible futures that could reasonably occur if global emissions do not decline quickly. The “Historical” period covered in this analysis is 1985 through 2014 for all temperature, precipitation, and humidity analysis.



2.1.1 EXTREME HEAT

More frequent heat waves, a stronger urban heat island (UHI) effect (discussed below) and warmer average temperatures will all impact the Sacramento area as the climate changes. Furthermore, as the effects of extreme heat grow more frequent and intense, vulnerable populations, those with underlying health conditions, households without cars, and people without access to regular cooling will be at the greatest risk. **Figure 2-2** shows the key dry bulb temperature—which refers to the ambient air temperature, without consideration of humidity—thresholds of concern for transportation infrastructure that were analyzed in this Plan.

80°F	Occupational Safety and Health Administration (OSHA) standards for outdoor worker safety measures implemented
90°F	General infrastructural impacts such as damage to roads, rails, bridges, and vehicles
95°F	Additional OSHA standards for outdoor worker safety measures implemented; minor City contractor work restrictions
100°F	SacRT overhead catenary system (OCS) sagging wires; general infrastructural impacts to equipment; DPW worker health concern; SacRT traction power is impacted; SacRT CNG compressor malfunction threshold
104°F	SacRT warping of light rail tracks; threshold of 'extreme heat' as defined by the CAAP VA (103.8°F); light rail traction power substations (TPSS) performance degrades as temperatures increase

FIGURE 2-2. DRY BULB TEMPERATURE THRESHOLDS OF CONCERN ANALYZED IN THIS PLAN[4]

[4] Threshold sources: 80°F: CalOSHA; 90°F: National Climate Assessment (NCA); 95°F: CalOSHA & City of Sacramento; 100°F: NCA; 104°F: City of Sacramento Climate Action & Adaptation Plan.

While some of these temperatures are familiar to a typical Sacramento summer, historically these conditions have been largely limited to certain parts of the year. As the climate continues to warm, these temperatures will occur more often, earlier in the year, and will linger for longer periods of time. **Table 2-1** summarizes the projected increase in days over high impact temperature thresholds for the high emissions scenario.

TABLE 2-1. AVERAGE ANNUAL NUMBER OF DAYS OVER HIGH IMPACT TEMPERATURE THRESHOLDS IN SACRAMENTO UNDER THE HIGH EMISSIONS SCENARIO

THRESHOLD	HISTORICAL	2050s	2080s
80°F	148 days	168 days	182 days
90°F	80 days	105 days	121 days
95°F	44 days	69 days	85 days
100°F	17 days	34 days	50 days
104°F	6 days	15 days	27 days

The increase in high-heat days has direct implications for Sacramento's transportation system, maintenance and operations staff, and everyone traveling through Sacramento. More days above 90°F and 95°F mean more frequent periods with softened or cracking pavement, rail components expanding, and vehicle and equipment cooling systems operating under strain. Days above 100°F and 104°F, once relatively rare, are projected to occur three to four times more often by the 2080s, increasing the likelihood of overhead OCS wire sag (which requires speed restrictions), track warping, and service disruptions. Warmer nights will also reduce the ability of systems and infrastructure to cool and recover between heat events, accelerating wear and increasing already strained maintenance needs.

HEAT INDEX

Heat index, a measure combining air temperature and relative humidity, is particularly useful for measuring the public health impacts of extreme heat. Increased humidity significantly diminishes people's capacity to naturally cool themselves and makes things like heat exhaustion and heat stroke far more likely. For example, a 90°F day with 50% relative humidity has a 95°F heat index. At 80% relative humidity, that 90°F day leaps up to a 113°F heat index.

Sacramento's typical dry summers have historically kept heat index values relatively lower than more humid regions, even on very hot days. However, projections show that both temperature and warm-season humidity are increasing in Sacramento. **Table 2-2** shows the impact that heat index temperatures can have on human health at different thresholds.

TABLE 2-2. NATIONAL WEATHER SERVICE HEAT INDEX CLASSIFICATIONS AND IMPACTS ON HUMAN HEALTH

CLASSIFICATION	HEAT INDEX (HI)	EFFECT ON THE BODY
Caution	80°F HI - 90°F HI	Fatigue possible with prolonged exposure and/or physical activity
Extreme Caution	90°F HI - 103°F HI	Heat stroke, heat cramps, or heat exhaustion possible with prolonged exposure and/or physical activity
Danger	103°F HI - 124°F HI	Heat cramps or heat exhaustion likely, and heat stroke possible with prolonged exposure and/or physical activity
Extreme Danger	125°F HI or higher	Heat stroke highly likely

Table 2-3 summarizes Sacramento's historical and future number of days within each of these categories, as well as the total days over an 80°F heat index per year. Note that, while the number of days in the lower categories are projected to decrease in future years, the number of days in the higher danger categories increases significantly, as does the total. This means that future summers will not only be hotter, but will also "feel" hotter, with more days reaching levels where heat stress becomes dangerous.

As a result, heat index temperatures that were once uncommon in Sacramento (particularly in the "Extreme Caution" and "Danger" ranges, dark yellow and orange respectively) are expected to occur far more frequently, increasing risks for community members, workers, and travelers across the city. For example, there have historically only been a handful of days over a 103°F heat index per year. By the 2080s, more than a *month* in total is expected to rise above that threshold instead. And, while temperatures alone do not often reach levels like 125°F, that heat index temperature can be reached with high enough humidity levels at just 90°F. An 'average' year is not expected to contain days above 125°F heat index level regularly; however, it is certainly a possibility for hotter-than-average years, and Sacramento has reached 125°F heat index in the past.

TABLE 2-3. AVERAGE ANNUAL NUMBER OF DAYS IN SACRAMENTO WITHIN EACH HEAT INDEX CLASSIFICATION UNDER THE HIGH EMISSIONS SCENARIO

CLASSIFICATION	HISTORICAL	2050s	2080s
Caution (80°F HI - 90°F HI)	81 days	73 days	65 days
Extreme Caution (90°F HI - 103°F HI)	54 days	66 days	69 days
Danger (103°F HI - 125°F HI)	4 days	16 days	35 days
Extreme Danger (125° F HI or higher)	0 days	0 days	0 days
Total (Days Above 80°F HI)	139 days	155 days	169 days

In Sacramento, the combined factors of increasing temperatures and relative humidity will dramatically increase the heat index and heat stress on outdoor workers and travelers. This will create more days when travelling outdoors becomes more physically taxing and, for some people, unsafe. Higher heat index temperatures increase the likelihood of heat exhaustion for people walking or biking, especially on long or unshaded routes. Transit riders may face longer wait times in direct sunlight at stops without shade or cooling, and vehicles without adequate cooling can become dangerously hot within minutes.

For outdoor workers, rising heat index values will trigger more frequent work-rest cycles and mandated breaks. CalOSHA currently only requires heat illness prevention measures when temperatures reach the dry bulb temperature thresholds discussed in **Figure 2-2** – which do not consider humidity – but a proposed update in California would shift the 80°F temperature threshold to be an 80°F *heat index* temperature threshold. Under future climate conditions, Sacramento is projected to exceed this threshold over 150 days per year – or at least five months of the year – which means managing heat-related precautions will need to become a routine part of daily operations and travel.

URBAN HEAT ISLAND

Urban areas often experience higher ambient temperatures than surrounding regions due to the concentration of buildings, pavement, and limited vegetation - an effect known as the urban heat island (UHI) effect. **Figure 2-3** shows the distribution of this effect throughout the city, with cooler areas generally located where there is more vegetation and water, while hotter areas generally overlap with larger expanses of pavement (e.g., major transportation corridors, large parking lots, industrial areas) as well as densely built urban clusters.

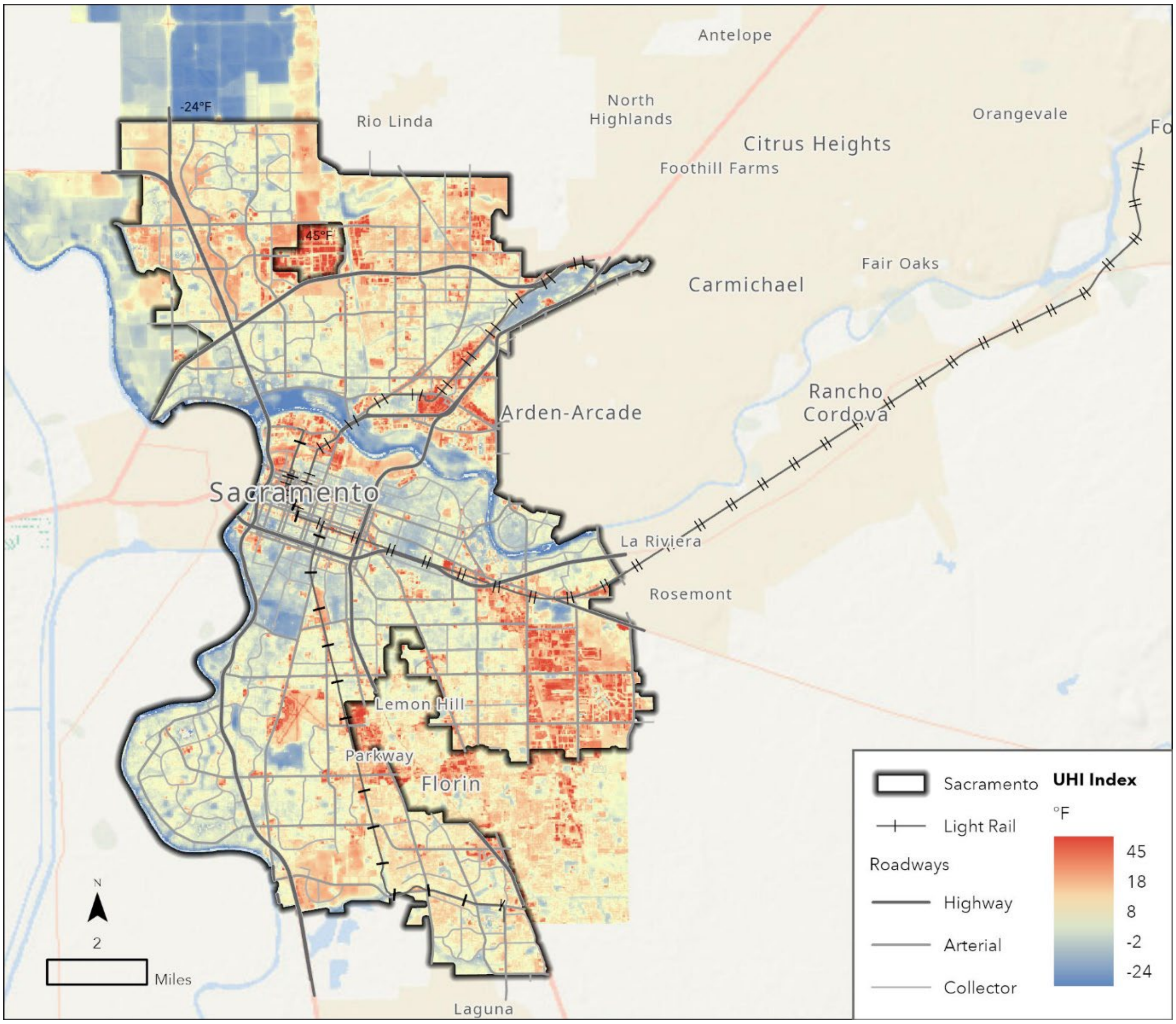


FIGURE 2-3. UHI INDEX (°F) FOR CURRENT CONDITIONS FROM SACRAMENTO 2020 NASA UHI STUDY

2.1.2 HEAVY PRECIPITATION

Rainstorms can cause damage to infrastructure, significant delays in service, and even loss of life. According to the climate scenarios analyzed for this Plan, rainstorm events are projected to grow more severe as the climate warms, since a warmer atmosphere allows rainclouds to hold more water at once.

Table 2-4 shows how different storm events are projected to increase over time in Sacramento. The return period is an estimate of how frequent or rare an event is. For example, a 2-year storm has a 50% chance of occurring each year (rather than being a storm that occurs once every 2 years as the name might suggest).

TABLE 2-4. AVERAGE PRECIPITATION DEPTH FOR VARIOUS RETURN PERIODS IN SACRAMENTO OF A 24-HOUR STORM UNDER THE HIGH EMISSIONS SCENARIO

RETURN PERIOD	HISTORICAL	2050s	2080s
2-Year (50% annual chance)	2.1 in	2.1 in	2.3 in
5-Year (20% annual chance)	2.7 in	2.7 in	3.0 in
10-Year (10% annual chance)	3.1 in	3.3 in	3.6 in
25-Year (4% annual chance)	3.8 in	4.0 in	4.4 in
50-Year (2% annual chance)	4.3 in	4.6 in	5.2 in
100-Year (1% annual chance)	4.8 in	5.3 in	6.0 in

As extreme precipitation events intensify, Sacramento's drainage systems will face increasing stress. The city's flat topography slows the natural movement of stormwater, making the city heavily dependent on the network of pipes, culverts, and pump stations to move water into local waterways or wastewater treatment facilities.

It is difficult to tie specific inches of precipitation dropped by a storm to exact flooding impacts, given how highly localized flooding impacts tend to be as a result of Sacramento's many smaller drainage basins. However, more frequent, larger downpours will push these systems closer to capacity, increasing the likelihood of localized flooding, backups, service disruptions, and road closures. High-intensity storms can also overwhelm pump stations, reduce roadway visibility, and create hazardous conditions for travelers.

2.1.3 RIVERINE FLOODING AND LEVEE FAILURE

The City of Sacramento sits at the confluence of the American and Sacramento rivers. While these rivers have been integral to the livability of this region, they contribute to significant flood risks. Historically, flooding has been the most frequent natural hazard occurring in the Sacramento region, and an extensive system of dams, levees, weirs, and other infrastructure has been established to mitigate these risks. Even so, flooding remains a major concern, and these risks are expected to increase as the climate changes. Additional development in flood-prone areas could exacerbate this further.

Major flooding resulting from a levee failure or similar event would lead to widespread damage and likely loss of life and injury. Much of the city's transportation system would become impassable, disrupting regular travel patterns and potentially hindering evacuation and emergency response efforts. The California Department of Water Resources Central Valley Flood Protection Plan Update (2022) analyzed current and future flood risks due to major events such as levee failure in the Central Valley, including in the Sacramento area.[5] Changes in temperature and precipitation across the large watersheds of the American and Sacramento rivers are projected to increase the magnitude of flows and water levels during extreme events. In turn, these increase the likelihood of levee failure and therefore property damage and loss of life.

[5] https://water.ca.gov/Programs/Flood-Management/Flood-Planning-and-Studies/Central-Valley-Flood-Protection-Plan

Figure 2-4 shows how the expected annual loss of life changes over a 50-year period. While levee failure has a low chance of occurring in any given year, consequences of failure would be catastrophic. The expected annual loss of life combines data on expected frequency of levee failure and consequences. It represents the fact that, in most years, there is no levee failure and thus no loss of life; but in the rare year that it does occur, there may be loss of life. The increase in expected loss of life is due to both higher flows driven by a changing climate and increased population with more intensive land use.

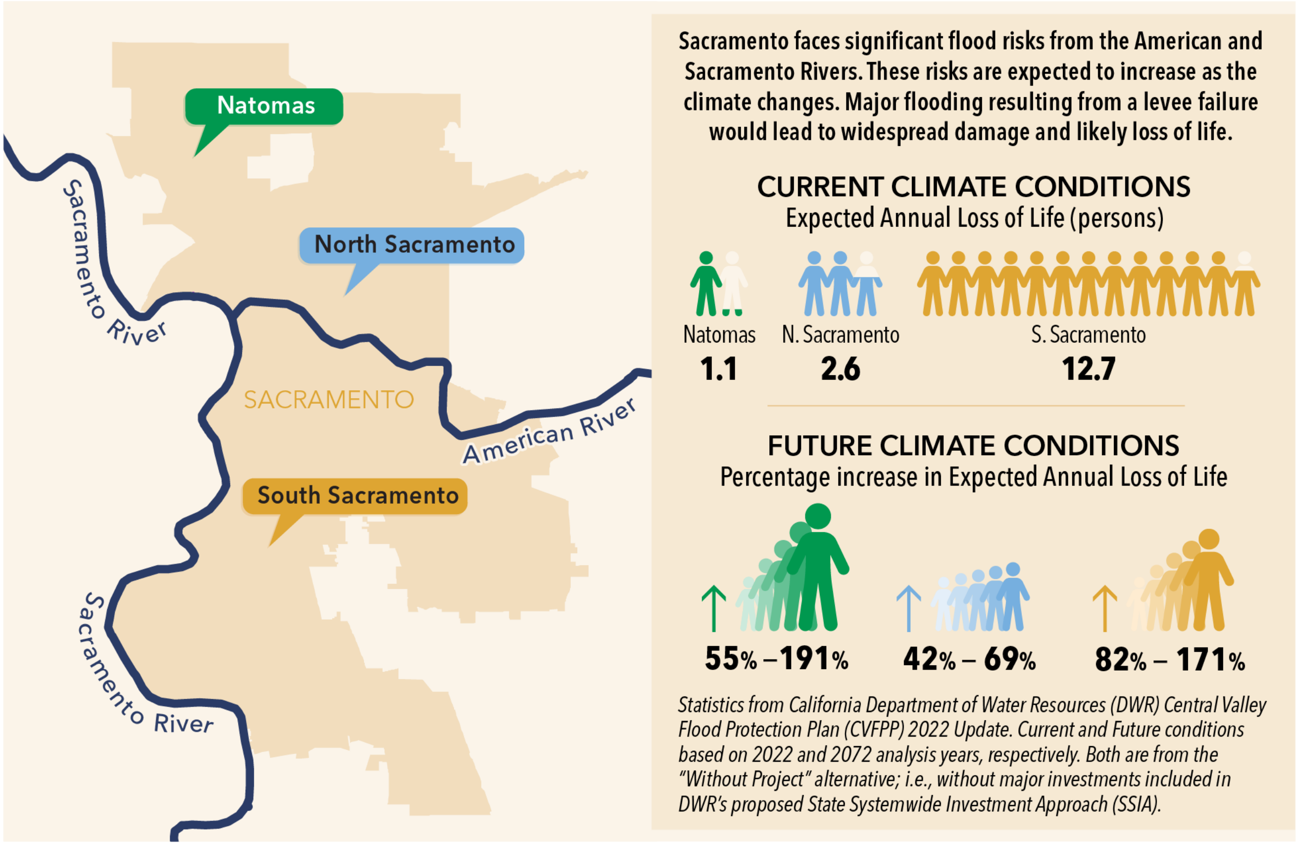


FIGURE 2-4. ANNUAL LOSS OF LIFE IN THE CITY OF SACRAMENTO FROM LEVEE FAILURE FOR 2022 AND 2072 AS OUTLINED IN THE CENTRAL VALLEY FLOOD PROTECTION PLAN

Floodplain mapping helps identify flood risks from both larger rivers and smaller streams by showing which areas would be inundated under different events. The Federal Emergency Management Agency (FEMA) creates maps for 100- and 500-year floodplains. **Figure 2-5** shows that most of the city lies within a FEMA-designated floodplain, although many of these areas are protected by levees that reduce the likelihood of flooding.[6] As the climate changes and peak flows increase, the current 100-year and 500-year events are expected to become more frequent and the area inundated by the future 100-year and 500-year floodplains is expected to expand, leading to stricter development consolidation, magnified potential for damage and loss of life, and possible insurance increases.

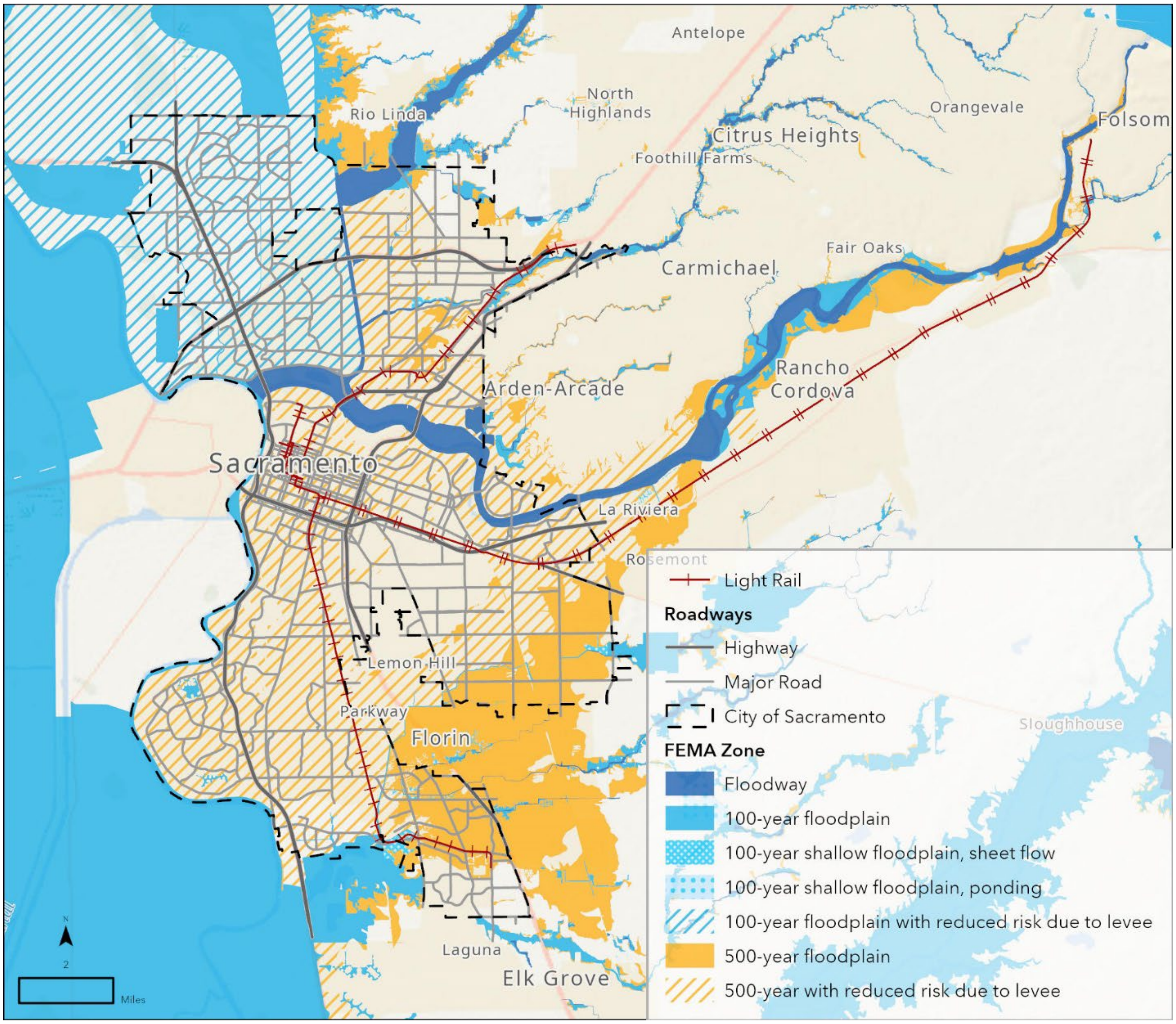


FIGURE 2-5. FEMA FLOODPLAINS

[6] The maps also refer to areas affected by shallow flooding due to sheet flow (unconfined water typically flowing over gently sloping land) and ponding (relatively flat areas where runoff gathers in depressions).

2.1.4 WILDFIRE IMPACTS AND AIR QUALITY

Figure 2-6 shows CalFire Fire Hazard Severity Zones for the Sacramento region. The City of Sacramento falls outside of high or very high fire hazard zones, with only small areas near the city's southern and eastern edges classified as moderate or high risk. This indicates that direct risk of wildfire impacts on Sacramento's transportation infrastructure are relatively low.

However, smoke from regional wildfires remains a significant concern for public health and transit operations. Larger fires in other areas of California routinely send smoke into the Sacramento Valley and, due to the Valley's topography, this smoke can linger for prolonged periods. Smoke events can reduce visibility and degrade air quality, posing significant health risks for travelers and operators. Increasingly hot conditions, particularly when combined with prolonged periods without rainfall, increase the likelihood of occurrence and may contribute to more severe wildfires occurring across the region. Exposure to wildfire smoke is increasing under climate change and this smoke is ultimately worsening our regional air quality.

In Sacramento County, most air pollution during the summer originates from mobile sources like cars, trucks, buses, and agricultural and construction equipment that pollute the air. The Sacramento Valley traps pollutants during windless, extreme heat days when ground-level ozone is more likely to form. In the winter, most air pollution comes from wood burning in residential fireplaces and wood stoves.

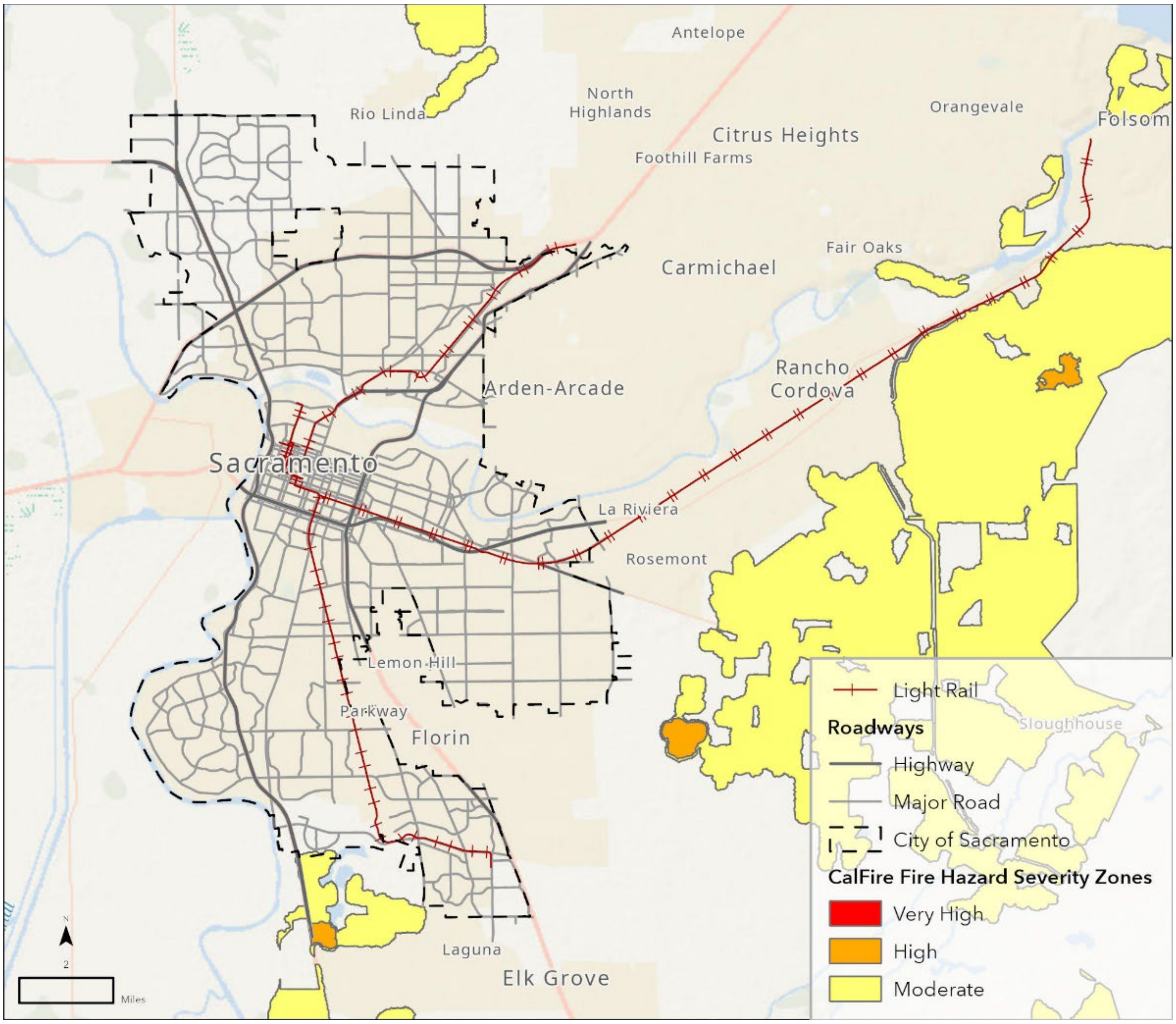


FIGURE 2-6. CALFIRE WILDFIRE RISK

2.1.5 WIND

Projections for changes in future high winds are available from some sources; however, unlike temperature or precipitation, wind is highly variable, occurs on incredibly fine spatial and time scales, and is very difficult to model. As a result, wind projections were not utilized in the development of this Plan. However, we know that windstorms can cause significant damage and disruption to the transportation system, including downed trees that block roadways, power outages, service disruptions, and damage to traffic signals, street lights, crossing gate arms, light-rail overhead canary system and other assets.

Extreme storms can also include extreme rainfall that saturates soil, thereby reducing root stability and making trees more prone to uprooting (**Figure 2-7**). Prolonged periods without rain can also weaken trees and make them more prone to snapping in high winds. When strong winds either accompany or follow extended periods of extreme heat and drought or heavy rain, tree failure becomes more likely, increasing risks to roads and travel.

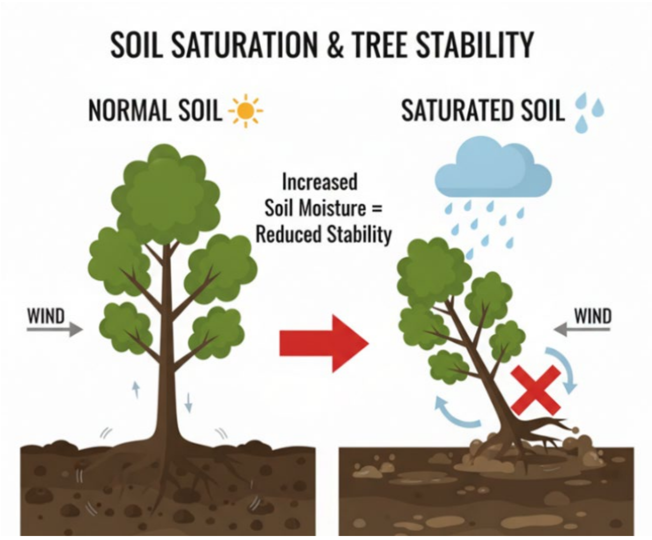


FIGURE 2-7. EFFECT OF SOIL SATURATION AND WIND ON TREE STABILITY

2.1.6 POWER OUTAGES

Given that extreme heat and windstorms often lead to power outages, this Plan incorporates information provided by the Sacramento Municipal Utility District (SMUD) on system reliability and operational continuity.

FORECASTING & RESPONSE TO WEATHER EVENTS

SMUD's engineering and operations team spend significant time forecasting and planning for weather events and their impact on the system. SMUD's System Average Interruption Duration Index (SAIDI) and System Average Interruption Frequency Index (SAIFI), which are electric distribution utility benchmarks for reliability, are historically low relative to industry averages. Between 2023 and 2024, California and the Sacramento region experienced some of the most intense winter and summer weather events of the past several decades. During both years, SMUD's system performed without major incident. In 2023 and 2024, SMUD's SAIFI and SAIDI were 1 and 75.6, and 0.75 and 44.4, respectively. SMUD's system reliability targets, as defined by their Strategic Direction (SD) Policy Number 4 is 0.85 – 1.14 for SAIFI and 49.7 – 68.7 minutes for SAIDI, excluding major events.

In addition to general reliability, SMUD has emergency response operations to quickly respond to and restore power loss. Following the 2023 storms, SMUD developed additional emergency response best practices to more rapidly restore power. One such operational improvement includes convening city, county, and state officials to identify customer impacts and coordinate restoration efforts in real-time.

As it relates to SacAdapt and planning for extreme weather events, SMUD will continue to update its forecasting methods to account for new and more intense weather and will ensure the system is hardened to maintain operations during those hours. Weather events that do impact the system and cause power outages are likely anomalous and would not be captured in any forecast scenario.

ELECTRIC TOPOLOGY & REDUNDANCY

Redundancy is built into SMUD's system. The electric topology ensures that, if a circuit or substation serving a SacRT light rail station goes down, then another circuit or substation will be able to pick up the load and maintain electrical service to the light rail station. SMUD's distribution system operators perform switching operations between circuits to maintain service and system reliability. Importantly, SacRT's light rail stations are not exposed to a single point of failure in SMUD's system because the system is built and operated to maintain service in n-1 situations.

ROTATING BROWNOUTS DURING PEAK EVENTS

If SMUD is forced to perform rotating brownouts to protect the electrical equipment from damage, or if demand outstrips supply causing a system imbalance, procedures are in place to ensure that electric service is maintained for critical loads and emergency services.

2.2 TRANSPORTATION SYSTEM VULNERABILITIES

The vulnerability assessment conducted as part of this planning effort examines how climate hazards intersect with the transportation system, identifying impacted asset locations, exposure, and ability to adapt or recover from extreme conditions. The process combined input from agencies and community members with climate and asset data to generate a clear picture of the system's strengths and weaknesses.

The initial hazard exposure analysis was conducted alongside agency interviews of operations, maintenance, engineering, and emergency response staff to understand how past events have affected assets such as bridges, traffic signals, and general operations.

TAC members provided additional insight into which hazards they consider most concerning and which assets are most disruptive when they experience issues. TAC members were polled on level of concern for each hazard. The most concerning hazard was extreme heat by a significant margin, and nearly half of the TAC members were 'very concerned' about all four hazards discussed: flooding, extreme heat, wind, and fire.

The Phase 1 public survey asked respondents about the types of extreme weather events that have disrupted or delayed their travel in the past five years. **Figure 2-8** summarizes these results, with respondents most frequently citing flooding/heavy rain and extreme heat. Respondents were allowed to select multiple extreme weather events; the Phase 1 survey received over 400 responses.

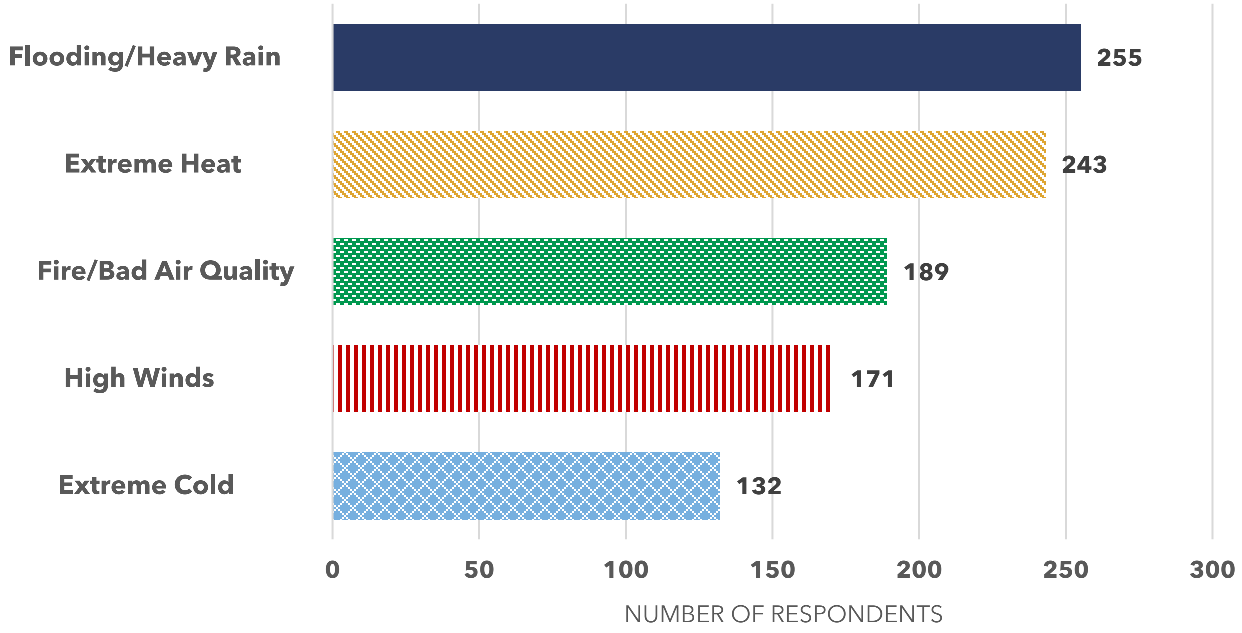


FIGURE 2-8. EXTREME WEATHER EVENTS REPORTED BY SURVEY RESPONDENTS TO HAVE IMPACTED TRAVEL IN THE PAST FIVE YEARS

In addition, the Phase 1 community survey asked about how different extreme weather events changed individual travel decisions. These results are shown in **Figure 2-9**. Community members most frequently reported increased travel times or transportation costs, along with disrupted access to schools and essential services such as groceries or healthcare. Many respondents noted they chose to stay home or were unable to travel during an emergency. Inability to evacuate was also one of the options on this survey question but received no responses. Respondents were able to select multiple impacts on travel decisions; the overwhelming choice of respondents during extreme weather was to stay home.

Notably, respondents who were not able to stay at home reported disrupted access to essential services, education, increased travel time and costs, and lost wages. These responses highlight the potential for inequitable impacts of extreme weather disruptions to Sacramento's transportation system, especially for community members who are not able to stay at home.

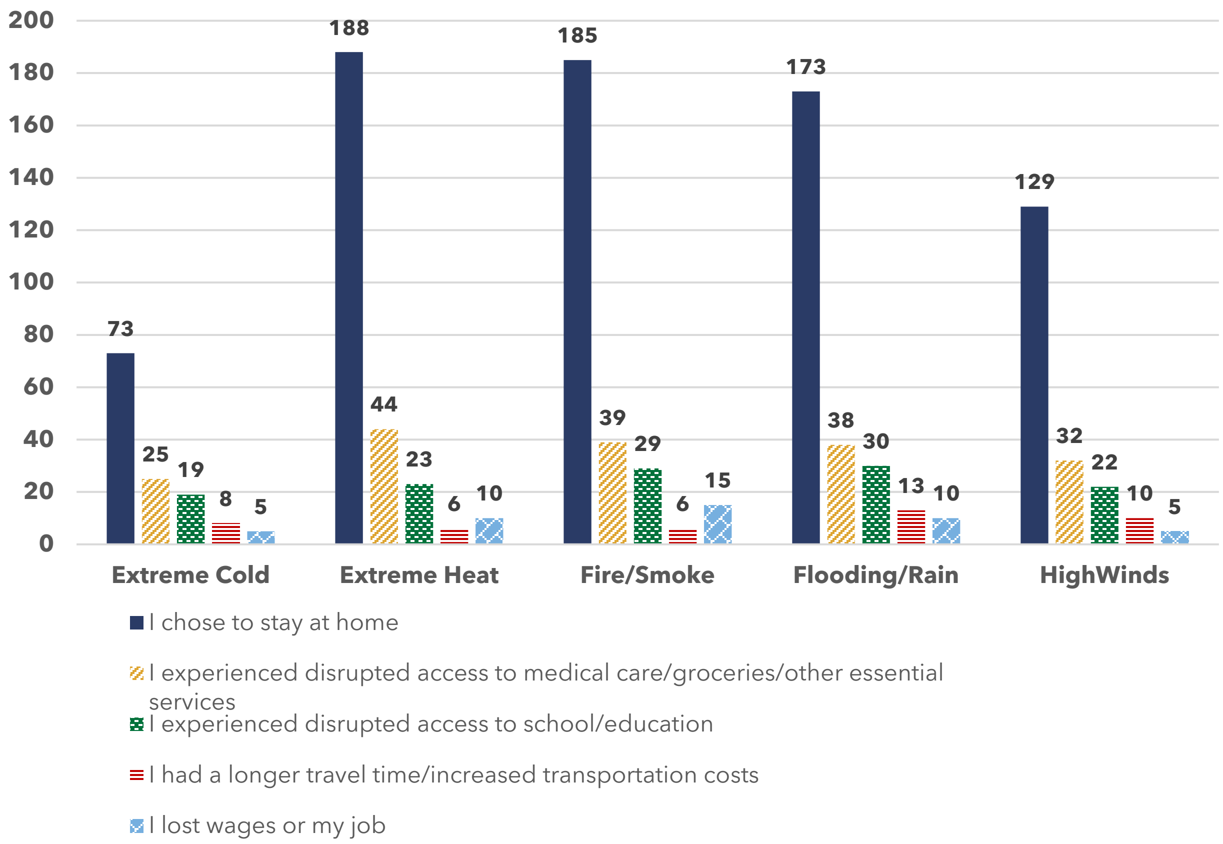


FIGURE 2-9. TYPES OF IMPACTS EXPERIENCED BY SURVEY RESPONDENTS DURING WEATHER EVENTS

Given these results, the Project Team used both quantitative and qualitative measures to identify how concerning each hazard may be for each type of transportation asset based on extensive interviews with city staff and relevant experts. **Table 2-5** provides a qualitative summary of the levels of concern based on agency and community feedback, organized by hazard.

The "Agency Feasibility to Adapt" column is a qualitative summary of the feasibility of the City or SacRT to directly address the damage type and mitigate risk, based on jurisdictional control and practicability of mitigation measures.

Transportation damage types with a low or moderate Agency Feasibility to Adapt reflect more limited feasibility for the City or SacRT to fully mitigate the impacts, even if unlimited funding was available. For example, neither the City nor SacRT directly manage the power grid; smoke impacts are typically from fires outside of the city; it is not feasible to prevent all instances of localized flooding in Sacramento; and it is not feasible to prevent all instances of extreme heat impacting outdoor traveler comfort and health.

Importantly, the "Agency Feasibility to Adapt" does not reflect the current availability of funding to implement adaptation strategies. The City has over $1 billion in unfunded deferred maintenance for streets, bicycle facilities, traffic operations, and stormwater drainage assets. Funding will be a key constraint and consideration for strategy implementation. Refer to **Technical Appendix B: Vulnerability Assessment** for more information.

TABLE 2-5. SUMMARY OF TRANSPORTATION DAMAGE TYPES, LEVEL OF CONCERN, AND FEASIBILITY TO ADAPT

DAMAGE TYPE	LEVEL OF CONCERN	AGENCY FEASIBILITY TO ADAPT
Extreme Heat		
Outdoor Traveler Comfort and Health (City, SacRT)	High	Low-Moderate
Outdoor Worker Health (City, SacRT)	High	High
Pavement (City)	Moderate	High
Light Rail Tracks (SacRT)	Low	High
Power Distribution System (SacRT)	High	High
Overhead Catenary System (OCS) (SacRT)	High	High
Compressed Natural Gas (CNG) Plant (SacRT)	Moderate	High
HVAC Systems (SacRT)	Moderate	Moderate
Signage (City, SacRT)	Moderate-High	Moderate
Extreme Wind		
Crossing Gate Arms and other SacRT Infrastructure	Low	High
Traffic Signals, Streetlights, and Other City Infrastructure	Moderate	Moderate-High
Flooding and Heavy Precipitation		
Levee Failure (City)	High	Moderate
Roadways, Railways, and Shared Use Paths (City)	Moderate	Low-Moderate
Underground/At-Grade Telecommunications and Electrical Infrastructure (City, SacRT)	Low	Moderate

DAMAGE TYPE	LEVEL OF CONCERN	AGENCY FEASIBILITY TO ADAPT
Transit Facility Damage (SacRT)	**Moderate-High**	**Moderate**
Bridge Damage (City)	**Moderate**	**High**
Wildfire		
Smoke Impacts to Travelers (City, SacRT)	**High**	**Low**
Multiple Hazards		
Power Grid Failure (City, SacRT)	**High**	**Low**

2.3 RISK ASSESSMENT

A risk assessment conducted as part of this Plan, provided in **Technical Appendix C: Risk Assessment**, identifies specific assets within the transportation system that should be considered for adaptation strategy implementation. The Risk Assessment evaluates all assets of a given type to calculate the level of consequence if the asset fails, as well as the level of risk from a given climate-related hazard (i.e., flooding, extreme heat).

The Risk Assessment was shaped by the following considerations:

- The analysis focused on asset-hazard combinations that present an opportunity for the City or SacRT to directly manage the risks.
    - For example, power grid failure was not analyzed because neither the City nor SacRT have direct control over the power grid. Agency-level adaptation strategies for back-up power systems are discussed in **Section 3: Adaptation Strategies**.
    - Similarly, smoke impacts were not analyzed since recent smoke events are primarily the result of regional wildfires that neither the City nor SacRT have direct control over. General adaptation strategies to smoke impacts on travelers are discussed in **Section 3: Adaptation Strategies**.
- The analysis does not attempt to differentiate between assets when risk is very similar.
    - For example, specific locations of pavement/roadways, light rail tracks, overhead catenary systems, and signage were not analyzed with respect to heat since the heat impacts are substantially similar to these assets across the City.
- The analysis avoids duplicating recently completed or ongoing efforts.
    - For example, bikeways and sidewalks were not mapped with heat risk, as the Streets for People Active Transportation Plan recently developed a Tree Opportunity Analysis. The findings in that memo will be used to inform the highest opportunity for expansion of the City's urban tree canopy over the active transportation network, in addition to Urban Forest Plan strategies that guide new policies and priority areas for tree investment.
    - Similarly, floodgates and bridges were not mapped with flood risk as there are either ongoing (e.g., regular bridge inspections by Caltrans) or recent projects (e.g., a floodgate assessment) that specifically evaluated these assets and provide guidance on implementation priority.
- The analysis does not include a system-wide evaluation of how assets are impacted by localized flooding since the City does not have citywide drainage modeling to identify these impacts.
    - For example, citywide pedestrian facilities like curb ramps and crosswalks were not mapped with respect to flooding since drainage modeling is not available

citywide and floodplain maps do not provide the level of detail appropriate for pedestrian-scale facility analysis.

  - Community feedback consistently emphasized the impacts that even small amounts of localized flooding can have on people walking, biking, and taking transit. General adaptation strategies to mitigate localized flooding impacts on such people are discussed in **Section 3: Adaptation Strategies**.

The systems-scale risk assessment was not completed for asset-hazard combinations where potential projects have already been identified or for asset-hazard combinations where general strategies (e.g., using more resilient materials or design specifications) can be developed without going through asset-by-asset prioritization.

The asset-hazard combinations that were analyzed in the Risk Assessment include:

- Major roadways with respect to floodplains
- Bikeways with respect to floodplains
- Bus stops with respect to the urban heat island (UHI) effect
- Light rail stations with respect to UHI

For each asset, a level of "consequence" was calculated to determine the impact if the asset were to fail (e.g., be flooded and impassable). These consequences accounted for factors such as how many people use an asset, its redundancy in the system, whether it provides access to critical facilities, and whether it serves disadvantaged communities.

Figure 2-10 shows one example of those factors: redundancy of bikeway segments. Bikeway redundancy was evaluated to understand the resilience of the active transportation network in the event of localized disruptions (e.g., flooding or construction). Redundancy measures how easily a bicyclist can reroute if a segment becomes inaccessible. This metric is particularly important because bikeways are currently being constructed at a larger scale, compared to other transportation assets, and have a greater opportunity for future projects to improve redundancy and resiliency.

Each segment is color-coded based on the length of the detour required and the stress level of the alternative route:

- Detour length was categorized as:
  - Short detour: Less than 0.5 miles
  - Long detour: Greater than 0.5 miles and up to 1.5 miles
  - Very long detour: Greater than 1.5 miles
- Stress level was based on the Neighborhood Connections dataset:
  - Low stress network: Detour uses only segments with a Level of Traffic Stress (LTS) score of 1 or 2

- High stress network: Detour includes segments with an LTS score of 3 or 4

This analysis highlights areas where bikeway redundancy is limited, particularly where detours are long or require travel on high-stress routes. These locations may warrant priority consideration for future bikeway investments to improve network resilience and accessibility.

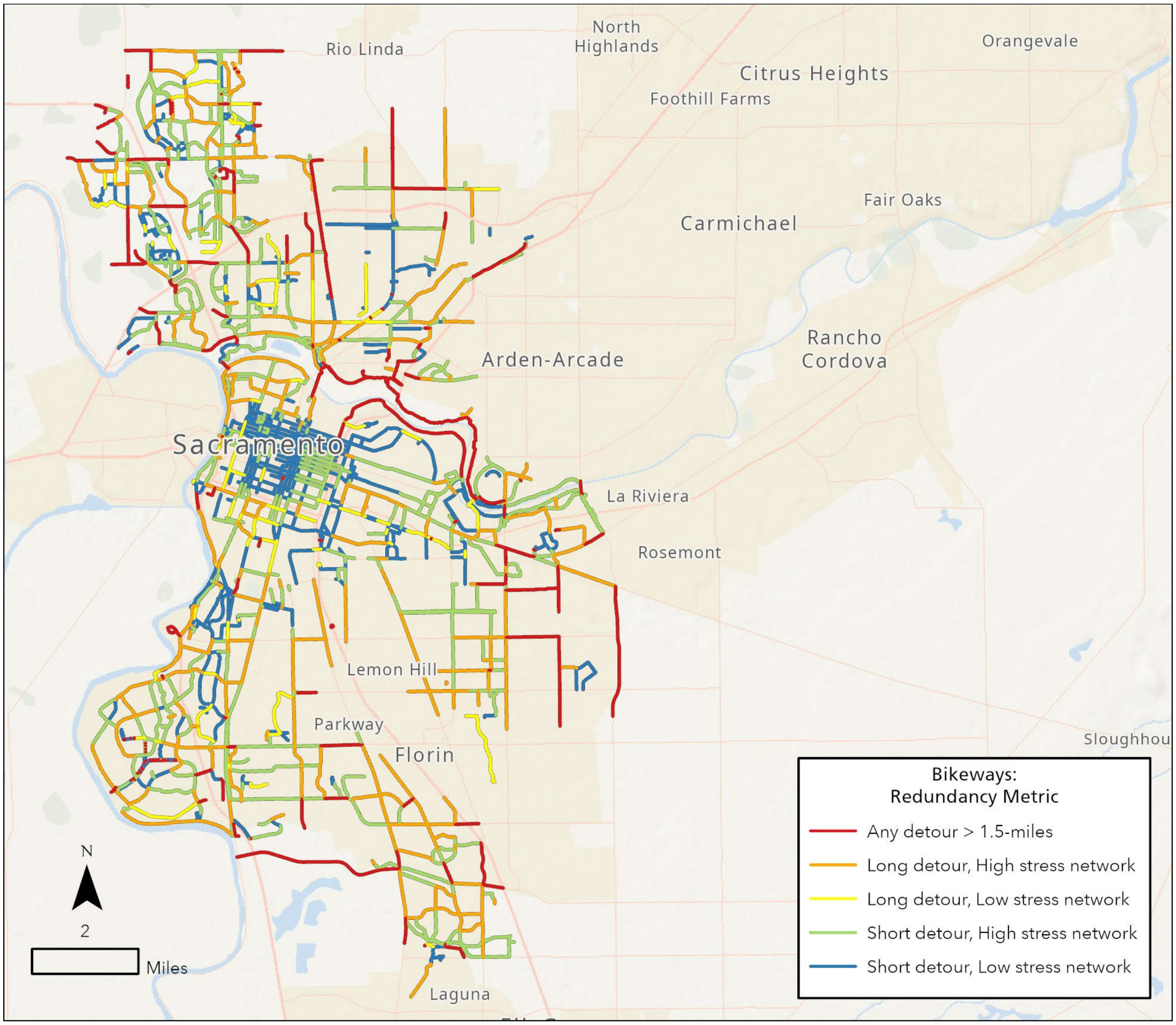


FIGURE 2-10. BIKEWAY REDUNDANCY METRIC

Downtown Sacramento generally has strong redundancy with short, low-stress detours, while peripheral neighborhoods, particularly in the north and southeast, have more segments with long or high-stress detours. Examples of segments with low redundancy include long portions of the bikeways on both sides of the American River; the Consumnes River Blvd. bicycle facility, the bicycle path on the levee east of Steelhead Creek.

The next several maps show consequence scores for four different types of assets: major roadways, bikeways, bus stops, and light rail stations. The maps include asset scoring from 0 to

10. Higher consequence scores indicate the possibility for greater impacts to city residents and services in the case of asset failure. Assets with higher consequence scores may be considered a higher priority for maintenance or upgrades.

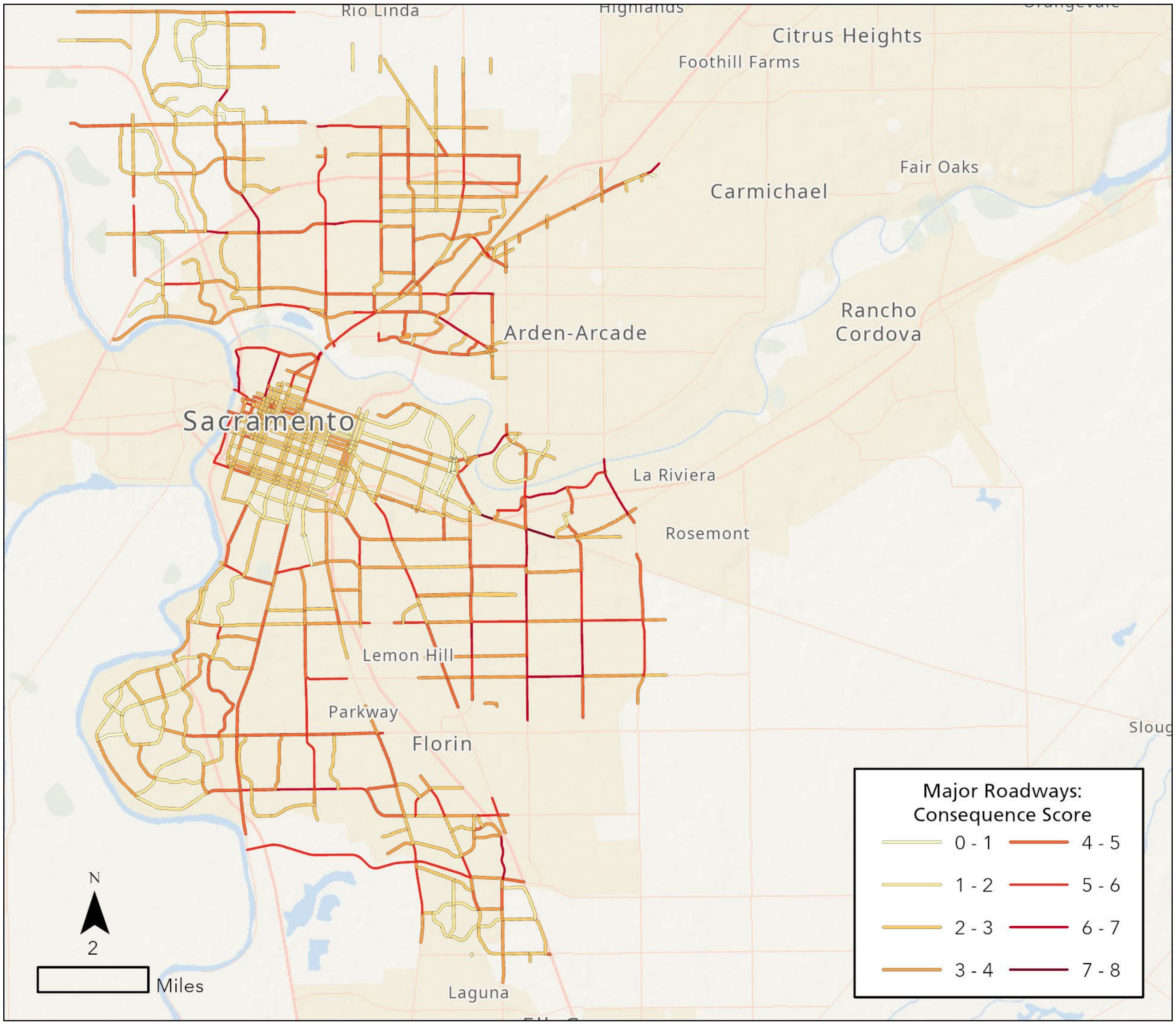


FIGURE 2-11. MAJOR ROADWAY CONSEQUENCE SCORES

Major roads in Sacramento are defined as arterials and collectors. Metrics contributing to consequence scores include average annual daily traffic (AADT), incremental detour time, critical facility access, and a demographics score derived from the CalEnviroScreen percentile.[7] Roads with higher consequence scores have higher usage, longer detours, provide access to critical facilities, and serve more disadvantaged communities. Roads with the highest consequence scores are shown in dark red in **Figure 2-12** and include portions of Folsom Blvd., Watt Ave., Jibboom St., El Camino Ave., Power Inn Rd., Auburn Blvd., and Truxel Rd.

[7] https://oehha.ca.gov/calenviroscreen/report/calenviroscreen-40

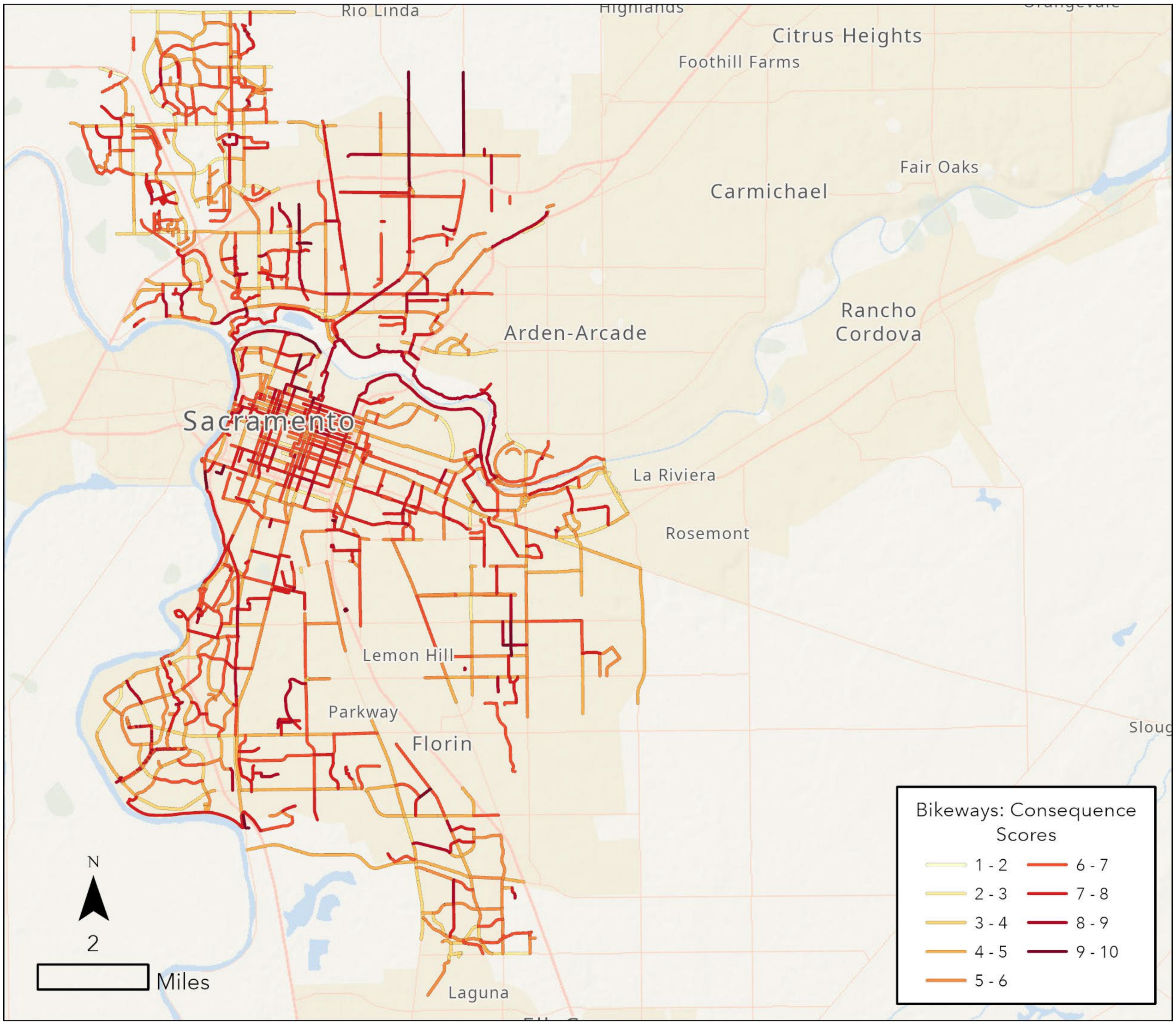


FIGURE 2-12. BIKEWAY CONSEQUENCE SCORES

Bikeway consequence scores are illustrated in **Figure 2-12**, with darker red segments indicating higher consequence scores. Metrics contributing to bikeway consequence scores include bikeway level of traffic stress (as outlined in Sacramento's Neighborhood Connections Plan), redundancy of the network, access to critical facilities, and a CalEnviroScreen percentile. Bikeways with higher consequence scores are those that are rated for lower traffic stress (and would therefore have a greater impact on riders if unavailable), have limited alternative routes, and serve destinations such as hospitals, schools, and emergency services. Bikeways with long segments of high consequence scores include Sacramento Northern Bike Trail, American River Bike Trail, Two Rivers Bike Trail, Raley Blvd., and Garden Highway Bike Trail.

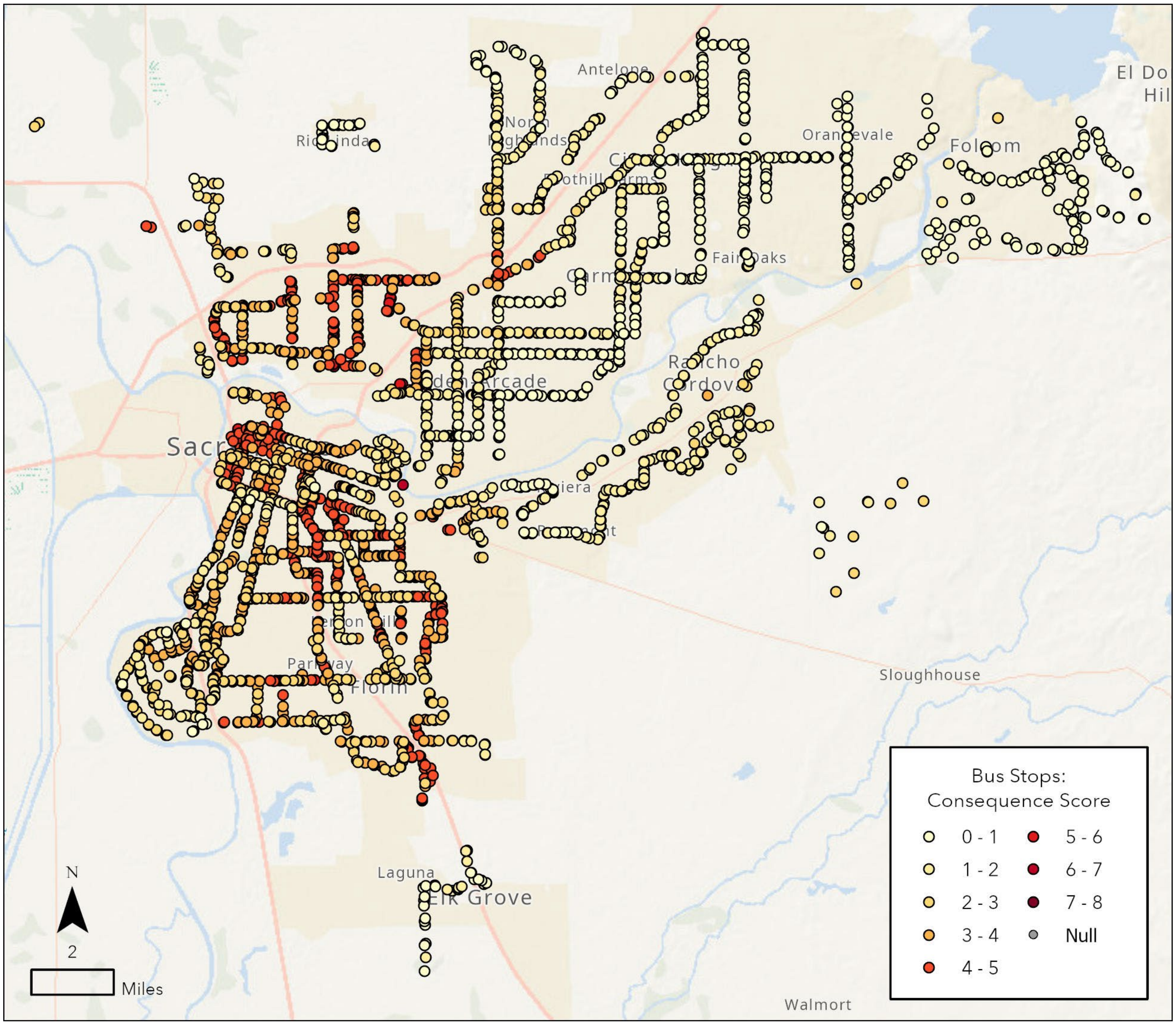


FIGURE 2-13. BUS STOP CONSEQUENCE SCORES

Bus stop consequence scores in **Figure 2-13** are based on ridership, proximity to the nearest alternative stop (excluding paired stops across the street), access to critical facilities, and a CalEnviroScreen percentile. Stops with higher consequence scores tend to serve more riders, have fewer nearby alternatives, provide access to essential destinations, and be located in more disadvantaged communities. The stops with the highest scores include Arden Way & Del Paso Blvd. light rail connection, Arden Fair Mall & Terminal, Carlson Dr. & State University Dr., 7th St. and J St., J St. and 6th St., and Arden Way & Heritage Lane. Detailed information on scoring per stop is available in **Technical Appendix C: Risk Assessment**.

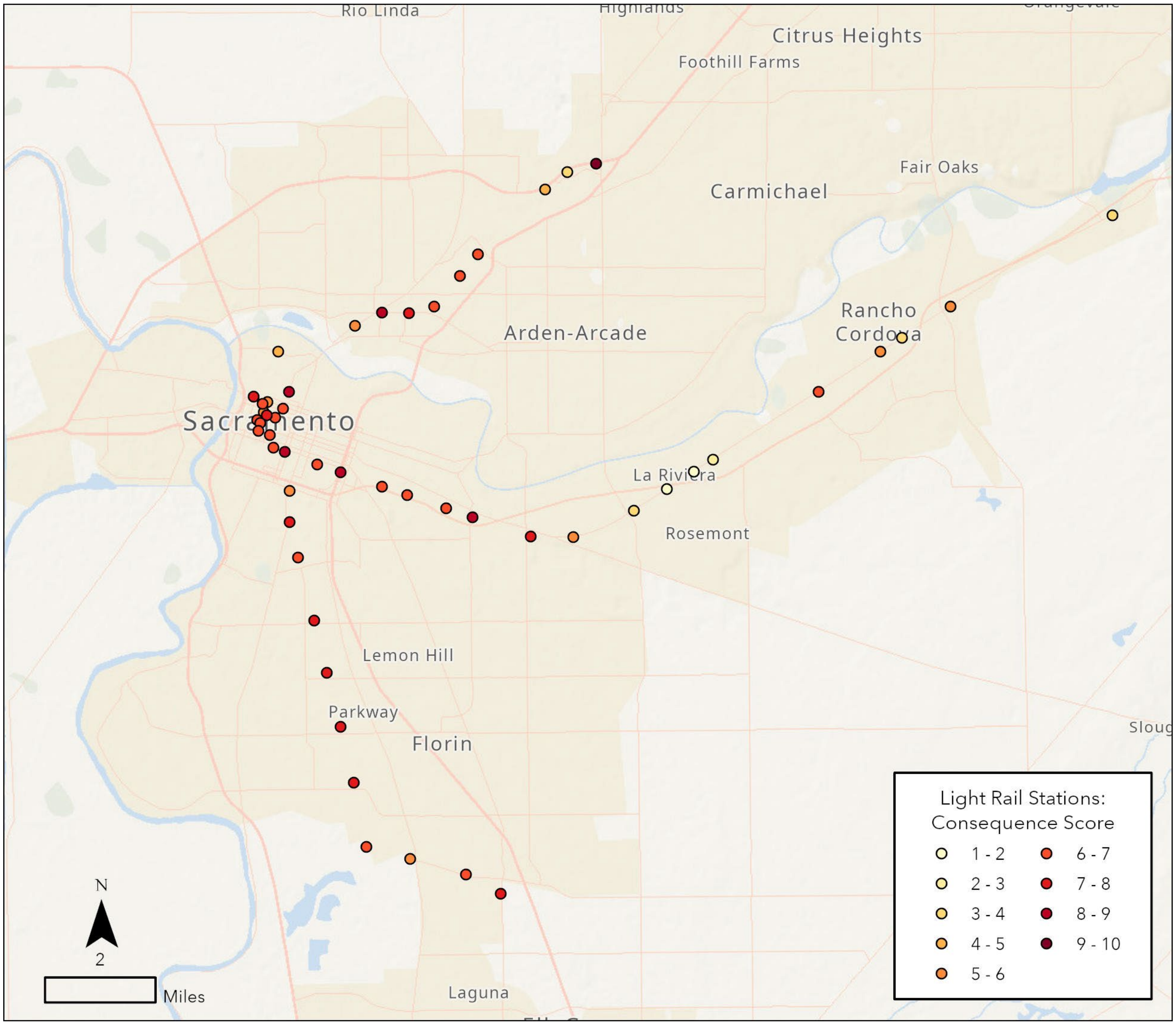


FIGURE 2-14. LIGHT RAIL STATION CONSEQUENCE SCORES

Figure 2-14 shows light rail station consequence scores based on ridership, typical bus bridge time required to bypass the station, access to critical facilities, and CalEnviroScreen percentile. Stations with higher scores tend to serve large numbers of riders, have longer travel times between stations, provide access to critical facilities, and be located in more disadvantaged communities. The highest consequence score stations are Watt/I-80, University/65th St., 29th St., 16th St., Alkali Flat/La Valentina, and Arden/Del Paso. Detailed information on scoring per stop is available in **Technical Appendix C: Risk Assessment**.

These next few maps show a combination of hazard likelihood and consequence data. For major roadways and bikeways, the maps highlight assets with the relatively high exposure to flooding. For roadways, this includes segments that cross the 100-year floodplain and do not have a bridge (i.e., are not elevated over the 100-year floodplain) or contain an underpass. For bikeways, segments that cross the 100-year floodplain are included.

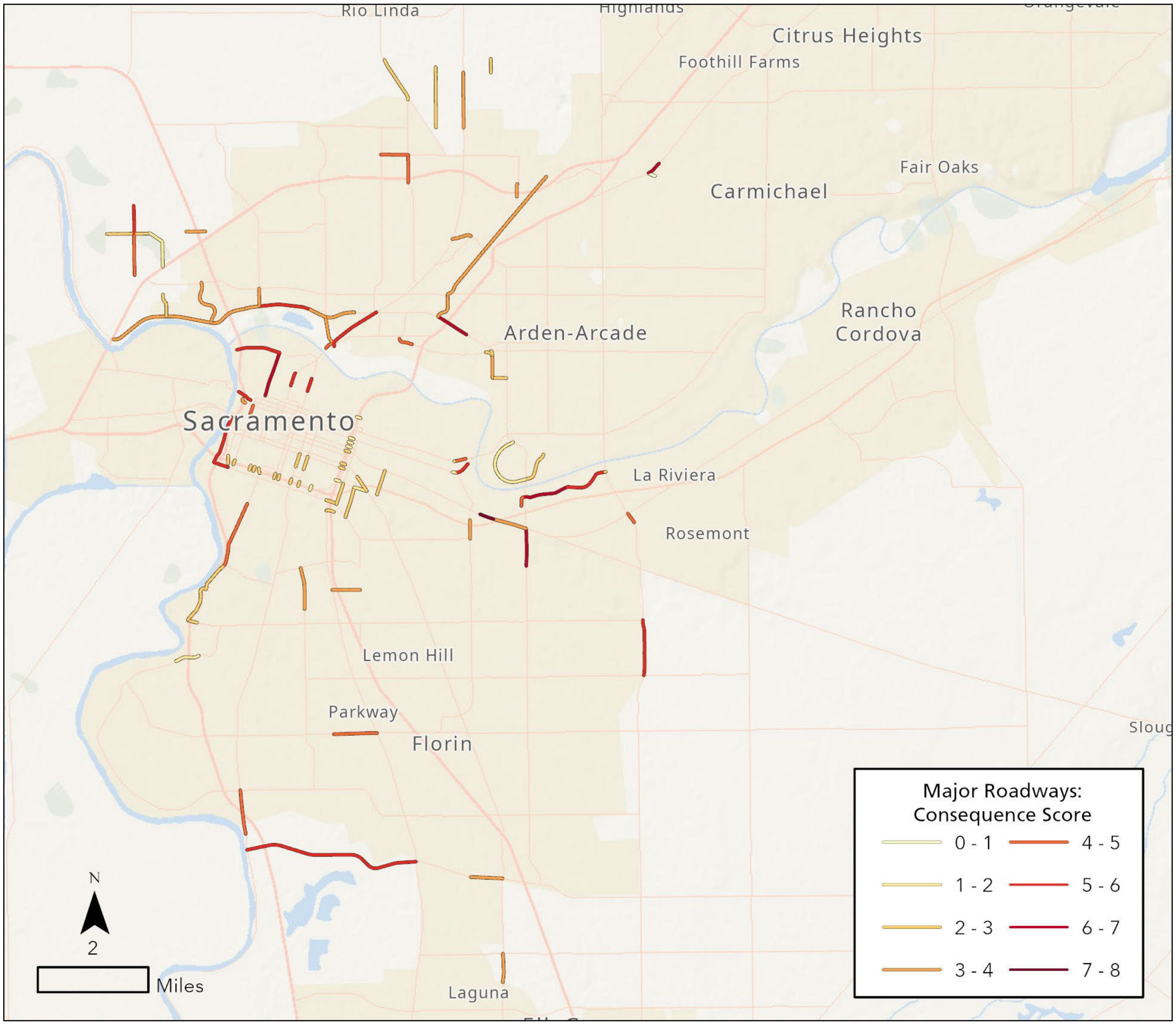


FIGURE 2-15. MAJOR ROADWAY CONSEQUENCE SCORES FOR HIGHER FLOOD LIKELIHOOD ASSETS

Roadways with high consequence and high flood exposure are shown in **Figure 2-15** and include Folsom Blvd., Auburn Blvd., Power Inn Rd., 7th St., and Arden Way. Many of these roads are located along the American River Parkway, where flooding is influenced by the American River, or are underpasses in downtown Sacramento along Capital City Freeway and US-50.

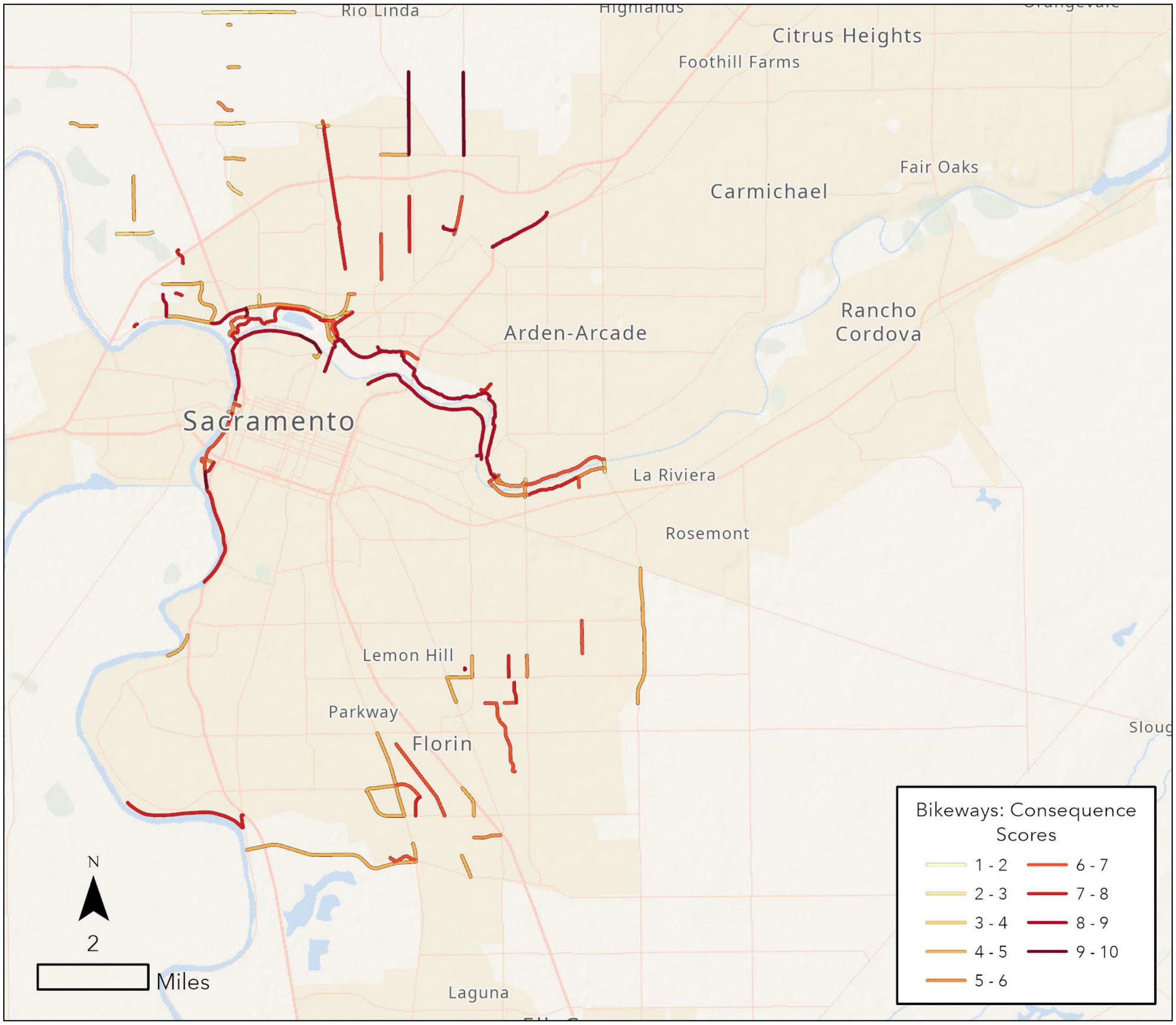


FIGURE 2-16. BIKEWAY CONSEQUENCE SCORES FOR HIGHER FLOOD LIKELIHOOD ASSETS

Similarly, bikeways with a relatively high flood exposure are shown in **Figure 2-16,** and these generally align with areas highlighted for roadways in **Figure 2-15**. High-consequence and high-exposure bikeway segments include routes along the Sacramento River include American River Bike Trail, Two Rivers Bike Trail, Raley Blvd., Sacramento Northern Bike Trail, and Garden Highway Bike Trail.

The next few maps show heat risk scores for bus stops and light rail stations, which combine consequence scores and UHI magnitude. Assets with a combined high consequence score and high hazard likelihood should be considered for priority maintenance and/or upgrade with adaptation strategy measures. UHI data coverage was restricted to the City of Sacramento as part of an Urban Development Study by NASA.[8]

[8] https://ntrs.nasa.gov/citations/20205011494

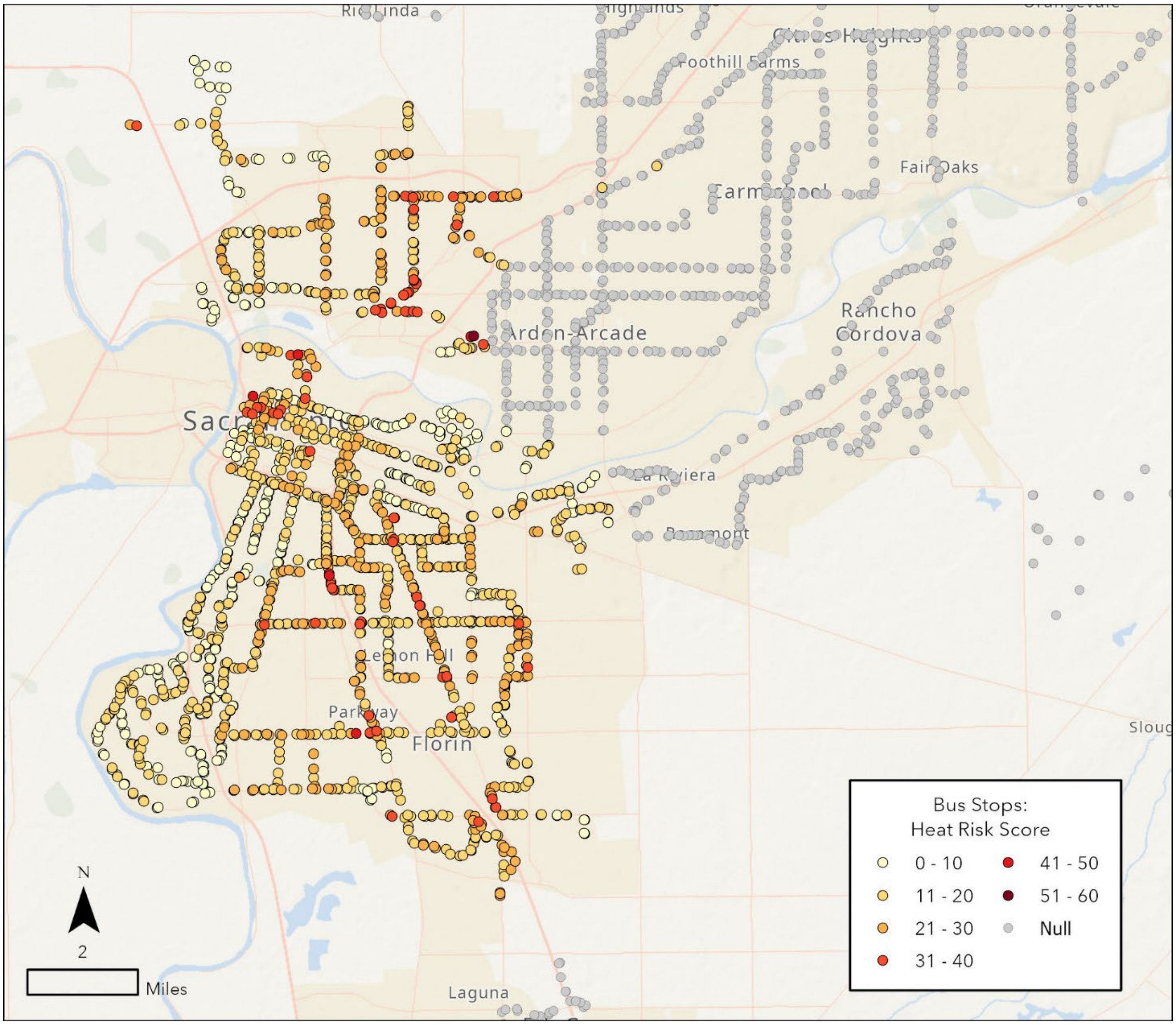


FIGURE 2-17. BUS STOP HEAT RISK SCORES

Figure 2-17 shows heat risk amongst bus stops within the city of Sacramento. Bus stops with the highest heat risk scores include Arden Fair Mall & Terminal, Richards Blvd. & Dos Rios St., Florin Rd. & Luther Dr., Amtrak & Depot, Franklin Blvd. & 16th, and Arden Way & Heritage Lane. Many of the stops with elevated heat risk are concentrated in the downtown area and along major corridors such as Del Paso Blvd., Stockton Blvd., and Franklin Blvd. These high-risk stops can be prioritized for adaptation measures such as shade structures, cooling elements, and improved passenger amenities to reduce heat exposure and enhance user comfort. Detailed information on scoring per stop is available in **Technical Appendix C: Risk Assessment**.

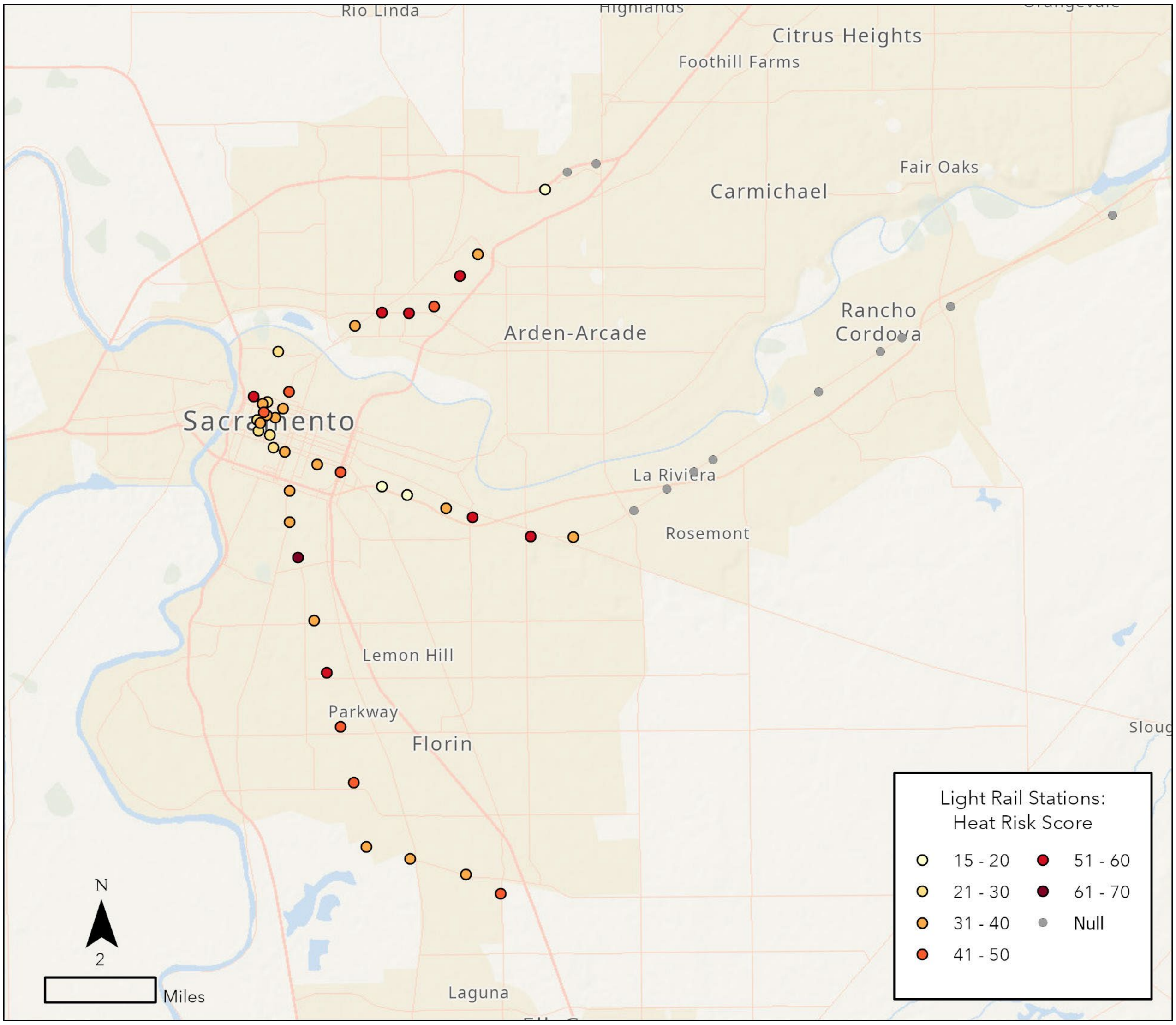


FIGURE 2-18. LIGHT STATION HEAT RISK SCORES

Figure 2-18 is a map of heat risk scores for light rail stations. The stations with the highest heat risk scores include City College, Watt/I-80, University/65th St., and Royal Oaks.

3. ADAPTATION STRATEGIES

Adaptation strategies were developed for each hazard and transportation asset type, guided by community feedback and agency expertise.

The adaptation strategies for Sacramento are listed in **Section 3.1** (for the City) and **Section 3.2** (for SacRT), with tables that organize the overarching adaptation strategies and supportive implementation actions. For each implementation action, a description, implementing department(s), priority, and general cost are also listed. The strategies and priorities were developed based on TAC and other staff input and refined based on public feedback.

3.1 CITY OF SACRAMENTO ADAPTATION STRATEGIES

City of SACRAMENTO

The City of Sacramento adaptation strategies were developed in alignment with the previously adopted 2040 General Plan (adopted 2024), Climate Action and Adaptation Plan (CAAP, adopted 2024), Local Hazard Mitigation Plan (LHMP, adopted 2021), Urban Forest Plan (UFP, adopted 2025), and Streets for People Active Transportation Plan (adopted 2025). Where applicable, SacAdapt has identified recommended updates to previously adopted strategies for consideration in the next update cycle (for example, the LHMP update process that kicked off in late 2025 will consider SacAdapt recommendations in addition to updated regulatory requirements). The previously adopted strategies are referenced as applicable in square brackets in the 'Description' column.

Cost is reflected for each implementation action as $ (low), $$ (medium), or $$$ (high). These reflect the scale and complexity of implementation actions as defined below:

- **$ (Below $500,000):** This category typically includes outreach initiatives, planning efforts, and small equipment purchases. These projects are generally less resource-intensive and can be implemented with modest funding.
- **$$ ($500,000 - $5,000,000):** Projects in this range often involve infrastructure and facility upgrades. These efforts require more substantial investment due to engineering, construction, and material costs.
- **$$$ (Above $5,000,000):** Major capital projects fall into this category. Examples include retrofitting bridges, implementing large-scale drainage system upgrades, or implementing adaptation strategies at a citywide (vs. project-level) scale.

3.1.1 CONSIDER EVACUATION NEEDS IN PLANNING

Evacuation and mitigation planning is a vital part of development and infrastructure decisions. Incorporating safe routes, emergency access, and mitigation measures into projects ensures community resilience and supports rapid response during hazard events.

*Italics distinguish implementation actions that are unique to SacAdapt from those that align with adopted actions in other plans or policies.
**Lead implementing departments are bolded.

TABLE 3-1. CITY OF SACRAMENTO IMPLEMENTING ACTIONS: CONSIDER EVACUATION NEEDS IN PLANNING

↓$ below $500k	$$ $500k - $5mil	↑$$$ above $5mil

IMPLEMENTATION ACTION	DESCRIPTION*	IMPLEMENTING DEPARTMENTS**	PRIORITY	COST
C-1-1. Adopt Additional Floodplain Development Standards	The Development Services Task Force will discuss adoption of additional development standards related to floodplain management and best practices. Additional regulations may include evacuation and rescue requirements, additional freeboard, elevation of utilities, and 200-year level of protection. [Local Hazard Mitigation Plan Action 41] [CAAP A-3-11]	**DOU** CDD	Medium	$
C-1-2. Align Roadway Safety Improvements with Emergency Response Functions	*Continue interdepartmental engagement around roadway design strategies that can facilitate evacuation in an emergency context, while also supporting immediate traffic calming and safety improvements.*	**PW** OEM; PD	Medium	$
C-1-3. Evaluation and Mitigation of Critical Facilities, *Roadways, and Evacuation Routes* in Identified Hazard Areas	This project addresses the additional evaluation of identified critical facilities to determine options for mitigation. The initial focus will be on those facilities within the flood hazard areas, with other hazard-prone facilities to follow. The end result of this analysis will be a list of facilities within the 100- and 500-year floodplain and their mitigation recommendations and priorities. *Consider evacuation routes, pumps, fuel tanks, and other ancillary flood control equipment as critical facilities.* *Evaluate cost effectiveness and impact of elevating regularly flooded assets and roadways (e.g., Raley Blvd.).* [Local Hazard Mitigation Plan Action 6] [CAAP A-3-2]	**DOU, PW** OEM; PD	Low	$-$$$ varies based on solutions and scope

IMPLEMENTATION ACTION	DESCRIPTION*	IMPLEMENTING DEPARTMENTS**	PRIORITY	COST
C-1-4. Flood Management Land Use Planning and Development	Implementation of the land use planning and development action items outlined in the City of Sacramento's Comprehensive Flood Management Plan. Highlighted projects include 200-year floodplain ordinance and projection plan, development guidelines for rescue and evacuation areas, City Code update for new development adjacent to levees. [Local Hazard Mitigation Plan Action 51] [CAAP A-3-19]	**DOU** CDD; YPCE	High	$

3.1.2 CREATE BUILT ENVIRONMENTS RESILIENT TO THE IMPACTS OF EXTREME HEAT

Extreme heat, as shown in **Figure 2-3** of UHI index distribution, poses growing challenges for transportation infrastructure and traffic systems. Updating pavement specifications, improving equipment resilience, and adopting innovative design strategies are actions to maintain safety, performance, and longevity under changing climate conditions.

*Italics distinguish implementation actions that are unique to SacAdapt from those that align with adopted actions in other plans or policies.
**Lead implementing departments are bolded.

TABLE 3-2. CITY OF SACRAMENTO IMPLEMENTING ACTIONS: CREATE BUILT ENVIRONMENTS RESILIENT TO THE IMPACTS OF EXTREME HEAT

↓$ below $500k	$$ $500k - $5mil	↑$$$ above $5mil

IMPLEMENTATION ACTION	DESCRIPTION*	IMPLEMENTING DEPARTMENTS**	PRIORITY	COST
C-2-1. Update Pavement Design to Withstand Current and Projected Future Heat Conditions	*Update pavement specifications to require a binder grade of PG 70-10 for all projects. Monitor the impacts of extreme heat to determine if/when future changes to pavement binder grade (e.g., to PG 76-10) may be appropriate. Encourage Caltrans to reevaluate statewide pavement specifications to support wider availability of appropriate binder grades.* *Explore design strategies including shorter joint spacing, thicker slabs, less rigid support, and enhanced load transfer. Engage departments and entities (e.g., PW, DOU, utilities) as part of discussions around any new specifications.*	**PW**	Medium-Low	$ to update specifications $$$ to implement citywide

IMPLEMENTATION ACTION	DESCRIPTION*	IMPLEMENTING DEPARTMENTS**	PRIORITY	COST
C-2-2. Pilot Heat-Reflective Strategies on Traffic Control Cabinets	*Pilot heat-reflective paint or other strategies on traffic control cabinets to reduce potential equipment stress and failure.* *Require public art campaigns, to paint or wrap traffic control cabinets, to achieve heat reduction outcomes.*	**PW**	Low	$
C-2-3. Proactively Replace Signage Based on Expected Lifecycle and Weather Impacts	*Enhance existing sign database to include attributes that can guide preventative maintenance of signage (e.g., installation date, recommended replacement date, orientation to sun, installation entity). Ensure contractors meet City sign specifications.*	**PW**	Low	$
C-2-4. Upgrade Traffic Detection Loops into New Technology	*Upgrade traffic detection loops to new systems that are not embedded within the pavement. Update standard specifications to ensure product upgrades at equipment end of life.*	**PW**	Medium	$ per project

3.1.3 CREATE BUILT ENVIRONMENTS THAT REDUCE EXPOSURE TO EXTREME HEAT AND MITIGATE THE URBAN HEAT ISLAND EFFECT

Reducing urban heat and improving comfort in public spaces requires integrated strategies across landscaping, street design, and amenities. By enhancing shade, promoting heat-mitigating materials, and expanding tree canopy, the City can create cooler environments for all residents.

*Italics distinguish implementation actions that are unique to SacAdapt from those that align with adopted actions in other plans or policies.
**Lead implementing departments are bolded.

TABLE 3-3. CITY OF SACRAMENTO IMPLEMENTING ACTIONS: CREATE BUILT ENVIRONMENTS THAT REDUCE EXPOSURE TO EXTREME HEAT AND MITIGATE URBAN HEAT ISLAND EFFECT

↓$	below $500k	$$	$500k - $5mil	↑$$$	above $5mil

IMPLEMENTATION ACTION	DESCRIPTION*	IMPLEMENTING DEPARTMENTS**	PRIORITY	COST
C-3-1. Cooling Landscape Standards	The City shall prepare a Landscape Manual or enhance landscape standards to mitigate urban heat island effects. Such standards could include a climate appropriate planting palette and recommended plant mix, targets for street tree canopy, shade structure coverage, and asphalt paving coverage. [General Plan ERC-Action 7] [CAAP A-2-3]	**PW** CDD; YPCE	Low	$
C-3-2. Create a Wayfinding Program	The City should implement a citywide comprehensive wayfinding program to highlight low-stress all ages and abilities routes for walking, rolling, and biking to community destinations and transit. [Streets for People - Programs - Engineering]	**PW**	Low	$
C-3-3. Expand Drinking Water Access	The City shall strive to install heat-reducing public amenities in areas most affected by urban heat, prioritizing the areas with vulnerable populations. Amenities may include drinking water fountains or bottle refilling facilities in public parks, at community facilities, transit centers, or other appropriate locations. [General Plan ERC-Action 8.6]	**YPCE; PW** DOU	High	$ per project
C-3-4. Heat Reduction in the Public Realm	The City should explore opportunities to amend development standards and guidelines so as to promote the use of heat mitigation strategies to reduce	**CDD** PW	High	$ to amend standards

IMPLEMENTATION ACTION	DESCRIPTION*	IMPLEMENTING DEPARTMENTS**	PRIORITY	COST
	temperatures in the public realm, particularly on active transportation networks, commercial corridors, near light rail transit (LRT) stations and along transit corridors. Requirements may include the incorporation of the following: Building design strategies (varied building heights; setbacks from sidewalks; vertical and horizontal shade features); Cooling building and pavement materials, treatments, and coatings; Multiple layers of shading to maximize coverage throughout the day; and Street trees, and landscaping. *Any public art features should also provide a cooling benefit.* [General Plan ERC-Action 4] [CAAP A-2-1]			
C-3-5. Implement the Urban Forest Plan	Urban Forest Plan - Implement the Urban Forest Plan and Parks Plan 2040 with a goal to achieve 25% urban canopy cover by 2030 and 35% by 2045. Prioritize tree planting and tree maintenance in areas with the lowest average tree canopy cover and explore strategies to reduce barriers to tree planting in disadvantaged areas and improve tree health. [General Plan ERC-Action 1] [CAAP CS-1.1; A-2-5] Key relevant sub-actions: 1.1.3: Continue to operate a street tree planting program. *Plan for tree succession.* 1.2.1: Amend Sacramento City Code as necessary to improve tree canopy inclusion and require minimum levels of tree planting in development projects. 1.2.2: Review and update design guidelines and development standards to support achievement of minimum canopy goals, outlined in strategy 1.1.1, and maximize benefits. 1.2.6: Support the achievement of 50 percent tree shading over streets and sidewalks and shared use paths. 1.3.1: Support City planting efforts and implementation of urban forest programs in priority communities. 3.2.2: Maintain and implement emergency response plans for storm events that result in tree loss and damage. 3.3.1: Continue to operate a proactive tree maintenance program to preserve and protect City-managed trees. 3.4.2: Explore opportunities to leverage the benefits of trees to retain stormwater runoff.	**PW** CDD; YPCE	High	$$$

IMPLEMENTATION ACTION	DESCRIPTION*	IMPLEMENTING DEPARTMENTS**	PRIORITY	COST
	3.4.3: When designing transportation improvements, support the inclusion of adequate tree canopy to provide substantial shade for active transportation infrastructure and support achievement of 50 percent shading on streets, sidewalks, and shared use paths. *Identify innovative ways to expand benefits of trees, particularly along streets (e.g., soil vault systems to increase feasibility of mature growth in constrained space).* 4.1.2 Conduct Citywide urban forest public outreach and education. *Incorporate tree succession planning into public outreach and education.*			
C-3-6. Improve Noticing for Closures and Hazards on Bicycle and Pedestrian Facilities	*Develop a detour alert system, aligned with the work zone and event detour policy, to include notices for flooding, debris or other closures. Increase coordination with Sacramento County to improve noticing for Discovery Park shared-use path closures.*	**PW** YPCE; DOU	Medium	$
C-3-7. Pilot Cool Pavement and Depaving	*Monitor cool pavement technologies and opportunities to increase pavement longevity and support urban heat island mitigation.* *Identify funding for pilot implementation. Monitor impacts on temperature and pavement quality and maintenance.*	**PW** CDD	Medium	$ per project, varies based on materials $$$ citywide
C-3-8. Street Standards for Tree Canopy	The City shall update Street Standards with objective design standards for shade trees along roadways to optimize tree canopy and provide solutions for various street functions and conditions. [General Plan ERC-Action 11] [CAAP A-2-8]	**PW** CDD	High	$

3.1.4 INCREASE COMMUNITY RESILIENCE TO PREPARE FOR CLIMATE CHANGE IMPACTS

Building community resilience requires proactive outreach and education. Expanding emergency preparedness programs, improving hazard awareness, and delivering multilingual resources ensure residents are inclusively informed and equipped to respond to climate risks.

*Italics distinguish implementation actions that are unique to SacAdapt from those that align with adopted actions in other plans or policies.
**Lead implementing departments are bolded.

TABLE 3-4. CITY OF SACRAMENTO IMPLEMENTING ACTIONS: INCREASE COMMUNITY RESILIENCE TO PREPARE FOR CLIMATE CHANGE IMPACTS

↓$	below $500k	$$	$500k - $5mil	↑$$$	above $5mil

IMPLEMENTATION ACTION	DESCRIPTION*	IMPLEMENTING DEPARTMENTS**	PRIORITY	COST
C-4-1. CERT Training	The City shall expand the Community Emergency Response Training (CERT) program to address community and neighborhood preparedness for climate impacts. Pilot implementation of the updated program in disadvantaged communities and areas with populations most vulnerable to climate impacts. *Identify funding to expand CERT programming and to develop multilingual resources.* [General Plan ERC-Action 3] [CAAP A-5-1]	**Fire** OEM	Medium	$
C-4-2. Community Outreach on Multi Hazard Preparation & Pre-mitigation	Continue to maintain and improve webpage that addresses the multi-hazard threat and add measures for preparation and pre-mitigation. Continue to participate and host many community outreach events associated with Hazard awareness and preparation. These events include: "Capitol Action Day", "Flood Preparedness Week", "Highwater Jamboree" Annual Flood Preparedness Event and visiting neighborhood meetings and community events to share preparedness information. *Promote emergency notification resources like SacAlert.* [Local Hazard Mitigation Plan Action 5] [CAAP A-5-5]	**DOU** OEM	High	$
C-4-3. Enhance Public Education and Awareness of	A comprehensive multi-hazard outreach program will ascertain both broad and targeted educational needs throughout the community. The City will work with the County and other agencies as appropriate to develop timely and consistent	**OEM**	High	$

IMPLEMENTATION ACTION	DESCRIPTION*	IMPLEMENTING DEPARTMENTS**	PRIORITY	COST
Natural Hazards and Public Understanding of Disaster Preparedness	annual outreach messages in order to communicate the risk and vulnerability of natural hazards of concern to the community. This includes measures the public can take to be better prepared and to reduce the damages and other impacts from a hazard event. The public outreach effort will leverage and build upon existing mechanisms. [Local Hazard Mitigation Plan Action 2] [CAAP A-5-3]			
C-4-4. Extreme Weather Outreach Strategy	This project is meant to serve as an outreach mechanism to the population in Sacramento City. It will be completed mainly by providing social media toolkits for the general population with access to internet. For more at-risk populations, such as the homeless, the outreach will be completed in person by targeting the areas of Sacramento where the homeless population tends to stay. Outreach will also be completed via food banks and homeless assistance centers. [Local Hazard Mitigation Plan Action 38] [CAAP A-2-11]	**DCR** OEM	High	$
C-4-5. Multi-lingual Disaster Education	Develop Public Service Announcements, educational videos, a social media campaign, and other material in a variety of languages to provide our diverse community with information on how to develop a personal/family safety plan. [Local Hazard Mitigation Plan Action 9] [CAAP A-5-6]	**OEM** DOU; CDD	High	$
C-4-6. Outreach on the Effects of Smoke on Air Quality	The purpose of the project is to educate Sacramento residents on the effects of smoke in the air and provide resources to check the air quality in their area. This will be carried out via social and network media. The city will utilize its social media pages and radio advertisements to convey knowledge and resources residents can use to know when to use precaution. The project will also provide helpful tips to decrease the impacts of poor air quality in their homes and through the daily routines. [Local Hazard Mitigation Plan Action 66]	**OEM; PIO; Sac Metro Air District**	High	$
C-4-7. Public Information Flood Response Plan	Develop a pre-flood plan for public information projects that will be implemented during and after a flood. The plan will include a collection of outreach templates including key messages that need to be disseminated before, during, and after a flood. The plan will also include written procedures that explain how the materials will be disseminated and when the information should be released. [Local Hazard Mitigation Plan Action 18] [CAAP A-3-7]	**DOU** OEM	High	$

3.1.5 INCREASE STORMWATER DRAINAGE CAPACITY

Managing stormwater and reducing flood risk requires a comprehensive approach to drainage infrastructure. By upgrading pipelines, pump stations, and green infrastructure and updating design standards, the City can improve system capacity, resilience, and long-term performance under changing climate conditions.

*Italics distinguish implementation actions that are unique to SacAdapt from those that align with adopted actions in other plans or policies.
**Lead implementing departments are bolded.

TABLE 3-5. CITY OF SACRAMENTO IMPLEMENTING ACTIONS: INCREASE STORMWATER DRAINAGE CAPACITY

↓$	below $500k	$$	$500k - $5mil	↑$$$	above $5mil

IMPLEMENTATION ACTION	DESCRIPTION*	IMPLEMENTING DEPARTMENTS**	PRIORITY	COST
C-5-1. Drainage Projects for Repetitive Loss Properties	Many drainage projects have been identified in the City's Drainage Master Plans. These projects include upsizing pipelines, adding detention basins, adding bypass pipelines, retrofitting pump stations, and land acquisition. These projects will be ranked and grant funding will be pursued. [Local Hazard Mitigation Plan Action 42] [CAAP A-3-12]	**DOU** YPCE	Medium	$-$$$ per project; varies based on project scope
C-5-2. Drainage Projects from the City's Priority Drainage Project List	Many potential drainage projects that have been identified in the City's Drainage Master Plans and have been prioritized on a Basin Master Planning and Improvement Projects priority list. These projects include upsizing pipelines, adding detention basins, adding pipelines, retrofitting pump stations, and land acquisition. These projects are ranked by priority. [Local Hazard Mitigation Plan Action 46] [CAAP A-3-15]	**DOU** YPCE	Medium	$-$$$ per project; varies based on project scope
C-5-3. Flood Resilient Design Techniques	The City shall update design guidelines, standards, and the municipal code to promote building materials and site design techniques that minimize the disruption of and speed recovery from flood impacts. *Leverage DOU outdoor water conservation rebates to support equitable implementation of residential flood resilient design techniques.* [CAAP A-3-26]	**CDD** DOU	Medium	$

IMPLEMENTATION ACTION	DESCRIPTION*	IMPLEMENTING DEPARTMENTS**	PRIORITY	COST
C-5-4. Increase Maintenance Capacity for Cleaning Culverts, Ditches, Creeks, and Storm Drains	*Purchase additional vactor trucks for storm drain and trash capture device cleaning.* *Seek to maintain adequate maintenance staff levels and supporting contracts. Identify funding to scale maintenance staff levels based on industry best practices to appropriately maintain culverts, ditches, creeks, and storm drains (including trash capture devices).*	**DOU** PW	High	$-$$
C-5-5. Integrate Stormwater Mitigation Strategies into City Infrastructure	Green Infrastructure – Identify opportunities, where feasible and consistent with the park site plan without reducing programmable parkland acreage, to add green infrastructure in parks and open space, including trees, to improve flood mitigation capacity in flood prone areas. *Identify opportunities, where feasible and aligned with drainage need, to add green infrastructure into the public right-of-way to improve localized flood mitigation capacity in flood prone areas. Incorporate green infrastructure into the design of traffic calming strategies, where appropriate.* *Seek to maintain adequate maintenance staff levels and supporting contracts. Identify funding to scale maintenance staff levels based on industry best practices to appropriately maintain green infrastructure.* [CAAP A-3-27]	**PW; YPCE; DOU**	Medium	$-$$ per project, varies based on solutions and scope
C-5-6. Internal Drainage System Improvements	Implementation of the internal drainage system improvements outlined in the City of Sacramento's Comprehensive Flood Management Plan. Highlighted projects include development of a grant program to fund drainage improvements, develop an Engineering Services efficiency plan, work on the passage of Proposition 218 drainage fee increase, and drainage master planning. [Local Hazard Mitigation Plan Action 53] [CAAP A-3-21]	**DOU**	High	$$-$$$ varies based on project scope
C-5-7. Master Planning to Identify Facilities Needed to Prevent 10-Year Event Street Flooding and 100-Year Event Structure Flooding	Develop master plans to identify facilities needed to prevent 10-year event street flooding and 100-year event structure flooding in areas of the City that do not currently have master planning. Prioritize the projects and formulate timeline for the identified projects. Execute the projects to provide protection from flooding. [Local Hazard Mitigation Plan Action 55] [CAAP A-3-23]	**DOU**	High	$$
C-5-8. Projects Identified in the Combined Sewer	Identified projects were categorized into storage and conveyance. The storage projects are located upstream or downstream of local flooding areas and are intended to detain flows until the CSS has re-generated capacity (i.e., peak of the storm has passed and HGL in the system has receded from peak	**DOU**	High	$$-$$$

IMPLEMENTATION ACTION	DESCRIPTION*	IMPLEMENTING DEPARTMENTS**	PRIORITY	COST
System Improvement Plan Update	conditions) and the storage facilities can be dewatered. The storage projects can be linear or parcel based. Conveyance projects would generally be located in proximity to or just downstream of localized flooding areas. Their objective would generally be to convey peak flows from and through the flood-prone areas to points downstream with greater capacity. The analysis carefully considered whether the increased conveyance had the potential to cause or exacerbate downstream flooding. If that was determined to be true, the conveyance project(s) were combined with upstream or downstream storage projects to mitigate the downstream flood exacerbation risk. Conveyance projects included upsizing existing pipes or constructing new pipes. Where baseline flooding occurred in a location with no opportunities for storage, a new pipe was sized to convey the 10-year storm design peak flows to the downstream system. Factors such as ground cover requirements, right-of-way width, and existing system pipe invert elevations (to which linear storage facilities must connect) were factored into the storage configurations. [Local Hazard Mitigation Plan Action 47] [CAAP A-3-16]			varies based on project scope
C-5-9. Retrofit Pumping Plants with Discharge Monitoring Devices	Retrofit pumping plants to measure discharge and monitor devices. Identify pumps that are underperforming and raise Reliable Capacity to 90 percent service factor. *Identify innovative technologies to enhance remote pump station monitoring capabilities.* [Local Hazard Mitigation Plan Action 56]	**DOU**	High	$$
C-5-10. Stormwater Master Planning	The City shall implement a stormwater master plan program to: - Update basin drainage models using the latest rainfall data that reflect changing precipitation patterns and intensity as a result of climate change. - Identify facilities needed to prevent 10-year event street flooding and 100-year event structure flooding; - Ensure that public facilities and infrastructure are designed pursuant to approved basin master plans; - Ensure that adequate land area and any other elements are provided for facilities subject to incremental sizing (e.g., detention basins and pump stations); and	**DOU**	High	$-$$ varies based on project scope

IMPLEMENTATION ACTION	DESCRIPTION*	IMPLEMENTING DEPARTMENTS**	PRIORITY	COST
	- Incorporate the use of "green infrastructure," Low Impact Development (LID) techniques, stormwater treatment controls, and, if applicable, trash capture devices. [General Plan PFS-Action 4] [CAAP A-3-1]			

3.1.6 INVEST IN INFRASTRUCTURE MAINTENANCE

Maintaining and upgrading critical infrastructure is essential for safety and resilience. By securing funding for inspections, preventative maintenance, and modernization of bridges, floodgates, and roadways, the City can reduce vulnerability to natural hazards while ensuring reliable access for all users.

*Italics distinguish implementation actions that are unique to SacAdapt from those that align with adopted actions in other plans or policies.
**Lead implementing departments are bolded.

TABLE 3-6. CITY OF SACRAMENTO IMPLEMENTING ACTIONS: INVEST IN INFRASTRUCTURE MAINTENANCE

↓$	below $500k	$$	$500k - $5mil	↑$$$	above $5mil

IMPLEMENTATION ACTION	DESCRIPTION*	IMPLEMENTING DEPARTMENTS**	PRIORITY	COST
C-6-1. Bridge Inspection Program	*Secure funding to establish a bicycle and pedestrian bridge inspection program.* *Continue regular inspections of scour critical bridges.*	**PW**	High	$
C-6-2. Expand Bridge Maintenance and Repair Funding	*Identify funding for urgent bridge improvements and upgrades beyond routine maintenance.*	**PW**	High	$$-$$$ varies based on project scope
C-6-3. Increase Capacity for Bicycle Facility Maintenance	*Secure funding to increase capacity (e.g., additional street sweepers, staff) for bicycle facility maintenance, particularly during winter months and after storm events.*	**PW**	Medium	$-$$

IMPLEMENTATION ACTION	DESCRIPTION*	IMPLEMENTING DEPARTMENTS**	PRIORITY	COST
C-6-4. Increase preventative Maintenance of Roads and Bikeways to Reduce the Vulnerability to Extreme Weather Risk	*Secure funding to increase preventative maintenance to mitigate asset failure (e.g., increased pavement crack sealing to prevent water intrusion, regularly refreshed striping).* *Seek to maintain adequate maintenance staff levels and supporting contracts. Identify funding to scale maintenance staff levels based on industry best practices to appropriately conduct preventative maintenance of roadways and bikeways to reduce vulnerability to extreme weather risk.*	**PW**	Medium	$-$$ varies based on project scope
C-6-5. Modernize City Floodgates	*Complete the Floodgate Modernization Project.* *Secure funding to complete minor floodgate repairs identified in the Floodgate Assessment.* *Secure funding to establish a program to regularly inspect floodgates to identify and implement needed repairs.* *Secure funding to construct a flood-wall between primary and secondary levee system to eliminate need for the Business 80 floodgate.*	**PW**	High	$-$$$ per project; varies based on solutions
C-6-6. Protection of Transportation Bridge Infrastructure	Retrofit all bridges in the city of Sacramento to current seismic standards. Elevate roads and bridges above the base flood elevation to maintain dry access. In situations where flood waters tend to wash roads out, construction, reconstruction, or repair can include not only attention to drainage, but also stabilization or armoring of vulnerable shoulders or embankments. *Prioritize scour mitigation and debris clearance around bridges with high water events or spread footings.* [Local Hazard Mitigation Plan Action 21]	**PW** DOU	High	$$$

3.1.7 REDUCE RISK OF POWER OUTAGE

Reliable power and utility infrastructure are critical for resilience and safety. By planning for backup power at pump stations, promoting battery storage and microgrids, improving tree maintenance near power lines, and undergrounding utilities, the City can reduce outage risks and enhance system reliability during extreme weather events.

*Italics distinguish implementation actions that are unique to SacAdapt from those that align with adopted actions in other plans or policies.
**Lead implementing departments are bolded.

TABLE 3-7. CITY OF SACRAMENTO IMPLEMENTING ACTIONS: REDUCE RISK OF POWER OUTAGE

↓$	below $500k	$$	$500k - $5mil	↑$$$	above $5mil

IMPLEMENTATION ACTION	DESCRIPTION*	IMPLEMENTING DEPARTMENTS**	PRIORITY	COST
C-7-1. Develop and Implement a Master Generation Plan for Pump Stations	Develop a plan for identifying, prioritizing, and implementing power generation needs for pumping stations. Perform a power audit to identify needs. Plan will identify needs, costs, funding, and lead personnel. Plan will include the purchase and installation of necessary built-in and mobile generators and additional equipment. The City has a robust generator plan but a master plan is still in the process. Sumps that need generators have been identified but the program has been delayed due to funding. *Evaluate zero-emission back-up power solutions, where appropriate.* (Aligned with CAAP WW-1.6) *Explore strategies to reduce vandalism of pump station infrastructure.* *Identify needed maintenance capacity for additional assets.* [Local Hazard Mitigation Plan Action 12] [CAAP A-3-5]	**DOU**	High	$
C-7-2. Increase the Amount of Electricity Produced from Local Resources and Work with SMUD to Install Additional Local Storage by 2030	Work alongside SMUD to promote and further incentivize battery storage as a means to maximize electrification benefits and improve resiliency. *Evaluate reliability and resilience of electric service to City-identified critical facilities supporting transportation-related operations, and advise and support implementation of distributed energy resources, such as battery energy stationary storage back up power solutions, as appropriate, to maintain City operations during a grid event.* [CAAP E-4.3]	**SMUD; PW** CDD; OEM	Low	$$

IMPLEMENTATION ACTION	DESCRIPTION*	IMPLEMENTING DEPARTMENTS**	PRIORITY	COST
C-7-3. Tree Trimming & Debris Removal	Dead branches fall very easily during high winds or a severe storm. These falling branches are a threat to nearby power lines. Trimming of trees treat diseases that can weaken the tree and make it susceptible to toppling during severe winds and storms. This project includes the year-round pruning of trees throughout the City that can pose a threat to power lines. *Increase preventative tree trimming around traffic signals and rail crossings. Ensure regular coordination between relevant departments and divisions to identify tree standards (e.g., for planting and maintenance) around traffic signals and rail crossings in order to mitigate infrastructure conflicts, ensure roadway safety, and support urban tree canopy.* *Seek to maintain adequate maintenance staff levels and supporting contracts. Identify funding to scale maintenance staff levels based on industry best practices to appropriately maintain tree canopy.* *Identify opportunities to streamline communication and approvals for SacRT tree trimming.* [Local Hazard Mitigation Plan Action 61]	**PW** SMUD	High	$-$$
C-7-4. Underground Powerlines	The City shall require new development to underground utility lines wherever feasible and coordinate with electricity and telecommunications providers to underground existing overhead lines where feasible. [General Plan PFS-3.14]	**CDD; PW; SMUD**	Low	$-$$$ per project; varies based on project scope

3.1.8 STRENGTHEN CITY GOVERNMENT CAPACITY FOR CLIMATE RESILIENCE

Strengthening organizational resilience requires clear priorities, robust communication, and proactive planning. By updating project scoring, improving emergency protocols, ensuring worker safety, and securing diverse funding sources, the City can enhance its ability to withstand and recover from natural hazards and climate impacts.

*Italics distinguish implementation actions that are unique to SacAdapt from those that align with adopted actions in other plans or policies.
**Lead implementing departments are bolded.

TABLE 3-8. CITY OF SACRAMENTO IMPLEMENTING ACTIONS: STRENGTHEN CITY GOVERNMENT CAPACITY FOR CLIMATE RESILIENCE

↓$	below $500k	$$	$500k - $5mil	↑$$$	above $5mil

IMPLEMENTATION ACTION	DESCRIPTION*	IMPLEMENTING DEPARTMENTS**	PRIORITY	COST
C-8-1. Align Transportation Priorities Plan Climate Scoring with Climate Resilience	*Consider updating TPP scoring to prioritize projects that increase redundancy.* *Consider updating TPP scoring to prioritize projects that provide multiple climate resilience benefits.*	**PW**	Medium	$
C-8-2. Improve Outage Communications and Alerts Between SMUD and the City	*Ensure contact lists are regularly updated for outage communications and alerts. Identify opportunities for improved communications as needed.*	**SMUD** All	Low	$
C-8-3. OSHA Requirements for Worker Safety	*Continue meeting OSHA requirements for worker safety, including regular trainings. Assess need to shift work schedules to cooler times, as needed (including early morning or night work).* *Monitor CalOSHA proposed rule development and review protocols annually.*	**DOU; PW**	Low	$
C-8-4. Protection of City Information Technology Infrastructure	Develop a system to withstand the variety of natural disaster the City is vulnerable to, such as, flooding, fire, and severe storms and wind. *Update IT Disaster Recovery Plans annually and implement key recommendations to ensure the City's technology infrastructure remains reliable, secure, and prepared for emergency response and continuity of operations.* [Local Hazard Mitigation Plan Action 26]	**IT** DOU; PW	High	$-$$ varies based on solutions and scope

IMPLEMENTATION ACTION	DESCRIPTION*	IMPLEMENTING DEPARTMENTS**	PRIORITY	COST
C-8-5. Pursue Federal, State, and Regional Funding	*Identify applicable state and federal grants* *Consider funding from diverse funding sources (e.g., climate action and adaptation programs, public health) to fund transportation resiliency projects.* *Identify partners to help broaden scope of potential funds and competitiveness for those funds*	**PW** All	High	$

3.1.9 STRENGTHEN CITY GOVERNMENT DISASTER PREPAREDNESS AND CAPACITY FOR EMERGENCY RESPONSE

Effective emergency management depends on strong staffing, inclusive planning, and advanced communication systems. By enhancing OEM capacity, improving notification technologies, leveraging data tools, and conducting regular training and outreach, the City can ensure rapid, coordinated, and equitable response during extreme events.

*Italics distinguish implementation actions that are unique to SacAdapt from those that align with adopted actions in other plans or policies.
**Lead implementing departments are bolded.

TABLE 3-9. CITY OF SACRAMENTO IMPLEMENTING ACTIONS: STRENGTHEN CITY GOVERNMENT DISASTER PREPAREDNESS AND CAPACITY FOR EMERGENCY RESPONSE

↓$	below $500k	$$	$500k - $5mil	↑$$$	above $5mil

IMPLEMENTATION ACTION	DESCRIPTION*	IMPLEMENTING DEPARTMENTS**	PRIORITY	COST
C-9-1. Develop Enhanced Emergency Planning for Special Needs Populations in the City of Sacramento Emergency Operations Plan and Other Planning Documents	By working with local advocacy groups, and by identifying weaknesses and gaps in the City's emergency planning, the increased capabilities of the enhanced plan will enable emergency responders to more effectively support the most vulnerable segment of the population. Access and Functional Needs (AFN) is included throughout the Emergency Operations Plan (EOP) and Pre-Disaster Recovery Plan. OEM continues to meet with AFN leaders to ensure accessibility and inclusion are maintained in compliance with the Americans with Disabilities Act. OEM plans are updated on a continuous basis and ensure that AFN is included throughout the entirety of the plan. Efforts to strengthen inclusivity continues as OEM networks and attends trainings, seminars, and events pertaining to AFN and diversity.	**OEM**	High	$

IMPLEMENTATION ACTION	DESCRIPTION*	IMPLEMENTING DEPARTMENTS**	PRIORITY	COST
	[Local Hazard Mitigation Plan Action 15] [CAAP A-5-9]			
C-9-2. Emergency Notification and Evacuation Planning	Enhancements to the existing Reverse 911 system to more effectively notify mass populations of evacuation orders and routes, consistent with FEMA guidelines, identifying special needs communities and transportation providers, targeted outreach to maximize the capabilities of Reverse 911, and strategic training to assure effective deployment of the enhanced capabilities. *Identify emergency notification procedures that do not rely on internet and/or cell connectivity.* *Leverage new technologies to enhance location-based alerts.* *Leverage the regional 511 system for emergency notifications.* [Local Hazard Mitigation Plan Action 43] [CAAP A-5-15]	**OEM** IT	High	$
C-9-3. Enhance Emergency Operations Center (EOC) resources	*Identify funding to enhance the technology and infrastructure for all venues utilized by the City as an EOC, including the Department Operations Center, regional EOC, and Virtual Operations Center.*	**OEM** DOU; PW; IT	Low	$
C-9-4. Incorporate Resilience Strategies into End-Of-Life Traffic Equipment Replacements	*Consider roundabouts instead of traffic signals during street (re)construction projects. Prioritize intersections with repeated outages or delays.* *Incorporate back-up power for priority traffic signals (e.g., intersections with high complexity and/or consequence). Prioritize solar-powered and/or other low-emission and low maintenance back-up power. Identify and fund routine maintenance of back-up power systems.* *Continue ensuring that all new signals are connected to the Traffic Operations Center.* *Fund replacement of high-consequence end-of-life traffic signal equipment.*	**PW**	Medium	$-$$$ per project; varies based on project scope
C-9-5. Leverage New Technologies to Enhance Emergency Response Capabilities	*Ensure SacGPT incorporates the latest emergency preparedness resources.* *Leverage public-facing AI tools for emergency preparedness.* *Explore ways to leverage real-time data (e.g., 311, 911 data) to enhance live emergency response.*	**OEM; IT** PW; DOU; SacRT; PD	Medium	$
C-9-6. Maintain and Identify Changes in Critical Facilities GIS Layer to Support Emergency Management Efforts	Businesses, schools, EMS Services or any other identified critical facilities will have contact information collected and mapped for analyzing and preparation for the Multi-Hazard Mitigation Plan. Protection of critical infrastructure are supported by City Ordinance 2020-0009.	**IT (GIS), OEM, SFD** DOU; PW	High	$

IMPLEMENTATION ACTION	DESCRIPTION*	IMPLEMENTING DEPARTMENTS**	PRIORITY	COST
	Incorporate Comprehensive Flood Management Plan data (e.g., potential levee breaches and impacted assets) into internal GIS maps. *Include floodgates as critical facilities in internal GIS maps. Incorporate interactive mapping of how floodgate closures change transportation routing.* *Conduct staff trainings on GIS resources.* [Local Hazard Mitigation Plan Action 4] [CAAP A-5-4]			
C-9-7. Regional Emergency and Disaster Preparedness Exercises to Test Operational & Emergency Plans	Conduct regional, multi-agency emergency and disaster preparedness exercises to test operational and emergency plans. Tests will include levee or dam failure and other natural hazards. *Conduct regular internal trainings on disaster response resources and procedures (e.g., new Virtual Operations Center platform; process for evacuation orders; emergency management traffic control techniques, etc.). Engage all relevant departments and divisions.* *Identify funding for large-scale exercises.* [Local Hazard Mitigation Plan Action 23] [CAAP A-5-13]	**OEM** PD	High	$
C-9-8. Special Needs and Critical Facilities Database and Advanced Warning System	Through outreach activities, develop a database of vulnerable population groups and critical facilities in need of advance warning or evacuation assistance. Development and implementation of an advanced warning procedure. Successful programs have been developed in Houston, San Antonio and Florida and could serve as a model for implementation and personnel training. *Identify advanced warning procedures that do not rely on internet and/or cell connectivity.* *Leverage new technologies to enhance location-based alerts.* [Local Hazard Mitigation Plan Action 24] [CAAP A-5-14]	**OEM** IT	High	$

3.1.10 SUPPORT RESILIENCE OF TRANSIT FACILITIES

Improving transit resilience is key to reliable, comfortable mobility. By designing heat-protective bus shelters, enhancing access and comfort at transit stops, and implementing signal technologies for faster, prioritized service, the City and SacRT can strengthen its public transportation network against climate impacts.

*Italics distinguish implementation actions that are unique to SacAdapt from those that align with adopted actions in other plans or policies.
**Lead implementing departments are bolded.

TABLE 3-10. CITY OF SACRAMENTO IMPLEMENTING ACTIONS: SUPPORT RESILIENCE OF TRANSIT FACILITIES

↓$ below $500k	$$ $500k - $5mil	↑$$$ above $5mil

IMPLEMENTATION ACTION	DESCRIPTION*	IMPLEMENTING DEPARTMENTS**	PRIORITY	COST
C-10-1. Bus Shelter Design	The City shall encourage Sacramento Regional Transit District (SacRT) to study the feasibility of designing and installing bus shelters that are designed to offer protection and relief from heat, including the incorporation of shade trees. [General Plan ERC-Action 5] [CAAP A-2-2]	**PW** SacRT	High	$
C-10-2. Support Public Transit Improvements	Support Public Transit Improvements to Achieve 11% Public Transit Mode Share by 2030 and Maintain Through 2045. Remove barriers to access transit stops and stations (provide low-stress connectivity) and provide enhanced, comfortable stops and stations. [CAAP TR-2.10]	**PW** SacRT	Medium	$ Per Project
C-10-3. Traffic Signal Enhancements	Work with SacRT to identify changes to signals and other technological enhancements for transit prioritization and faster transit travel times. *Identify opportunities to increase emergency response priority as part of transit signal priority.* [CAAP TR-2.5]	**PW** SacRT; Fire; PD	Medium	$

3.2 SACRT ADAPTATION STRATEGIES

SACRAMENTO
REGIONAL TRANSIT

The SacRT adaptation strategies were developed to strengthen the resilience of public transit infrastructure in the face of evolving environmental and climate-related challenges. These strategies were developed in accordance with current SacRT plans and studies, including but not limited to the Transit Asset Management (TAM) Plan, 2023 Bus Stop Improvement Plan (BSIP), Zero-Emission Bus (ZEB) Rollout Plan, and current facilities transition planning efforts. These recommended strategies are designed to protect critical assets and ensure the long-term reliability and safety of public transit infrastructure for the communities SacRT serves.

Each of the following sections represents an adaptation strategy with implementation actions, departments, cost, and priority level. Cost is reflected as $ (low), $$ (medium), or $$$ (high). These reflect the scale and complexity of implementation actions as defined below:

- **$ (Below $500,000):** This category typically includes outreach initiatives, planning efforts, and small equipment purchases. These projects are generally less resource-intensive and can be implemented with modest funding.
- **$$ ($500,001 - $5,000,000):** Projects in this range often involve infrastructure and facility upgrades. These efforts require more substantial investment due to engineering, construction, and material costs.
- **$$$ (Above $5,000,000):** Major capital projects fall into this category, like replacing all compressed natural gas (CNG) infrastructure.

3.2.1 CONTINUE ADDRESSING HIGH WIND AT LIGHT RAIL CROSSINGS

Improving the safety and reliability of light rail crossings increases resilience of the transportation system. By enhancing detection, reporting, and repair processes, adding monitoring technologies, and ensuring timely maintenance, SacRT can reduce risks and maintain reliable operations.

TABLE 3-11. SACRT IMPLEMENTING ACTIONS: CONTINUE ADDRESSING HIGH WIND AT LIGHT RAIL CROSSINGS

↓$ below $500k	$$ $500k - $5mil	↑$$$ above $5mil

IMPLEMENTATION ACTION	DESCRIPTION	IMPLEMENTING DEPARTMENT	PRIORITY	COST
RT-1-1. Continue Replacing Cross Gates as Needed During High Wind Events	- Review and improve response time for broken light rail grade crossings, including detection, reporting, and repair intervals - Install signage at all crossings to allow the public to report issues - Ensure dispatch reports any observed issues during operations - Explore camera installation or sensor technology at crossings to monitor status and improve safety - Maintain and review wayside inspection schedules for crossings and ensure timely identification of issues - Assess strategic placement of replacement infrastructure for efficient repair	SacRT- LRM/ENG	Low	$

3.2.2 CONTINUE MEETING OSHA REQUIREMENTS FOR WORKER SAFETY

Protecting worker safety is essential for operational resilience. By maintaining regular safety trainings, monitoring regulatory updates, and adjusting work schedules to cooler times, SacRT can safeguard employees while sustaining reliable service.

TABLE 3-12. SACRT IMPLEMENTING ACTIONS: CONTINUE MEETING OSHA REQUIREMENTS FOR WORKER SAFETY

↓$	below $500k	$$	$500k - $5mil	↑$$$	above $5mil

IMPLEMENTATION ACTION	DESCRIPTION	IMPLEMENTING DEPARTMENT	PRIORITY	COST
RT-2-1. Monitor Protocol Development and Continue Safety Trainings	- Monitor CalOSHA proposed rule development and review protocols annually - Continue regular safety trainings - Shift work schedules to cooler times, as needed (including early morning or night work)	SacRT- EHS	Low	$

3.2.3 ENHANCE RESILIENCE OF TRANSIT TO FLOOD EVENTS

Enhancing flood resilience for critical electrical infrastructure is vital to maintaining transit operations during extreme weather, especially as storm events become more frequent and intense (e.g., projections shown in **Table 2-4**). By elevating transformers and installing protective pads for TPSS units, SacRT can reduce flood risk and safeguard essential systems at key facilities.

TABLE 3-13. SACRT IMPLEMENTING ACTIONS: ENHANCE RESILIENCE OF TRANSIT TO FLOOD EVENTS

↓$	below $500k	$$	$500k - $5mil	↑$$$	above $5mil

IMPLEMENTATION ACTION	DESCRIPTION	IMPLEMENTING DEPARTMENT	PRIORITY	COST
RT-3-1. Elevate Electrical Systems at Transit Facilities (e.g., BMF)	- Evaluate elevating electrical transformers at underground/downtown transit facilities to improve flood resiliency - Consider installing cement pads for TPSS units to elevate equipment above potential flood levels	SacRT- FAC/ENG	Low	$-$$

3.2.4 ENHANCE RESILIENCE OF TRANSIT TO HEAT EVENTS

By developing operational plans, upgrading cooling systems for substations, improving CNG infrastructure reliability, and implementing heat mitigation strategies for tracks, SacRT can reduce failure risks and maintain safe, efficient service. These address some of the vulnerabilities listed in **Table 2-5**.

TABLE 3-14. SACRT IMPLEMENTING ACTIONS: ENHANCE RESILIENCE OF TRANSIT TO HEAT EVENTS

↓$ below $500k $$ $500k - $5mil ↑$$$ above $5mil

IMPLEMENTATION ACTION	DESCRIPTION	IMPLEMENTING DEPARTMENT	PRIORITY	COST
RT-4-1. Implement CNG Infrastructure Upgrades and/or Heat Operational Plan	- Develop operational plan - Assess CNG system heat-resiliency needs, including pressure management, heat dissipation, and potential failure points - Confirm automatic shutdown protocols for CNG infrastructure during high-heat or fault conditions - Continue preventive maintenance on compressors and cooling components before summer peaks - Explore whether adaptation funding could support CNG compressor replacements or system upgrades - Evaluate long-term strategy for replacing aging compressor systems (some ~30 years old) and determine when full-system replacement is required	SacRT- FAC/BM	Medium	$$-$$$ Varies based on project scope
RT-4-2. OCS Heat Resiliency Operational Recommendations	- Develop operational plan based on SacAdapt analysis	SacRT- LRM	High	$
RT-4-3. Heat Management Plan/ Recommendations for Substations	- Develop a plan to address substation overheating issues, cooling system improvements, and new technology/design to reduce failures - Prioritize replacing SacRT starter line substations with new equipment - Upgrade cooling for substations with undersized systems - Develop a heat-resilience plan for TPSS locations, including assessments and specifications for cooling improvements - Identify and pursue funding opportunities to support TPSS cooling upgrades - Classify TPSS cooling improvements as a high-priority need for planning and resource allocation	SacRT- LRM	High	$-$$ Varies based on project scope

IMPLEMENTATION ACTION	DESCRIPTION	IMPLEMENTING DEPARTMENT	PRIORITY	COST
RT-4-4. Light Rail Track Heat Resiliency Operational Recommendations	- Develop an SOP for light rail track heat resiliency, outlining actions and timing during extreme heat events - Continue mitigation practices such as slow orders and operational monitoring of tracks and OCS - Note international practices, such as Japan's use of track-cooling sprinklers, while considering potential risks from sudden temperature changes	SacRT- LRM/LROPS	High	$

3.2.5 IMPLEMENT ZERO EMISSION BUS RECOMMENDATIONS

As SacRT expands its ZEB fleet, it is important for the associated infrastructure and services to be resilient to power outages and other types of climate events.

↓$	below $500k	$$	$500k - $5mil	↑$$$	above $5mil

TABLE 3-15. SACRT IMPLEMENTING ACTIONS: IMPLEMENT ZERO EMISSION BUS SUBTASK RECOMMENDATIONS

IMPLEMENTATION ACTION	DESCRIPTION	IMPLEMENTING DEPARTMENT	PRIORITY	COST
RT-5-1. Strengthen Power Resilience for Existing and New Bus Facilities	- Implement backup power systems (e.g., generators, solar panels, battery storage) - Enhance heat mitigation (e.g., shade sails and reflective pavements to reduce heat impact) - Develop resilience charging network considering modular charger design, early coordination with utilities, and real-time monitoring	SacRT- PL	High	$-$$ Varies based on solutions and scope

3.2.6 IMPROVE COMMUNICATION CHANNELS

Clear and efficient outage communication is essential for minimizing service disruptions. By identifying SMUD's protocols for notification, SacRT can streamline coordination and improve response during power outages.

TABLE 3-16. SACRT IMPLEMENTING ACTIONS: IMPROVE COMMUNICATION CHANNELS

↓$ below $500k	$$ $500k - $5mil	↑$$$ above $5mil

IMPLEMENTATION ACTION	DESCRIPTION	IMPLEMENTING DEPARTMENT	PRIORITY	COST
RT-6-1. Ways of Streamlining Outage Communications between SMUD and Agencies	- Identify SMUD protocol for outage comms, including who, when, and how	SacRT-EHS/LRM/SOC/MKT	High	$

3.2.7 INVEST IN BACK-UP POWER SYSTEMS

Reliable backup power is essential for maintaining transit operations during outages and extreme heat. By evaluating battery storage options, upgrading generators, and partnering with SMUD for resiliency programs, SacRT can ensure critical systems remain functional and minimize service disruptions.

TABLE 3-17. SACRT IMPLEMENTING ACTIONS: INVEST IN BACK-UP POWER SYSTEMS

↓$ below $500k	$$ $500k - $5mil	↑$$$ above $5mil

IMPLEMENTATION ACTION	DESCRIPTION	IMPLEMENTING DEPARTMENT	PRIORITY	COST
RT-7-1. Develop Battery Storage from Solar Energy	- Determine how much redundancy this storage would provide and feasibility as alternative power source during outage. - Evaluate battery storage capacity, ROI, and capability to support facilities during heat events	SacRT- FAC/ENG/PL	Low	$-$$ Varies based on project scope

IMPLEMENTATION ACTION	DESCRIPTION	IMPLEMENTING DEPARTMENT	PRIORITY	COST
	- Confirm current battery maintenance responsibilities and whether new tasks fall to facilities - Review wayside backup batteries: age, efficiency, and replacement needs - Reach out to SMUD for resiliency battery storage programs and potential locations - Conduct regular review of battery technology and vendor options to ensure up-to-date resiliency			
RT-7-2. Secure Generators for Temporary and/or Permanent Deployment at Stations	Though there is an additional maintenance cost with additional backup generators (or batteries), they are critical. - Procure portable or fixed generators at priority stations. - Evaluate power needs for stations and light rail platforms during outages, including generator use for essential systems - Assess feasibility of temporary solutions (e.g., using parking lots, running buses) during platform outages - Explore SMUD support or loan programs for emergency power equipment instead of SacRT purchasing for rare events	SacRT- FAC	Low	$-$$

3.2.8 MITIGATE HIGH HEAT AT BUS STOPS, LIGHT RAIL STATIONS, & ALONG PRIORITY CORRIDORS

Improving comfort and safety at transit stops, particularly those identified as higher risk in **Figure 2-17** and **Figure 2-18**, makes transit a more appealing mode choice and prevents mode shift away from transit on hotter days. By advancing cooling strategies, shade solutions, and clear signage, SacRT can create more accessible, heat-mitigated stops that enhance the passenger experience.

TABLE 3-18. SACRT IMPLEMENTING ACTIONS: MITIGATE HIGH HEAT AT BUS STOPS, LIGHT RAIL STATIONS, & ALONG PRIORITY CORRIDORS

↓$	below $500k	$$	$500k - $5mil	↑$$$	above $5mil

IMPLEMENTATION ACTION	DESCRIPTION	IMPLEMENTING DEPARTMENT	PRIORITY	COST
RT-8-1. Install Shade and Other Heat Mitigation Amenities at Priority Bus Stops and Stations	- Develop preliminary design and obtain environmental clearance - Conduct high-level scoping (including identification of need) partnering with CIPs - Coordinate with the City of Sacramento to clarify property ownership and maintenance responsibilities for bus stops - Conduct a study on cooling strategies for light rail and bus stops, using Los Angeles as a case study - Explore shade solutions for stops where feasible. Note international practices, such as Korea's use of retractable canopies for pole-only bus stops, while considering potential risks from canopies getting stolen - Assess bench installation feasibility at bus stops, noting constraints at pole-only locations - Assess type(s) and feasibility of cooling amenities at light rail stations (i.e., hydration stations, misters, etc.)	SacRT- FAC	High	$-$$ Varies based on project scope
RT-8-2. Improve SacRT Wayfinding Signage to Withstand Extreme Heat	- Repaint/upgrade existing signage - Ensure new signage withstands expected conditions - Clear direction on where to go/what to do	SacRT- FAC	High	$

3.2.9 SECURE FUNDING FOR ADAPTATION

Securing diverse funding sources is critical to advancing SacRT's resilience and adaptation projects. By identifying federal, state, and regional grants, establishing joint proposal processes, and partnering with agencies and organizations, SacRT can maximize resources and competitiveness for climate and infrastructure initiatives.

TABLE 3-19. SACRT IMPLEMENTING ACTIONS: SECURE FUNDING FOR ADAPTATION

↓$ below $500k	$$ $500k - $5mil	↑$$$ above $5mil

IMPLEMENTATION ACTION	DESCRIPTION	IMPLEMENTING DEPARTMENT	PRIORITY	COST
RT-9-1. Pursue Opportunities for Federal, State, and Regional Funding	- Identify applicable state and federal grants - Establish joint proposal process for grant applications - Identify partners to help broaden scope of potential funds and competitiveness for those funds (e.g. work with Sacramento County Public Health on opportunities related to climate change and health)	SacRT- PL/GR	Medium	$

3.2.10 SUPPORT CRITICAL TRANSPORTATION FACILITY BUILDING RESILIENCE

Strengthening building resilience is essential for SacRT's operations under extreme heat. By prioritizing HVAC upgrades at critical facilities, exploring cool roofing strategies, and leveraging partnerships for energy-efficient improvements, SacRT can protect infrastructure, reduce heat risks, and enhance long-term sustainability.

TABLE 3-20. SACRT IMPLEMENTING ACTIONS: CRITICAL TRANSPORTATION FACILITY BUILDING RESILIENCE

↓$ below $500k	$$ $500k - $5mil	↑$$$ above $5mil

IMPLEMENTATION ACTION	DESCRIPTION	IMPLEMENTING DEPARTMENT	PRIORITY	COST
RT-10-1. Replace Aging HVAC Systems with More Energy-Efficient and Newer Systems That Can Withstand Extreme Temperatures	- Review and prioritize HVAC systems at critical locations (control centers, dispatch, server rooms) - Track aging HVAC units, identify replacement needs, and maintain progressive replacement plans - Confirm budget sources for HVAC replacements and document for planning purposes - Explore opportunities to include HVAC adaptation and replacement plans in adaptation grant applications	SacRT- FAC	Medium	$-$$ Varies based on project scope
RT-10-2. Cool Roofing	- Explore cool roofing options (reflective surfaces, vegetation) and document maintenance, cost-benefit, ROI, and other benefits - Identify partnerships and incentives for cooling and HVAC programs, including reaching out to SMUD - Create a plan for cooling/HVAC improvements and share with SMUD for potential incentives	SacRT- FAC	Low	$-$$ Varies based on project scope

3.2.11 UPDATE EXISTING OR DEVELOP NEW EMERGENCY PLANS

Strengthening SacRT's emergency preparedness is essential to ensure safety and operational continuity during extreme events. By consolidating evacuation and shelter protocols, coordinating with city, state, and agency partners, and implementing annual drills, SacRT can establish clear procedures and maintain resilience for transportation and emergency services.

TABLE 3-21. SACRT IMPLEMENTING ACTIONS: UPDATE EXISTING OR DEVELOP NEW EMERGENCY PLANS

↓$ below $500k	$$ $500k - $5mil	↑$$$ above $5mil

IMPLEMENTATION ACTION	DESCRIPTION	IMPLEMENTING DEPARTMENT	PRIORITY	COST
RT-11-1. Designate 'Emergency Bus Stops' for Pickup During Emergencies and Communicate These to the Public	- Compile a list of high-priority safe zones for downtown evacuation based on elevation and accessibility - Coordinate with city, state, and agency partners (Red Cross, FEMA, G1C, Republic Stadium) for safe zone management and final routing - Develop and maintain annual drills for evacuation and shelter operations - Establish a clear chain of command and SOP for emergencies	SacRT- FAC/OPS	Medium	$
RT-11-2. Develop a Plan Regarding How to Stage Buses at Future Satellite Yards to Allow Quicker Deployment During Emergencies	- Develop an SOP for staging buses and operations staff during emergencies, including restroom and basic facility needs - Consult FEMA and Red Cross for recommendations on safe emergency sites and evaluate Park and Ride locations (Power Inn, Sunrise, Florin, Meadowview) - Identify the best stations for SacRT and other emergency services coordination	SacRT- EHS/OPS	Medium	$
RT-11-3. Develop a Protocol Regarding How to Fuel Buses Prior to Expected Weather Event	- Determine safe and suitable locations for CNG buses during emergencies - Assess ability to respond quickly versus planning for anticipated scenarios - Determine protocol for ZEV fueling during extreme weather events and/or other emergencies.	SacRT- BM	Medium	$
RT-11-4. Develop an Emergency Preparedness / Operations Plan for Transit Facilities	- Develop and implement an annual evacuation drill - Ensure drill is citywide and coordinated with all relevant agencies	SacRT- EHS/FAC	Medium	$

4. IMPLEMENTATION

The SacAdapt adaptation strategies primarily guide policy, maintenance, and operational recommendations to support climate resilience and operational reliability across Sacramento's transportation and utility infrastructure. However, additional implementation guidance resources were developed to inform strategic implementation tailored to local conditions.

Each section summarizes ongoing implementation efforts for each recommended strategy, as well as key takeaways from the strategy implementation guidance.

4.1 CREATE BUILT ENVIRONMENTS THAT REDUCE EXPOSURE TO EXTREME HEAT AND MITIGATE URBAN HEAT ISLAND EFFECT

Sacramento faces worsening heat waves, exacerbated by the urban heat island effect. By the 2080s, an estimated 50 days per year on average may exceed 100°F, with hotspots along major corridors and industrial zones, while green spaces stay cooler.

The implementing actions within this strategy focus on expanding tree canopy and other shade structures, expanding drinking water access, piloting cool pavements, depaving, and other efforts that can streamline travel time for people walking and biking.

The City is already taking many steps to mitigate the impacts of extreme heat, including but not limited to:

- Adoption of the Sacramento Urban Forest Plan in 2025.
- Scheduled update to the City's Street Design Standards, which will identify opportunities to incorporate street trees.
- Planned work to develop minimum tree planting requirements for new development and update design guidelines to incorporate heat-resilient strategies into private development.

Guidance was developed to support the implementation of other key actions where there are agency knowledge gaps and/or questions about cost-effectiveness.

4.1.1 COOL PAVEMENTS

Cool pavements utilize high-albedo materials and reflective coatings to decrease the amount of heat that pavements absorb. At a large scale, cool pavements offer the potential to mitigate the urban heat island effect. However, studies have found mixed results on the impacts of cool pavement on pedestrian comfort and, overall, they conclude that cool pavements paired with shade trees, bus shelters, and vegetated parkways yield better results than cool pavements alone.

There is high variability in the cost-effectiveness of cool pavements (see **Technical Appendix D: Implementation Guidance** for more details), with lifecycle costs often outweighing expected benefits and many of the maintenance and lifespan assumptions still under research.

To better test effectiveness of cool pavement in Sacramento, Implementation Action C-3-7 recommends that the City seek grant funding to pilot (and ideally fund near-term maintenance) of cool pavement technologies. This will allow localized evaluation of the efficacy of cool pavement technologies and required maintenance. Results from the pilot can inform a policy-level approach to cool pavement implementation. Funding for upfront construction and ongoing maintenance will be a significant challenge for cool pavements, as the City has an unfunded backlog of approximately over $400 million in pavement maintenance costs that are increasing exponentially.[9]

4.1.2 INNOVATIVE APPROACHES TO INCREASING TREE SOIL VOLUME

Trees provide natural cooling through shade and evapotranspiration, making them a cost-effective and visually appealing long-term solution to reducing heat exposure (see Implementation Action C-3-5). Effective implementation requires careful selection of tree species suited to local conditions, proper placement to maximize shade and avoid conflicts with utilities and other infrastructure, and, importantly, sufficient soil volume and quality for healthy growth.

In urban areas with limited space, advanced techniques like soil-cell systems or structural soils (as shown in **Figure 4-1**) can be used to increase soil volume beneath the pavement, supporting larger, healthier trees even in constrained sites.

As discussed in **Technical Appendix D: Implementation Guidance**, while traditional soil pits tend to be more economical, costlier engineered soil systems can be justifiable in some cases, such as providing rooting volume under paving or preventing sidewalk heave. Broader benefits such as shade, heat island mitigation, stormwater management, and long-term tree health

[9] City of Sacramento Pavement Condition Report (2025 Update) https://www.cityofsacramento.gov/content/dam/portal/pw/Maintenance-Services/Sacramento%202025%20Pavement%20Condition%20Report.pdf

should guide decisions. Benefits of tree planting scale nonlinearly with more trees, as well as with mature trees.

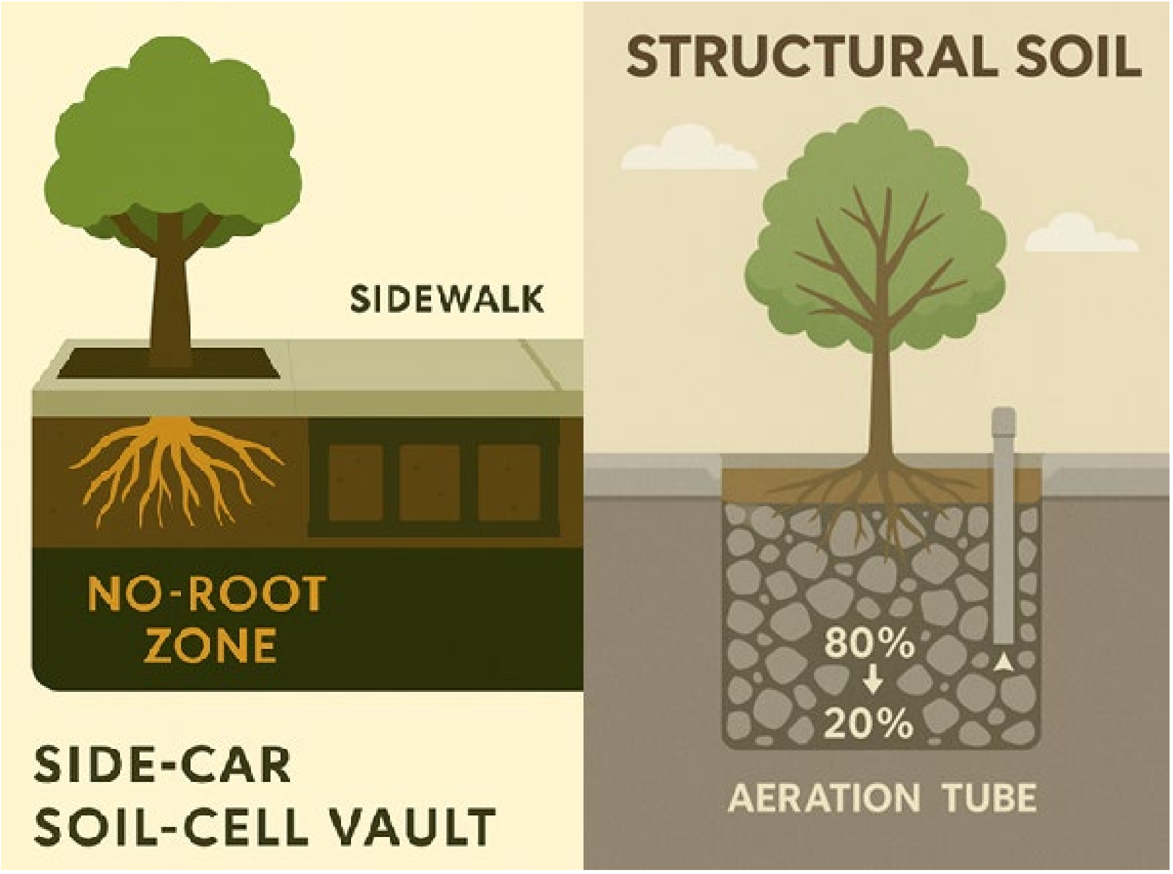


FIGURE 4-1. A SCHEMATIC OF SOIL-CELL AND STRUCTURAL SOIL SYSTEMS.

4.1.3 SHADE STRUCTURES

Shade structures are used where planting trees is impractical due to space, utility conflicts, or other constraints (see Implementation Actions C-3-1 and C-3-4). These structures (e.g., covered walkways as shown in **Figure 4-2**, and carports) use solid or semi-solid materials to block sunlight and protect users from heat, rain, and wind. **Technical Appendix D: Implementation Guidance** outlines various structure types and their typical locations, sizes, and integrated features like lighting, solar panels, security cameras, and signage.

Material selection is crucial for durability, heat resilience, and maintenance; options include stainless steel, concrete, aluminum, composites, and specialized fabrics, each with different lifespans and costs. Design strategies emphasize ventilation, high solar reflectance, and vandal resistance.

Though upfront costs are higher, covered walkways and carports deliver strong long-term value through improved comfort, vehicle protection, and heat resilience. Integrating features like solar panels or tree shading enhances sustainability and emission reduction. Cost-effectiveness can be optimized in high-use or heat-sensitive areas, with design and site conditions key to planning.

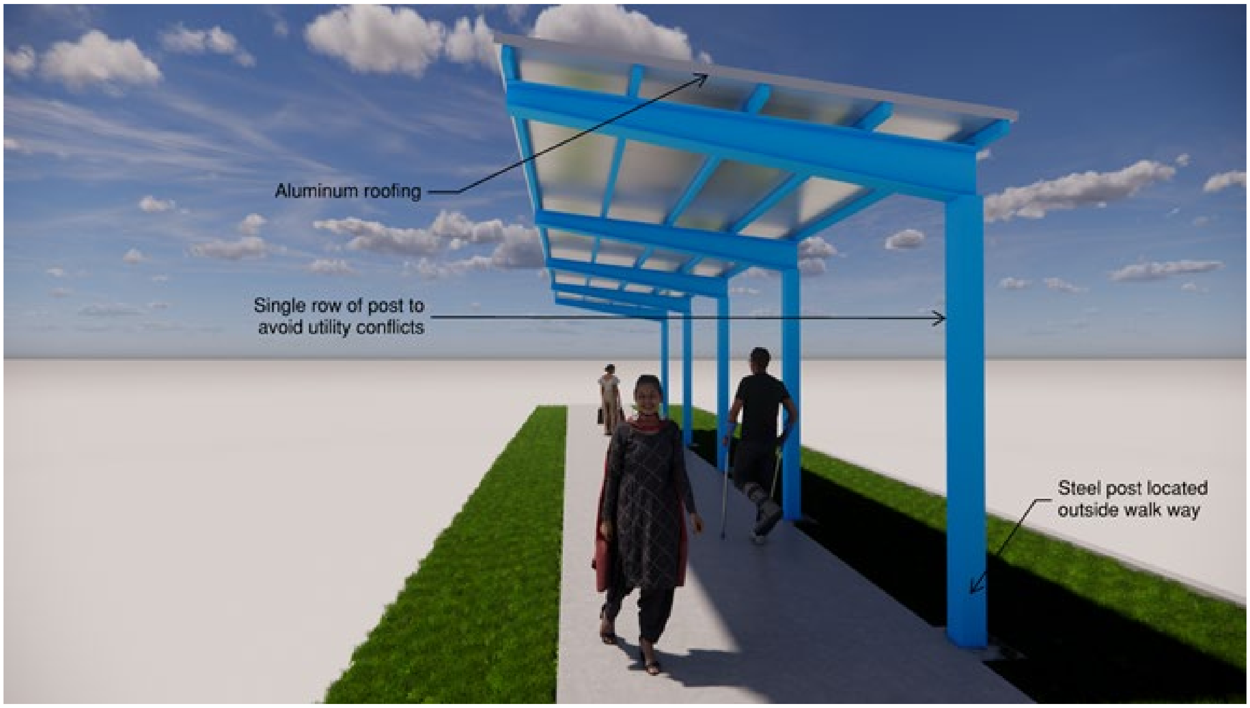


FIGURE 4-2. COVERED WALKWAY DESIGN USING ROOF WITH HIGH SOLAR REFLECTIVE INDEX AND HIGH ENOUGH ELEVATION TO REDUCE HEAT TRANSMISSION TO OCCUPANTS

4.2 CREATE BUILT ENVIRONMENTS RESILIENT TO THE IMPACTS OF EXTREME HEAT

Extreme heat poses a growing threat to urban infrastructure, reducing the reliability and lifespan of critical assets. Pavement, traffic signal systems, and signage are particularly vulnerable to heat-related damage, which can lead to safety hazards, service disruptions, and costly repairs.

The implementing actions within this strategy focus on the ability of City infrastructure, including pavement, traffic signal loops and cabinets, and signs, to withstand the impacts of extreme heat.

The City is already taking many steps to mitigate the impacts of extreme heat, including but not limited to:

- Upgrading from traffic detection loops to video traffic detection during street redesign projects.
- Performing regular sign maintenance.

Guidance was developed to support the implementation of other key actions where there are agency knowledge gaps and/or questions about cost-effectiveness.

4.2.1 PAVEMENT BINDER GRADE

Sacramento's pavement specifications were assessed based on current and projected future temperatures. Pavement binder grades are selected based on temperature to avoid rutting in hotter conditions and cracking in colder conditions. The analysis suggested that current grades used in certain projects may be too low in Sacramento, even based on historical conditions. Implementation Action C-2-1 recommends updating the pavement binder grade specifications to meet current conditions with potential future adjustments as the climate continues to warm.

4.2.2 COOL PAVEMENTS

Cool pavements utilize high-albedo materials and reflective coatings to decrease the amount of heat that pavements absorb. Some studies suggest that cool pavement technologies may be able to improve pavement longevity by reducing the heat stress on pavement. However, many of the maintenance and lifespan assumptions are still under research.

As previously noted, there is high variability in the cost-effectiveness of cool pavements (see **Technical Appendix D: Implementation Guidance** for more details) and most of the products analyzed for this technical appendix had greater lifecycle costs than benefits.

Based on these findings, Implementation Action C-3-7 recommends that the City seek grant funding to pilot (and ideally fund near-term maintenance) of cool pavement technologies. This will allow localized evaluation of the required maintenance and any potential increases to pavement integrity and longevity. Results from the pilot can inform a policy-level approach to cool pavement implementation. Funding for up-front construction and ongoing maintenance will be a significant challenge for cool pavements, as the City has an unfunded backlog of approximately over $400 million in pavement maintenance costs that is increasing exponentially.[10] However, if cool pavement technologies are able to meaningfully increase pavement longevity with minimal ongoing maintenance, this may be a feasible approach to lower the UHI effect while also managing the City's deferred pavement maintenance.

4.3 INCREASE STORMWATER DRAINAGE CAPACITY

Flooding poses a significant challenge for Sacramento as climate change drives more intense storms and increases runoff from urbanized areas. Aging drainage systems, combined with impervious surfaces, heighten the risk of localized flooding, property damage, and service disruptions.

[10] City of Sacramento Pavement Condition Report (2025 Update) https://www.cityofsacramento.gov/content/dam/portal/pw/Maintenance-Services/Sacramento%202025%20Pavement%20Condition%20Report.pdf

The implementing actions within this strategy focus on designing and implementing drainage infrastructure upgrades, increasing green stormwater infrastructure, and ensuring adequate maintenance capacity so that drainage infrastructure works as designed.

The City is already taking many steps to increase stormwater drainage capacity, including but not limited to:

- Implementing an ongoing Capital Improvements Program, including multiple deferred maintenance programs such as Ditch/Channel Repair, Drainage Sump Rehabilitation/Replacement, and Drainage Collection System Rehabilitation/Replacement.
- Requiring new development projects to submit drainage studies and implement drainage mitigation methods to ensure they do not negatively impact the City's storm drain system.
- Inspecting portions of the drainage system regularly throughout the year. The summer maintenance program removes debris from channels, canals, and creeks that would otherwise impede water flow during winter storms and lead to bridge scour.

Guidance was developed to support the implementation of other key actions where there are agency knowledge gaps and/or questions about cost-effectiveness.

4.3.1 PERVIOUS PAVEMENTS

Pervious pavements, including pervious concrete, pervious asphalt, and pervious pavers, are a type of green stormwater infrastructure that can reduce stormwater runoff. Pervious pavements can be used for low- to medium-traffic areas such as alleyways, residential streets, and parking lots. An example cross-section of pervious pavement is shown in **Figure 4-3**.

There is high variability in the construction cost and amount of stormwater captured by pervious pavements, depending on the design and soil permeability; however, the three pervious concrete scenarios considered in **Technical Appendix D: Implementation Guidance** all had far greater lifecycle costs than benefits.

Based on these findings, pervious pavements should primarily be considered in locations that experience recurring localized flooding; have an acute negative impact on people walking, biking or taking transit; have soil conditions that support infiltration; and have alignment with grant funding to offset the higher construction costs.

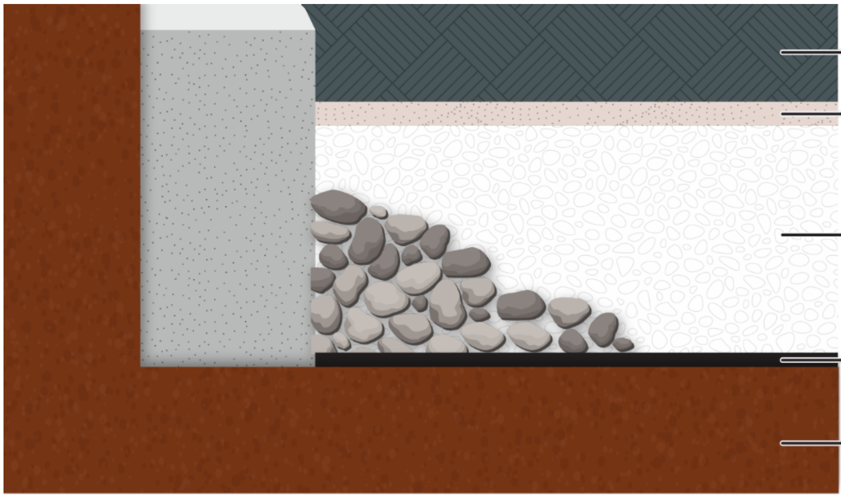


FIGURE 4-3. A SCHEMATIC OF PERVIOUS PAVEMENT

4.3.2 DRAINAGE BASIN MODELING

The Department of Utilities (DOU) has developed drainage models for selected drainage basins. However, the rainfall models and underlying data used in these analyses do not reflect recent climate trends or future projections. To address this gap, DOU seeks a comprehensive update of its basin drainage models, aiming to incorporate the latest precipitation data and expand model coverage within the city (see Implementation Action C-5-10). This effort would leverage new rainfall projections, updated climate studies, and advanced modeling techniques to enhance the accuracy and reliability of flood risk assessments and drainage master planning.

Technical Appendix D: Implementation Guidance provides strategic guidance for updating DOU's stormwater hydraulic models. It emphasizes the importance of comprehensive, up-to-date models for effective flood risk management, infrastructure investment, operational resilience, and regulatory compliance. The guidelines outline a three-step process: data gathering, hydrologic modeling, and hydraulic modeling, all aimed at expanding model coverage and integrating future climate and land use scenarios.

4.4 INVEST IN INFRASTRUCTURE MAINTENANCE

Maintaining Sacramento's transportation and flood protection infrastructure is vital for public safety, mobility, and resilience. Aging assets and intensifying climate impacts increase the risk of failures and costly repairs, making proactive upkeep of infrastructure a top priority.

The Implementing Actions from C-6-1 to C-6-6 within this strategy focus on preventative maintenance to City-managed roadways, bikeways, bridges, and floodgates.

Infrastructure maintenance is an ongoing effort and funding challenge. The City is taking many steps to invest in infrastructure maintenance, including but not limited to:

- Grant applications to secure funding to replace structurally deficient roadway bridges.

- A Floodgate Assessment that led to a successful grant-funded Floodgate Modernization Project.
- City staff tracking needed maintenance and repairs, as identified from Caltrans bridge inspections conducted every other year.

Guidance was developed to support the implementation of other key actions where there are agency knowledge gaps and/or questions about cost-effectiveness.

4.4.1 SCOUR MITIGATION

Scour is the erosion or removal of sediment (such as sand, gravel, or silt) from structures such as bridge foundations due to the action of flowing water. Bridge scour is the leading cause of bridge failures in the United States.[11] Scour is an increasing concern in Sacramento as climate change contributes to more intense precipitation and higher peak flows. These risks can be particularly pronounced at crossings over smaller, flashy creeks where older bridges may not have been designed to accommodate current or future hydrologic conditions. **Technical Appendix D: Implementation Guidance** summarizes strategies to reduce scour risk as well as permitting considerations for larger-scale measures (e.g., creek realignment) to address scour, with the Roseville Road bridge over Arcade Creek as a case study.

Bridge scour mitigation combines structural, hydraulic, monitoring, and design measures to protect foundations (Implementation Action C-6-6). Cost-effective options like riprap and gabions are common, while capital-intensive solutions such as sheet piles, concrete mats, and deep foundations are applied where risk is higher. Preventive design and monitoring reduce long-term vulnerability and are far more cost-effective than bridge replacement.

For the case study at the Roseville Road bridge, creek realignment could mitigate scour but requires extensive federal, state, and local permits for streambed alteration, fill discharge, and floodway work. The regulatory burden makes realignment less feasible than localized scour protection at the bridge.

4.4.2 INSPECTION CHECKLISTS

The guidance also provides inspection checklists and protocols for both scour-critical and bicycle-pedestrian bridges (see Implementation Action C-6-1).

The bicycle-pedestrian bridge inspection checklist focuses on ensuring public safety, structural integrity, and user comfort for lighter, non-vehicular bridges. It recommends an initial baseline inspection after construction, routine inspections, and special inspections after events like floods or vandalism.

The scour-critical bridge inspection checklist is designed for bridges with foundations vulnerable to erosion, following FHWA and Caltrans requirements. It calls for more frequent and

[11] https://www.fhwa.dot.gov/publications/focus/01feb/scour.cfm

event-driven inspections, especially after high-flow events, and includes pre-inspection review of records, hydraulic assessments, and safety planning.

A $10,000 cost per bridge inspection (about 40 hours) is a rough estimate for a routine visual assessment and report. This does not include traffic control, specialized or in-depth inspections, material testing, underwater work, or load rating. Actual costs may vary based on project needs. The City's preventative bridge maintenance backlog is estimated at over $29 million.

4.5 INCREASE COMMUNITY RESILIENCE TO PREPARE FOR CLIMATE IMPACTS

Building community resilience requires more than infrastructure – it relies on informed, engaged residents. Multi-hazard education and preparedness programs equip people with the knowledge to respond to extreme events, while inclusive City engagement ensures all voices are heard in planning and decision-making.

The implementing actions within this strategy focus on multi-hazard education and preparedness, inclusive City engagement, and expanded programming.

The City is already taking many steps to increase community resilience to prepare for climate impacts, including but not limited to:

- Flood preparedness outreach through City communication channels (including brochures, billboards, events, hotlines, and a dedicated email address), as well as an outreach program under the Community Rating System guidelines.
- Storm preparation outreach through City communication channels, outreach events, and community volunteers.
- Free CERT training for selected applicants.
- Emergency preparedness resources available online with in-page translation.
- Upgrades at the Pannell Community Center to create a Clean Air Center in the event of a smoke event, in addition to activation of weather respite centers during severe weather, cold weather, and hot weather.

All the implementation actions under this strategy involve the Office of Emergency Management (OEM) as a lead or support department. Consequently, strategy implementation will depend on OEM staff levels and supporting contracts. Additional funding may need to be identified to scale OEM staff levels based on industry best practices to appropriately serve Sacramento's population.

4.6 REDUCE RISK OF POWER OUTAGE

Power outages pose significant risks to community safety, critical infrastructure, and daily life. Addressing both the causes and consequences of outages is essential to maintaining reliable services and protecting vulnerable populations.

The implementing actions within this strategy focus on reducing the likelihood of a power outage occurring through tree trimming and debris removal and reducing the impacts of a power outage by expanding the coverage of back-up power solutions.

The City is already taking many steps to increase community resilience to prepare for climate impacts, including but not limited to:

- City tree crews meeting industry recommended maintenance standards, although increased maintenance may help further mitigate impacts.
- Following Caltrans standards for signal foundation depth and size to withstand wind loads.
- Ensuring the majority of City-managed critical facilities have an installed back-up generator to provide essential power during an outage.
- Safeguarding City pump stations with either a dedicated on-site back-up generator or ensuring they are served by a portable generator that is rotated between smaller facilities.

4.7 STRENGTHEN CITY GOVERNMENT CAPACITY FOR CLIMATE RESILIENCE

Climate resilience is built by embedding adaptive strategies into everyday city operations and decisions – not as a standalone effort, but across planning, budgeting, and emergency preparedness. This integration enables the City to proactively manage climate risks, protect essential services, and strengthen long-term community resilience.

The implementing actions within this strategy focus on embedding climate resilience strategies into government operations.

The City is already taking many steps to strengthen City government capacity for climate resilience, including but not limited to:

- Implementation of OSHA requirements for worker safety, including regular trainings and availability of adequate heat safety supplies. Re-scheduling some maintenance work to night shifts or early morning shifts to minimize work during times of high heat.
- Development of IT Disaster Recovery Plans.
- Pursuit of grant funding across sectors; for example, seeking climate resilience funds for floodgate improvements.

4.8 SUPPORT RESILIENCE OF TRANSIT FACILITIES

The implementation actions within this strategy focus on opportunities for the City to support, encourage, and work with SacRT in efforts to improve resilience of transit facilities. The City is already taking many steps to strengthen City government capacity for climate resilience, including but not limited to partnership with SacRT on the development of SacAdapt.

4.9 STRENGTHEN CITY GOVERNMENT DISASTER PREPAREDNESS AND CAPACITY FOR EMERGENCY RESPONSE

Strengthening disaster preparedness and emergency response within city government is essential for protecting the community during extreme events.

The implementation actions within this strategy focus on planning, trainings, and resources for emergency response. The City is already taking many steps to strengthen City government capacity for climate resilience, including but not limited to:

- Adopting plans, including the Comprehensive Flood Management Plan, All Hazards Emergency Operations Plan, and Local Hazard Mitigation Plan.
- Conducting regular internal training on disaster preparedness and response. Pursuing funding for large-scale exercises.
- Implementing extensive coordination and deployment of City staff based on river water levels (e.g., for close monitoring, levee patrol, or floodgate deployment).
- Leveraging public-facing tools to support disaster preparedness education.

All the implementation actions under this strategy involve the Office of Emergency Management (OEM) as a lead or support department. Consequently, strategy implementation will depend on OEM staff levels and supporting contracts. Additional funding may need to be identified to scale OEM staff levels based on industry best practices to appropriately serve Sacramento's population. Cross-departmental knowledge and coordination will be essential to support staff training and education.

4.10 CONSIDER EVACUATION NEEDS IN PLANNING

Effective evacuation planning is essential to protecting lives during emergencies such as floods, wildfires, and other hazards. As climate risks grow and urban areas become more complex, ensuring safe, timely, and accessible evacuation routes is critical.

The implementation actions within this strategy focus on planning for potential evacuation needs. The City is already taking many steps to consider evacuation needs in planning, including but not limited to:

- Engagement with emergency services staff as part of transportation planning projects.
- Development standards that reflect floodplain management and best practices.

In addition, when planning road diets, it is crucial to ensure that changes to street design do not hinder emergency evacuation (Implementation Action C-1-2). While road diets improve everyday safety by slowing traffic and reallocating space, they can reduce vehicle capacity during evacuations if not carefully designed. Features like mountable curbs, flexible bike lanes, and detachable bollards can allow roads to be quickly adapted for outbound traffic in emergencies. Case studies show that, with proper planning and coordination with emergency responders, road diets can enhance safety without compromising the ability to evacuate people efficiently when needed.

4.11 ENHANCE RESILIENCE OF TRANSIT TO HEAT EVENTS

This strategy focuses on enhancing the resilience of SacRT's light rail traction power substations (TPSS) and Overhead Catenary System (OCS) and its compressed natural gas (CNG) infrastructure to high heat events (Implementation Actions RT-4-1, RT-4-2, RT-4-3 and RT-4-4).

4.11.1 INVEST IN AGING LIGHT RAIL SUBSTATIONS

SacRT's TPSS are responsible for powering portions of the light rail services. These substations are considered mission critical sites and require a myriad of support systems to operate properly. One of these support systems is the HVAC system. HVAC systems are vital to prevent substation overheating and condensation, and to reduce dust infiltration and accumulation of dangerous gases. A properly maintained and designed HVAC system is necessary for reducing service downtimes, improving electrical equipment efficiency, mitigating risks to mission critical equipment, and protecting SacRT staff. HVAC equipment needs to be replaced as it reaches the end of its useful life.

Technical Appendix D: Implementation Guidance documents conditions at one of the many substations facing challenges during high temperatures. The assessment suggests that recurring high temperature alarms are linked to deficiencies in the existing HVAC systems, including aging equipment, lack of proper ventilation features, and the potential for undersized cooling capacity relative to current electrical loads. Addressing these issues is essential to maintaining reliable substation operation, preventing service disruptions, and protecting mission critical electrical infrastructure. Implementing a comprehensive, engineered HVAC replacement supported by formal load analysis offers the most effective long-term solution. Regardless of the selected approach, additional improvements such as dedicated battery exhaust, controlled outside air intake, and proper filtration will enhance safety, performance, and maintainability across SacRT's substation network.

4.11.2 INVEST IN CNG INFRASTRUCTURE

SacRT depends on compressed natural gas (CNG) fueling infrastructure and associated control systems to fuel its CNG fleet. However, aging compressors and outdated controls have led to rising maintenance costs, limited diagnostics, and increased risk of unplanned downtime, especially during periods of extreme heat. These challenges not only threaten operational reliability and safety but also highlight broader organizational needs to embed resilience and adaptive strategies into daily operations. Addressing these vulnerabilities can help SacRT maintain reliable transit service and support the City's climate resilience goals.

To enhance the resilience of SacRT's existing bus fleet and operations, **Technical Appendix D: Implementation Guidance** provides high-level guidance on how to make its existing CNG compressors and associated equipment more resilient to high heat conditions. Advanced compressors and control systems enable real-time diagnostics and predictive maintenance, reducing unplanned outages and extending asset life (see Implementation Action RT-4-1).

4.12 MITIGATE HIGH HEAT AT BUS STOPS, LIGHT RAIL STATIONS, & ALONG PRIORITY CORRIDORS

In many urban areas, limited space, utility lines, and other restrictions make tree planting impractical. Installing shade structures can often be a more feasible solution. These structures (bus shelters as shown in **Figure 4-4**, light rail stations, and transit pavilions) use solid or semi-solid materials to block sunlight and protect users from heat, rain, and wind (see Implementation Action RT-8-1). **Technical Appendix D: Implementation Guidance** outlines various structure types, their typical locations, sizes, and integrated features like seating, lighting, and signage.

Material selection is crucial for durability, heat resilience, and maintenance; options include stainless steel, concrete, aluminum, composites, and specialized fabrics, each with different lifespans and costs. Design strategies emphasize ventilation, high solar reflectance, and vandalism resistance. Installing bus shelters can be cost-effective despite higher upfront costs, as long-term benefits such as improved heat resilience, emission reductions, and enhanced rider experience can outweigh initial expenses. Pairing shelters with tree shading can further amplify heat mitigation and add aesthetic value. Shelters are best suited for high-ridership or heat-vulnerable areas, with design, materials, and site conditions influencing costs.

FIGURE 4-4. BUS SHELTER DESIGN USES PERFORATED PANELS AND LOUVERS TO MAXIMIZE SUN SCREENING AND ALLOW VENTILATION

5. CONCLUSION

Over the coming decades, Sacramento is expected to see hotter conditions, heavier precipitation events, and greater risk of flooding from the American and Sacramento rivers. Changes in Sacramento's climate will pose everyday challenges to the integrity of transportation infrastructure. Additionally, impacts to user comfort will become increasingly impacted by more hot days and longer heatwaves, posing a major obstacle to City goals for increasing the percentage of trips taken by walking, biking, and public transit.

Sacramento must be prepared for acute events, such as intense winter storms where wind and heavy rain disrupt the transportation system and power grid. The region must also be ready for lower likelihood, but potentially catastrophic, events such as major levee failure, when the transportation system must facilitate large-scale evacuation.

The transportation system is vulnerable to these changes, but adapting the system can enhance the resilience of the city and region.

The implementation guidance developed for SacAdapt will help the City and SacRT advance adaptation strategies in the most strategic and cost-effective ways. Some of the SacAdapt recommendations, particularly regarding expanded stormwater modeling, are aimed at improving analytics used to evaluate where resilience investments are most impactful.

SacAdapt is a detailed examination of how climate hazards can and will affect the Sacramento transportation system – a relatively focused topic. Going forward, the City and SacRT will need to balance adaptation with a broader set of needs. For both the City and SacRT, this means better integrating climate resilience as one criterion among several (equity, safety, etc.) in how to prioritize and fund projects and maintenance activities.

Adequately funding infrastructure resilience improvements will be a challenge and will require significant financial resources. The City and SacRT will need to continue to be creative and flexible in finding ways to fund priority activities, including pursuing competitive funding programs and considering other revenue and funding sources.

The competitive funding landscape for adaptation and resilience projects is dynamic and will need to be monitored as grant funding opportunities shift at the Federal and State levels. Many of the priority adaptation actions highlighted in SacAdapt provide multiple types of benefits; and staff should consider the nexus between transportation adaptation strategies and climate resilience, public health, and emergency preparedness in the pursuit of diverse sources of funding to supplement traditional transportation-specific programs.

For example, California's Proposition 4, the Safe Drinking Water, Wildfire Prevention, Drought Preparedness, and Clean Air Bond Act of 2024, a $10 billion bond measure[12], has several

[12] https://lao.ca.gov/Publications/Report/5076

programs focused on climate resilience being rolled out in 2026, with many programs proposing multiple cycles of funding. Proposition 4 augments previously established sources such as FHWA PROTECT formula and discretionary funds for transportation resilience; other Federal grant programs for transportation, such as USDOT Better Utilizing Investments to Leverage Development (BUILD) and FTA grants; CA Senate Bill 1, the Road Repair and Accountability Act; and other State funding. Sacramento should continue to be opportunistic about funding sources coming from the State and Federal levels but also ready to address high-priority but unmet resilience funding through local funding sources such as an increase in its sales tax or other revenue-generating mechanisms.

By emphasizing priorities, providing information about feasibility and cost-effectiveness, and demonstrating the need for investment, SacAdapt supports the funding and implementation of a more resilient Sacramento.