Vulnerability Assessment

City of Santee Safety and Environmental Justice Element

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Table of Contents

Figures

Tables

Section 1 Climate Change and Climate Vulnerability

1.1 What is Climate Change?

Climate change is a long-term change in the average meteorological conditions in an area. The global climate is changing due to an increase in greenhouse gas (GHG) emissions that trap heat near Earth's surface. GHGs (at some levels) are necessary to maintain a comfortable temperature on Earth; however, an increased concentration of GHGs due to human activity that traps additional heat can change Earth's climate system in several ways. Climate change can create intensified or new hazardous conditions that can increase the risk of damage to critical infrastructure, injury to sensitive populations, and disruption of essential services. The City of Santee has prepared a Vulnerability Assessment to gain a better understanding of how a changing climate may impact Santee and to identify which aspects of the community—including people, infrastructure, and services—are most vulnerable to climate change's effects.

1.2 What is Vulnerability?

The following definition was developed by the Integrated Climate Adaptation and Resiliency Program Technical Advisory Council. The program's definition of "vulnerability" is meant to provide a clear understanding of the multiple components that characterize vulnerable communities.[1] This definition also draws upon the work of the Intergovernmental Panel on Climate Change and the California Climate Justice Working Group.[2]

> *"Climate vulnerability describes the degree to which natural, built, and human systems are at risk of exposure to climate change impacts. Vulnerable communities experience heightened risk and increased sensitivity to climate change, but also have less capacity and fewer resources to cope with, adapt to, or recover from climate impacts. These disproportionate effects are caused by physical (built/environmental), social, political, and/or economic factors, which are exacerbated by climate impacts."*

Executive Order B-30-15 directs state agencies to integrate climate change into all planning efforts, including accounting for current and future climate conditions. Executive Order B-30-15 mandates this because "climate change will disproportionately affect California's most vulnerable people," and all "state agencies' planning and investments shall . . . protect California's most vulnerable populations."[3] Section 2, Vulnerable Communities/Sensitive Populations, provides descriptions of how some populations are more vulnerable to the impacts of climate change than others.

[1] OPR (Governor's Office of Planning and Research). 2018. Defining Vulnerable Communities in the Context of Climate Adaptation. July. Accessed July 2023. http://www.opr.ca.gov/docs/20200720-Vulnerable_Communities.pdf.

[2] CJWG (Climate Justice Working Group). 2017. Advancing Climate Justice in California: Guiding Principles and Recommendations for Policy and Funding Decisions. August. Accessed July 2023. https://www.healthyworldforall.org/en/pdf/AdvancingClimateJusticeInCaliforniaWithoutAppendix.pdf.

[3] OPR (Governor's Office of Planning and Research). 2018. "Vulnerable Populations." In Executive Order B-30-15 Resiliency Guidebook. Accessed July 2023. http://opr.ca.gov/docs/20180312-Vulnerable_Communities_Descriptions.pdf.

1.3 Climate Vulnerability and Climate Resilience

Climate vulnerability describes the ways in which a person or a community (receptor) is susceptible to sustaining harm or damage (impact) as a result of climate change. Climate vulnerability is a function of (1) climate-related changes in conditions that are experienced by a receptor and (2) the receptor's sensitivity to experiencing impacts because of those changing conditions. **Climate resilience** describes the receptor's ability and capacity to cope with or adapt to impacts caused by climate change.

Climate vulnerability is related to physical factors, such as whether a community is likely to experience increases in the frequency of dangerously high-heat events or to be flooded during more frequent/intense storms, as well as social and economic factors, such as inequities in access to and benefits of education, economic investment, and government services.

Climate vulnerability is experienced by urban, suburban, and rural communities, but communities may be vulnerable in different ways, depending on the context and the relative presence/absence of the above factors. An individual or community may be vulnerable with respect to multiple factors of vulnerability at once. The cumulative impacts of these disparities and inequities may contribute to heightened vulnerability among certain groups, which are often referred to as "vulnerable communities" or "sensitive populations" (see Section 2 for further discussion of vulnerable communities/sensitive populations).

1.4 Climate Change Modeling

This Vulnerability Assessment evaluates the ability of Santee's vulnerable populations to adapt to the impacts of four climate change hazards (extreme heat, wildfire, extreme precipitation, and drought). The assessment uses Cal-Adapt modeling and supplemental analysis to project the impacts of these climate change hazards. Cal-Adapt provides local climate projections for jurisdictions in California using climate scenarios. Climate projections from Cal-Adapt and other sources rely on climate models, which are computer simulations that forecast future climate conditions under the various climate scenarios, described further below. While no model can project future conditions perfectly, current models are heavily reviewed by climate scientists and can accurately reproduce observed climate conditions.

The Intergovernmental Panel on Climate Change, an organization that represents the global scientific consensus about climate change, has identified four climate scenarios, which are referred to as "Representative Concentration Pathways" (RCPs), that can be used to project future climate conditions. RCPs are different scenarios that measure the future severity of climate change. RCP scenarios are defined by assumptions for the growth of GHG emissions and an identified point at which GHG emissions are expected to begin declining (assuming various GHG reduction policies or socioeconomic conditions). The four RCP scenarios, RCP 2.6, RCP 4.5, RCP 6.0, and RCP 8.5,

are labeled with different numbers that refer to the increase in the amount of energy that reaches each square meter of Earth's surface under that scenario. The greater the number, the more severe future climate change conditions could be. For example, RCP 8.5 is the "business as usual" projection, which assumes that GHG emissions will continue to rise until at least the end of the 21st century. Below is a summary of the four RCPs:

- **RCP 2.6:** Global GHG emissions peak around 2020 and then begin to decline substantially (low-emissions scenario).
- **RCP 4.5:** Global GHG emissions peak around 2040 and then begin to decline.
- **RCP 6.0:** Global emissions continue to rise until the middle of the century (2050).
- **RCP 8.5:** Global emissions continue to increase at least until the end of the century (2100) (high-emissions scenario).[4]

RCP 4.5 and RCP 8.5 are displayed in Cal-Adapt's tools, allowing users to assess emission-dependent variability to evaluate a medium-emissions scenario (RCP 4.5) alongside a high-emissions scenario (RCP 8.5). Cal-Adapt's models represent the range of expected climate changes (e.g., annual average maximum temperature) under RCP 4.5 and RCP 8.5. The Governor's Office of Planning and Research (OPR) recommends that agencies use RCP 8.5 for analyses considering impacts through 2050 because minimal differences exist between emissions scenarios during the first half of the century.[5] Per OPR's recommendation, this analysis uses RCP 4.5 and RCP 8.5 to model climate conditions and impacts related to climate change hazards in Santee.

1.5 Climate Adaptation Planning

The purpose of climate adaptation planning is to reduce vulnerability and increase the local capacity to adapt to projected climate change effects, as well as build resilience through adoption of goals and policies. A climate-resilient city is one that is prepared for the effects of climate change and can provide essential services during and after hazard events.

The California Adaptation Planning Guide (APG) was developed by the Governor's Office of Emergency Services as a resource for local governments to include climate adaptation and resilience in the City's Safety and Environmental Justice Element.[6] The APG was designed to ensure that the Vulnerability Assessment meets Safety Element requirements in California Government Code, Section 65302(g)(4), as updated by Senate Bill (SB) 379 and SB 1035. The APG provides guidance to local governments on local adaptation and resiliency planning by presenting an updated, step-by-step process that communities can use to plan for climate change.

[4] Cal-Adapt. 2021. "About Climate Projections and Models." Accessed July 2023. https://cal-adapt.org/help/get-started/about-climate-projections-and-models/.

[5] OPR (Governor's Office of Planning and Research). 2018. Planning and Investing for a Resilient California: A Guidebook for State Agencies. Accessed July 2023. http://opr.ca.gov/docs/20180313-Building_a_Resilient_CA.pdf.

[6] CalOES (Governor's Office of Emergency Services). 2020. California Adaptation Planning Guide. 22. June. Accessed July 2023. https://www.caloes.ca.gov/HazardMitigationSite/Documents/CA-Adaptation-Planning-Guide-FINAL-June-2020-Accessible.pdf.

The adaptation planning process consists of the following phases, as shown on **Figure 1, Adaptation Planning Process**. Public outreach and engagement should occur during all four phases the adaptation planning process:

- **Phase 1: Explore, Define, and Initiate.** This phase includes scoping the process and project by identifying the potential climate change effects and important physical, social, and natural assets in the community. It also identifies the key stakeholders in the local government and throughout the community.
- **Phase 2: Assess Vulnerability.** This phase determines the climate vulnerability of populations, natural resources, and assets in the community by analyzing potential impacts and the community's capacity to adapt. The Vulnerability Assessment identifies how climate change could affect the community.
- **Phase 3: Define Adaptation Framework and Strategies.** This phase focuses on creating an adaptation framework and developing adaptation strategies based on the results of the Vulnerability Assessment. The adaptation strategies are the community's response to the Vulnerability Assessment—that is, how the community will address the potential for harm identified in the Vulnerability Assessment given the community's resources, goals, values, needs, and regional context.
- **Phase 4: Implement, Monitor, Evaluate, and Adjust.** In this phase, the adaptation framework is implemented, consistently monitored and evaluated, and adjusted based on continual learning, feedback, and/or triggers.

Figure 1. Adaptation Planning Process

Source: CalOES 2020.

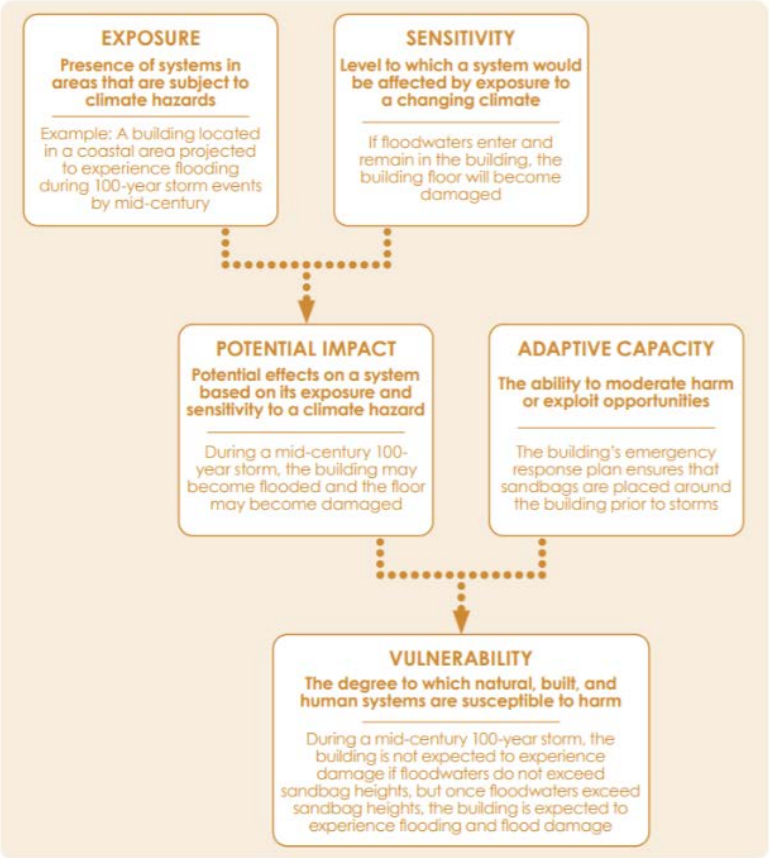
Phase 1 of the climate adaptation planning process (explore, define, and initiate) concluded that the primary hazards of concern for Santee are extreme heat, wildfire, extreme precipitation, and drought. In conformance with the APG, the City has prepared a Vulnerability Assessment that follows the process outlined in Phase 2 of the APG and identifies the risks that these hazards pose to Santee.

1.5.1 Assessing Vulnerability to Climate Change Hazards

For each of the four climate change hazards (extreme heat, wildfire, extreme precipitation, and drought) addressed in this Vulnerability Assessment, Santee's vulnerability to the hazard is assessed using each of the five following categories (**Figure 2, Vulnerability Assessment Phase 2**):

1. **Exposure:** The goal of this step is to characterize the community's exposure to current and projected climate hazards. Climate projection data from Cal-Adapt is used to develop projections for how existing hazards are expected to change by mid- and late century.
2. **Sensitivity:** This step identifies the populations (i.e., people) and assets (i.e., critical infrastructure) that are sensitive to localized climate change effects.
3. **Potential Impacts:** This step seeks to understand how sensitive populations and assets may be affected by climate change. "Potential impact" is a function of exposure and sensitivity.

Figure 2. Vulnerability Assessment Phase 2



Source: CalOES 2020 (Adapted by Harris and Associates 2022).

4. **Adaptive Capacity:** The purpose of this step is to characterize Santee's current ability to cope with climate impacts. Santee's ability to adapt to each identified climate impact is determined through a review of existing plans, policies, and programs and through stakeholder engagement.
5. **Vulnerability Scoring:** Vulnerability is a function of potential impact and adaptive capacity. The vulnerability scoring method allows the City to understand which populations and assets will potentially face the greatest threats and where gaps are in current planning efforts. The scoring rubric used to assess the potential impact, adaptive capacity, and overall vulnerability is shown on **Figure 3, Potential Impact and Adaptive Capacity Scoring Rubric**, and **Figure 4, Vulnerability Scoring Rubric**.

The Vulnerability Assessment assigns vulnerability scores to populations (i.e., people) and assets (i.e., critical infrastructure). The potential impact and adaptive capacity scores (**Figure 3**) determine the vulnerability score for each population and asset under each of the four climate

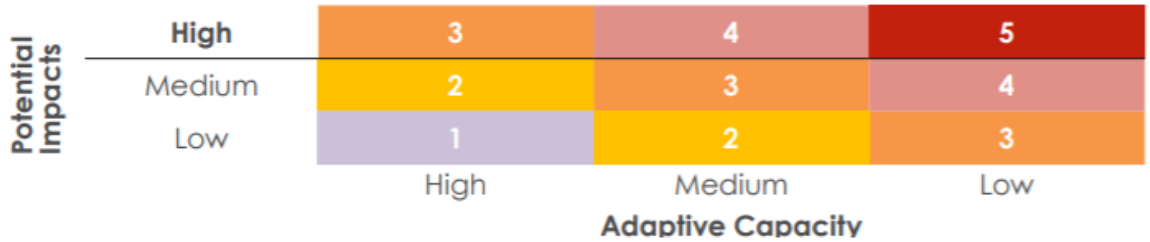
change hazards. The vulnerability score reflects how susceptible a population or asset is to harm from a particular hazard. Vulnerability is assessed on a scale of 1 to 5 (**Figure 4**). The matrix on Figure 4 shows how potential impact and adaptive capacity scores combine and translate into a vulnerability score. For example, if a hazard's potential impact is highly likely and the population or asset lacks capacity to manage this impact, there is a very high vulnerability to this hazard. Lower vulnerability scores indicate the population or asset has a lower vulnerability to the hazard; higher values indicate greater vulnerability.

Figure 3. Potential Impact and Adaptive Capacity Scoring Rubric

SCORE	POTENTIAL IMPACT	ADAPTIVE CAPACITY
Low	Impact is unlikely based on projected exposure; would result in minor consequences to public health, safety, and/or other metrics of concern.	The population or asset lacks capacity to manage climate impact; major changes would be required.
Medium	Impact is somewhat likely based on projected exposure; would result in some consequences to public health, safety, and/or other metrics of concern.	The population or asset has some capacity to manage climate impact; some changes would be required.
High	Impact is highly likely based on projected exposure; would result in substantial consequences to public health, safety, and/or other metrics of concern.	The population or asset has high capacity to manage climate impact; minimal to no changes are required.

Source: CalOES 2020 (Adapted by Harris and Associates 2022).

Figure 4. Vulnerability Scoring Rubric



Source: CalOES 2020 (Adapted by Harris and Associates 2022).

1.5.2 Relationship to Hazard Mitigation Planning

The information provided in the Vulnerability Assessment integrates information from the County of San Diego's Multi-Jurisdictional Hazard Mitigation Plan (MJHMP)[7] with supplemental

[7] County of San Diego. 2018. Multi-Jurisdictional Hazard Mitigation Plan. October. Accessed July 2023. https://www.sandiegocounty.gov/content/dam/sdc/oes/emergency_management/HazMit/2018/2018%20Hazard%20Mitigation%20Plan.pdf.

information collected through the Safety and Environmental Justice Element planning process. Assembly Bill (AB) 2140 and SB 379 allow jurisdictions with federally approved Local Hazard Mitigation Plans (LHMPs) to adopt their LHMPs in the Safety Element and incorporate by reference the relevant sections of the LHMP into the Safety Element. This Vulnerability Assessment incorporates by reference relevant sections of the County's 2018 FEMA-approved MJHMP, including Santee's profile, risk analysis, and identification of critical facilities in Santee. Because the County's update of the MJHMP is scheduled to occur in 2023, after the Safety and Environmental Justice Element, supplemental information related to critical facilities was collected for this assessment when available through additional sources. Sources include the County's 2018 MJHMP, Sustainable Santee Plan,[8] information collected from City staff, publicly available datasets, and SanGIS, which is the joint powers authority between the City and County that provides a regional geographic information system (GIS). The 2023 MJHMP update can be incorporated into the Safety and Environmental Justice Element at a later date, such as when the MJHMP is adopted or when the next Safety and Environmental Justice Element is updated.

Specifically, this Vulnerability Assessment incorporates the MJHMP's hazard identification, analysis of exposure and loss in Santee, information on historical hazard events, and list of critical community infrastructure and facilities within hazard zones. **Table 1, Critical Facilities**, includes the types of critical infrastructure evaluated in this Vulnerability Assessment. Supplemental analysis was performed using these definitions to evaluate new information that may have changed since 2018. In Section 3.1 through Section 3.4, the Vulnerability Assessment analyzes the potential impact and adaptive capacity of the following critical infrastructure categories to climate-driven hazards, including extreme heat, wildfire, extreme precipitation, and drought.

Table 1. Critical Facilities

Category	Description
City Operations	City Hall, Emergency Operations Center
Public Safety Facilities	Fire stations
Public Health Facilities	Hospitals
Community Centers	Libraries
Utility Facilities	Water treatment and distribution facilities
Critical Transportation	Airports, bridges
Schools	Educational facilities

1.6 Section 1 Summary

This section introduced climate vulnerability and the climate adaptation planning process, which is used to achieve climate resilience. Section 1, Climate Change and Climate Vulnerability, also explained the methodology of scoring vulnerability of populations and assets by using the Potential

[8] City of Santee. 2019. "Sustainable Santee Plan: The City's Roadmap to Greenhouse Gas Reductions." Final. December. Accessed July 2023. https://www.cityofsanteeca.gov/Home/ShowDocument?id=18422.

Impact and Adaptive Capacity Scoring Rubric (**Figure 3**) and the Vulnerability Scoring Rubric (**Figure 4**). Finally, Section 1 identified the types of critical facilities included in the evaluation of climate change-related hazards (Section 3, Climate Change Hazards and Community Vulnerabilities). Section 2 will identify vulnerable populations included in the evaluation of climate change-related hazards and discuss how these populations are more vulnerable to the effects of climate change.

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Section 2 Vulnerable Communities/Sensitive Populations

The Vulnerability Assessment analyzes potential impacts on people and critical facilities, with a particular look at the types of populations that are most sensitive/vulnerable to climate change-related impacts. Vulnerable populations may include people with access and functional needs (AFNs), which consist of people in multi-lingual communities, families with infants and children, older adults, people with disabilities, and people experiencing homelessness (see Section 2.1, People with Access and Functional Needs). Vulnerable populations may also include people with existing chronic health conditions, people with low incomes, people experiencing homelessness, outdoor workers, children, and people without life-supporting resources. Several populations noted in this section (i.e., people with low incomes, people experiencing homelessness) are closely related to the "disadvantaged communities" identified in Section 5.3, Climate Adaptation and Resilience, of the Safety and Environmental Justice Element. Descriptions of vulnerable populations are summarized in **Table 2, Vulnerable Populations**, and described further in Section 2.1 through Section 2.8.

Table 2. Vulnerable Populations

Category	Description
People with AFNs	People in multi-lingual communities, families with infants and children, older adults, people with disabilities, and people experiencing homelessness
People with Existing Chronic Health Conditions	People with diabetes, cardiovascular diseases, psychiatric illnesses, respiratory diseases (e.g., asthma)
People with Low Incomes	People with incomes that are between 50 percent and 80 percent of the area median income (Note: The 2021 Area Median Income (AMI) for a four-person household in San Diego County was $95,100)
People Experiencing Homelessness	People who are living in a place that is not meant for human habitation, in emergency shelter, in transitional housing, or exiting an institution where a person temporarily resided
Outdoor Workers	People who spend most of their workday outside (e.g., gardeners, landscapers, and park/recreation staff)
Older Adults	People who are 65 years of age or older
Children	People who are 17 years of age or younger
People without Life-Supporting Resources	People who lack adequate housing or ways to cool living space, are renters/tenants, or are food-insecure

Notes: AFNs = access and functional needs

The City's Emergency Management Team, which includes the Care and Shelter Branch, have identified areas of Santee with high concentrations of vulnerable populations. The City continually works to identify individuals that fall into the AFN community criteria through engagement and outreach with local non-governmental organizations and Santee Fire Department personnel when these organizations locate AFN individuals while providing emergency services.

2.1 People with Access and Functional Needs

Per California Government Code, Section 8593.3, "'AFN populations' consists of individuals who have developmental or intellectual disabilities, physical disabilities, chronic conditions, injuries, limited English proficiency or who are non-English speaking, older adults, children, people living in institutionalized settings, or those who are low income, homeless, or transportation disadvantaged, including, but not limited to, those who are dependent on public transit or those who are pregnant."

For the purposes of assessing climate change vulnerability, "people with AFNs" have been divided into the following subgroups, which are described in Section 2.2 through Section 2.8:

- People with Existing Chronic Health Conditions
- People with Low Incomes
- People Experiencing Homelessness
- Outdoor Workers
- Older Adults
- Children
- People without Life-Supporting Resources

2.2 People with Existing Chronic Health Conditions

People with existing chronic health conditions are most impacted by the intersections of heat waves, extreme weather events, unreliable/unavailable access to medical care, insufficient/non-existent interpersonal support networks, and fewer resources to relocate, adapt, or and/or manage climate-related hazards. People of color and people from low-income communities tend to have relatively high rates of existing health conditions (e.g., heart disease, chronic obstructive pulmonary disease [COPD], asthma). People living in areas of concentrated poverty also tend to have higher rates of obesity, diabetes, and depression than residents not living in these areas.

Hospital admissions and emergency room visits increase during heat waves for people with diabetes, cardiovascular diseases, respiratory disease, and psychiatric illnesses. Heart disease increases sensitivity to heat stress. People with diabetes are subject to the impacts of extreme weather events, which may limit access to medicine and food that they need to stay healthy. Asthma can be exacerbated by exposure to air pollution caused by or made worse by changes in temperature, humidity, wind, or wildfires. COPD increases sensitivity to changes in air quality made worse by climate change.

People with chronic health conditions frequently have greater reliance on healthcare systems, which may become disrupted during extreme weather events. Climate change has the potential to impact individuals' financial situations or displace people from their homes, which may result in

limited access to healthcare services. Inaccessibility to quality, affordable healthcare can lead to worsening symptoms, compromised personal safety, and novel disease complications.

People with the following characteristics are at an increased risk of health impacts from climate change:

- Individuals 65 years or older
- Individuals without access to stable, reliable healthcare
- Individuals with multiple health conditions or disabilities

2.3 People with Low Incomes

Economic factors, such as income, poverty, and wealth, are collectively one of the largest determinants of health. Higher income is associated with greater longevity in the United States. Inequalities in longevity between those with lower and higher incomes continue to increase.[9,10,11]

The health status of most people with low incomes compounds the risk of climate change impacts. Poverty increases vulnerability to climate change impacts, and communities experiencing poverty have fewer resources to evacuate during natural disasters, such as wildfires. Poverty also reduces the capacity to adapt to rising water or energy prices. Communities with low incomes face an even greater challenge when trying to rebuild after a disaster, especially because fewer people with low incomes have insurance. People with low to middle incomes have less access to healthcare and receive worse quality of care than people with high incomes. People with low incomes are also more likely to reside in housing that sustains damage due to lower-quality construction.

Climate change impacts on food cost and scarcity will magnify current inequalities in food access and choices. The existing disparities in health status and living conditions increase vulnerability of communities with low incomes to the health-related impacts of climate change. Climate-related health burdens due to poverty disproportionately impact the following populations:

- Populations who are unemployed, disabled, homeless, or have little formal education
- Racial, ethnic, and linguistic minority groups, including migrants
- Children of families with low incomes living in conditions that are harmful to their development
- Children in immigrant families with low incomes with reduced access to services
- People with psychiatric disorders, including neurotic disorders, functional psychoses, and alcohol/drug dependence

[9] Chetty, R., M. Stepner, S. Abraham, et al. 2016. "The Association Between Income and Life Expectancy in the United States, 2001–2014." JAMA; Published online April 10. doi:10.1001/jama.2016.4226.
[10] Marmot M., S. Friel, R. Bell, et al. "Closing the Gap in a Generation: Health Equity through Action on the Social Determinants of Health." The Lancet. 2008;372(9650):1661–1669.
[11] Woolf S.H., and P. Braveman. "Where Health Disparities Begin: The Role of Social and Economic Determinants—and Why Current Policies may Make Matters Worse." Health Aff (Millwood). 2011;30(10): 1852–1859.

2.4 People Experiencing Homelessness

People experiencing homelessness can be defined as individuals who use shelters to sleep and individuals who sleep outdoors or in other places that are not intended for human habitation. Homeless populations are more likely to live in poverty, lack access to healthcare services, and have multiple baseline conditions, such as poor health, which would be exacerbated by the impacts of climate change.

Pre-existing conditions and lack of access to resources among this vulnerable population increase the likelihood of experiencing the negative impacts of climate change exposures, including air pollution, heat waves, vector-borne diseases, and storms and floods. Vulnerable populations, such as those experiencing homelessness, are at a higher risk of heat-related illness than other people living in a population. Heat illnesses are exacerbated because of difficulty finding refuge from the heat and hydrating during times of extreme temperatures. People experiencing homelessness are also more likely to have higher levels of exposure to outdoor air pollution. Residing in cities (unhoused) puts this group at higher risk of air pollutants from freeways and highways. Vector-borne diseases have higher impacts on this population because people experiencing homelessness are more likely to live in immuno-compromising situations that can exacerbate infectious diseases.

People experiencing homelessness are more likely to occupy marginal areas of cities—along freeways, in creeks/riverbeds, and other areas—making them more vulnerable to environmental hazards, such as storms and floods. The physical deficiency of shelter puts them at even greater risk from storms and floods from which they cannot seek protection, except in the limited availability of facilities to house this group. People experiencing homelessness are particularly susceptible to natural disasters but are often not included in disaster planning.

2.5 Outdoor Workers

Outdoor workers are often among the first to be exposed to the effects of climate change. Climate change is likely to affect the health of outdoor workers through increases in temperature, poor air quality, extreme weather, vector-transmitted diseases, industrial exposures, and damage to infrastructure. Outdoor workers affected by climate change include farmers, ranchers, and other agricultural workers; commercial fishery workers; foresters; construction workers; military personnel; miners; refinery workers; paramedics, firefighters, police, and other first responders; hazardous waste site workers; and transportation workers. Outdoor workers in Santee consist of gardeners, landscapers, and park/recreation staff who spend the majority of their workday outside.

Extreme heat may result in more cases of heat-related illnesses, such as heat stroke and heat exhaustion and fatigue, among outdoor workers, especially among more physically demanding occupations. Heat stress and fatigue can reduce alertness and work capacity, leading to safety lapses that can increase the risk of injury. Higher temperatures can also worsen air pollution,

raising the risk of respiratory illness for workers. Heat extremes in areas not previously affected by higher temperatures can affect workers who are not used to working in high-heat conditions or are unaware of heat-related hazards.

Extreme events, such as floods, storms, droughts, and wildfires, are becoming more frequent and intense as a result of climate change, which can create risky conditions for workers involved in disaster response, rescue, and cleanup. For example, firefighters battling wildfires are exposed to hazards, such as being overrun by fire, heat-related illnesses and injuries, smoke inhalation, and air pollutants. First responders and other emergency workers face greater health and safety risks when working in conditions with infrastructure disruptions, communication interruptions, and social unrest or violence following storms.

The most vulnerable outdoor workers include (1) farm workers/day laborers, since this population tends to have lower incomes and belong to communities of color, both of which are associated with adverse health effects due to climate change, and (2) immigrants who work outdoors, since this population is subject to long workdays under strenuous conditions, language barriers, limited capacity to protect their rights, and exposure to chemicals, such as pesticides.

2.6 Older Adults

Older adults are vulnerable to climate change-related impacts for a number of reasons. The primary reason is that normal changes in the body associated with aging, such as loss of muscle or bone mass and agility, can limit mobility. Aging also impairs cognitive abilities, immune systems, and the regulation of body temperature. Older adults are more likely to have a chronic health condition, such as diabetes, that requires medications for treatment. Older adults with disabilities in one or more of the following areas may also need assistance with daily activities: communication (seeing, hearing, or speaking), mental functioning (e.g., Alzheimer's disease or dementia), and physical functioning (limited or no ability to walk, climb stairs, or lift and grasp objects).

Climate change will increase extreme heat events and lead to higher temperatures throughout the year. Extreme heat exposure can increase the risk of illness and death among older adults, especially people with congestive heart failure, diabetes, and other chronic health conditions that increase sensitivity to heat. Growing evidence suggests that injury, disease, and death are greatest among older adults during heatwaves. Higher temperatures have also been linked to increased hospital admission for older adults with heart and lung conditions. Side effects of some medications intensify the heat-related conditions in older adults.

Climate change affects the frequency and intensity of some extreme weather events, such as flooding related to heavy rains, hurricanes, coastal storms, droughts, and wildfires. Older adults are more likely to suffer storm- and flood-related fatalities and have a high risk of both physical and mental impacts if an extreme weather event requires evacuation. People with disabilities, with chronic medical

conditions, or living in nursing homes or assisted-living facilities are some of the most vulnerable. Health impacts are made worse by interruptions in medical care and challenges associated with transporting patients with their necessary medication, medical records, and any equipment like oxygen. Extreme events can also cause power outages that can affect electrically powered medical equipment and elevators, leaving some people without treatment or the ability to evacuate.

Older adult populations with the following characteristics are at an increased risk of health impacts from climate change:

- Aged 65 years or older
- Live alone, have limited mobility, are socially isolated, are residents of institutions, or are dependent on care
- Are women, have a low socioeconomic status, or are African American
- Have multiple chronic conditions (e.g., cardiovascular diseases, respiratory illnesses, diabetes) or pre-existing health conditions

2.7 Children

Children's continuous, ongoing growth and development from infancy to adolescence makes them more sensitive to environmental hazards related to climate change. Injury, death, infectious diseases, malnutrition, and post-traumatic stress are more common in children than adults after extreme weather events. Children are especially vulnerable to the impacts of climate change because of their (1) growing bodies, (2) unique behaviors and interactions with the world around them, and (3) dependence on caregivers.

Children's behaviors and interactions with their surroundings increase their exposure to certain health threats that are expected to increase due to climate change. Children, particularly those with disabilities or special health needs, must rely on parents or caregivers to provide basic needs, such as nutrition, shelter, and hygiene. Children also spend more time outdoors than adults, which increases their risk of being exposed to extreme heat and higher average temperatures, pollutants in air and water, and diseases carried by mosquitoes and ticks.

Individuals who are the most vulnerable to climate impacts include young children, infants, and pregnant women; children in low-income, rural, immigrant, or linguistically isolated households; children with pre-existing conditions (cardiac/respiratory); and children who spend considerable time outdoors.

2.8 People without Life-Supporting Resources

Life-supporting resources are essential to one's resilience in the face of climate change. Such resources include access to secure housing, access to food and sustenance, means to stay cool during extreme heat events, access to reliable transportation (for evacuating or navigating natural

disasters), and access to healthcare. Health, well-being, and resilience during climate change-related events are closely related to the availability of these resources. In other words, individuals who lack one or more of these resources (i.e., people who experience food insecurity, are uninsured, lack adequate and quality housing or are tenants or renters, and with low incomes) are especially vulnerable.

Climate change resiliency is dependent on several factors, including social status, geographic location, race, gender, disability, and personal resource, which significantly impact one's overall well-being during gradual or sudden climate-related events. Certain groups (e.g., renters, food-insecure individuals) disproportionately lack life-supporting resources. Renters without air conditioning are vulnerable to heat illness and are often unable to install air conditioners because they do not own their home. Many people facing economic challenges choose not to use their air conditioning units, even if they have them, due to concern about paying energy bills. Food-insecure individuals already experience hunger, which affects their immune systems and economic stability, but may experience excessive food insecurity during food shortages or price increases due to climate-related food scarcity.

People who lack multiple life-supporting resources will be especially vulnerable to a wide array, as well as a deeper extent, of climate impacts. Many of these vulnerabilities have different levels (e.g., level of food insecurity or quality of housing). Following are the individuals who are especially impacted and under-resourced:

- Those who are already vulnerable due to other factors (e.g., an individual who faces discrimination based on race, gender, or disability)
- Those who are unable to access compensating emergency resources (e.g., a person experiencing homelessness who is refused from a homeless shelter)
- Those who lack access to multiple resources (e.g., a person who cannot afford safe, secure housing or healthy, nutritious food)

2.9 Section 2 Summary

Section 2 discussed vulnerability to climate change-related effects focusing on AFN populations. Section 3 will discuss four climate change-related hazards (extreme heat, wildfire, extreme precipitation, and drought) and the risk that Santee's vulnerable populations and critical infrastructure face from these hazards.

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Section 3 Climate Change Hazards and Community Vulnerabilities

The Vulnerability Assessment addresses the climate change-related hazards that are the most pressing to the City, including extreme heat, wildfire, extreme precipitation, and drought. The analysis presented in this section evaluates how hazards are expected to occur, including frequency and severity, and how these hazards will affect sensitive populations and critical facilities at the local level. In Santee, climate change is expected to intensify specific existing hazards or create new hazards.

3.1 Extreme Heat

Overall temperatures are expected to rise in California during the twenty-first century. While the entire state will experience temperature increases, local impacts will vary greatly. The County's 2018 MJHMP projects that the region will face an increase in the frequency, duration, and severity of heatwaves in the coming decades. Extreme heat days are defined by days where the daily maximum temperature exceeds a threshold temperature of 98.7 degrees Fahrenheit (°F). Threshold temperatures are defined as the 98th percentile value (or the highest 2 percent of days) of historical daily maximum temperatures from 1961 to 1990 between April and October in Santee.

3.1.1 Exposure

The observed historical annual average temperature in Santee is 76.1°F. Average temperatures are projected to increase between 3.8°F and 4.7°F by mid-century (2035–2064) and between 4.9°F and 8.1°F by end of century (2070–2099), depending on the emissions scenario. In addition, the number of extreme heat days is projected to increase from a historical average of 3 days per year to between 12 and 15 days by mid-century and 16 to 32 days by end of century. Warmer days will also be accompanied by an increasing number of warmer nights.

3.1.2 Sensitivity

The Sustainable Santee Plan describes the impacts of extreme heat days on public health and safety. Intrinsic heat-related risks include age, socioeconomic status, and pre-existing medical conditions. The communities that are most vulnerable to the impacts of extreme heat are people experiencing homelessness, outdoor workers, people without life-supporting resources, older adults, young children, and people with pre-existing medical conditions (e.g., cardiovascular disease, diabetes, mental illness)—all of which are communities that may have a potential inability to survive/thrive in hotter conditions.

Other extrinsic factors, or those external to an individual, that increase sensitivity to extreme heat include neighborhoods with high levels of impervious surfaces and low tree cover or housing units that lack air conditioning. Immigration status and occupational profession are other significant

factors that may contribute to an individual's sensitivity to heat events, particularly outdoor workers and warehouse workers who do not have adequate accommodations and protections. Santee's unsheltered population is among the most sensitive to heat events.

The Heat Health Action Index score is a statistically weighted result of indicators that is intended to represent geographic areas of greater heat sensitivity. Indicators include the following:

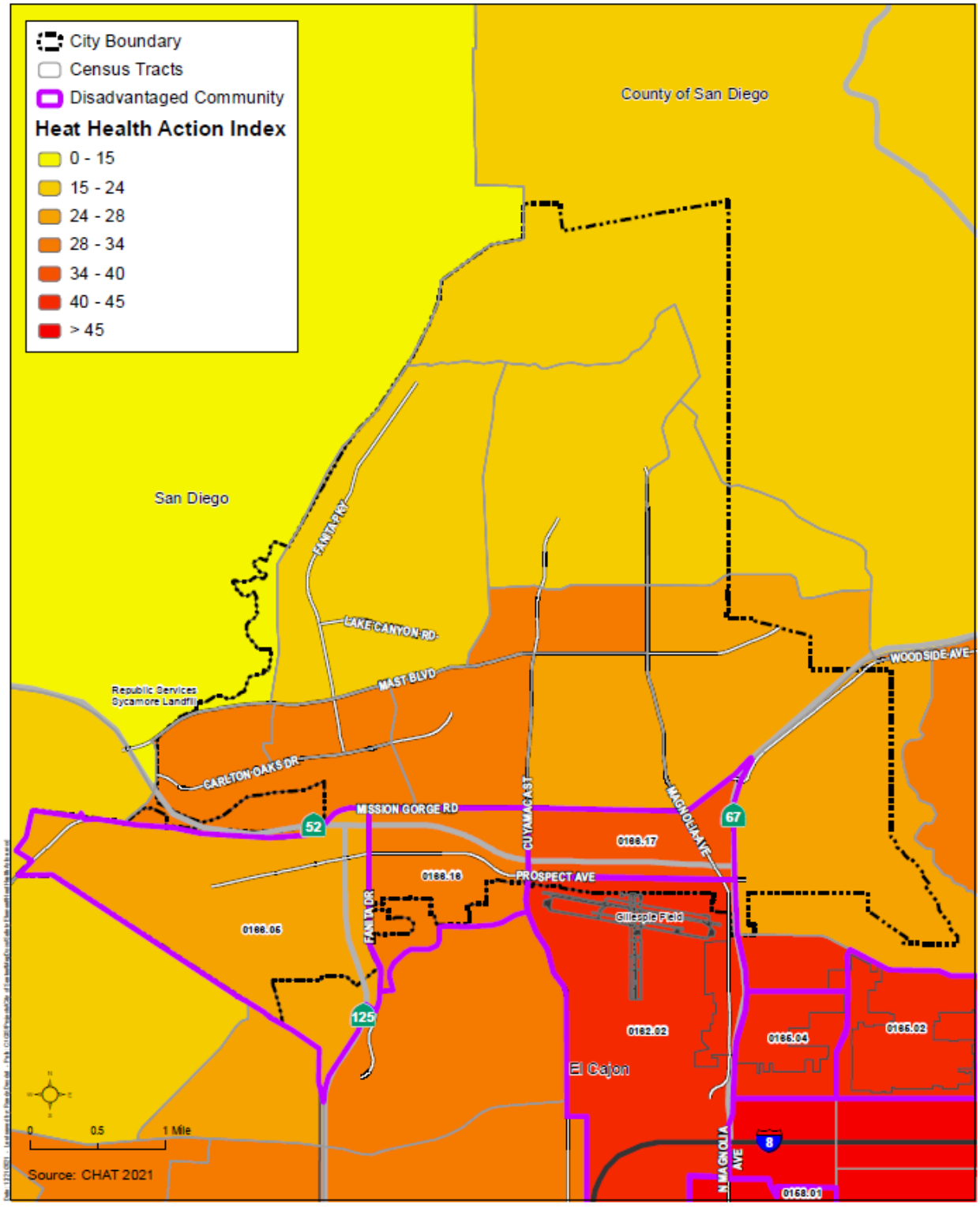
- Social vulnerability, such as percent of poverty, outdoor workers, and no vehicle access
- Health, including asthma rates and cardiovascular disease rates
- Environment, including lack of tree canopy, urban heat island, and ozone concentration

The composite score identifies the census tracts that may be most susceptible to heat health events. Heat health events are defined by a set of meteorological conditions over several days that have been associated with negative public health events. Higher scores indicate greater vulnerability. **Figure 5, Heat Health Action Index**, shows Heat Health Action Index scores for Santee by census tract, providing an overall summary of heat vulnerability for Santee. As shown on Figure 5, heat vulnerability ranges from low to moderate, with the moderately vulnerable census tracts located in the central and southern portions of Santee. Some of the moderately vulnerable census tracts are also disadvantaged communities, bordered by State Route (SR-) 52 and SR-67. Disadvantaged communities are identified and analyzed in the City's Safety and Environmental Justice Element and Existing Conditions Report. Santee's disadvantaged communities have been included on Figure 5 for comparison between the communities that have been identified as "disadvantaged" and the communities that are most vulnerable to impacts of extreme heat.[12]

Most buildings that house or operate as critical infrastructure may not be particularly sensitive to extreme heat. However, to the extent that Santee's electrical infrastructure is sensitive to extreme heat, so are Santee's critical facilities that depend on reliable electricity to power their operations, including hospitals, fire and police stations, schools, and water facilities. Higher temperatures can decrease the capacity of grid components (i.e., power plants, substations, and transmission lines) while increasing electricity demand due to increased cooling needs.

[12] California Natural Resources Agency. 2021. "California Heat Assessment Tool (CHAT)." Accessed July 2023. https://www.cal-heat.org/.

Figure 5. Heat Health Action Index



3.1.3 Potential Impact

Climate change, particularly extreme heat events, present serious health risks to Santee residents. Increased temperature or extended periods of elevated temperatures can increase heat-related mortality, cardiovascular-related mortality, respiratory mortality, and heart attacks while increasing hospital admissions and emergency room visits. Extreme heat can also affect a person's ability to thermo-regulate, causing heat stress and sometimes leading to death. Heat also intensifies smog and air pollutants that can contribute to and exacerbate respiratory disease and result in more asthma and heart attacks. Furthermore, the same areas that are most exposed to extreme heat are often the same areas that lack tree canopy and have high concentrations of racial minorities, making extreme heat an issue of environmental justice in addition to community safety (refer to **Figure 5**).

"Potential impact" refers to how incidents of extreme heat will affect sensitive critical facilities. Extreme heat events do not necessarily have significant impacts on most critical facilities. However, the Sustainable Santee Plan acknowledges that infrastructure is generally built to meet historical climate conditions so it can potentially be impacted by extreme heat. For example, roadways and railways are dark or metal based, conducting heat and raising temperatures well beyond the observed air temperature. Increased temperatures can cause pavement to soften and expand, causing potholes. Railways can buckle under extreme heat, requiring trains to go slower to navigate the buckle or stop service for repairs.

The County's MJHMP identifies the secondary impacts of heat, such as power outages and poor air quality. Critical facilities can be susceptible to extreme heat due to additional demand placed on the power system to power air conditioning. Extreme heat events may result in power demand outpacing supply, resulting in power outages. When this happens, San Diego Gas & Electric (SDG&E) implements California Independent System Operator Rotating Outages, wherein SDG&E rotates the outage across groups of customers throughout the service territory to protect the integrity of the electric system while limiting the inconvenience to any one customer or community. Loss of power can disrupt essential public facilities and services and pose a public health risk to residents. Further, increased temperatures can have an impact on air quality because ozone formation, a component of smog, increases with higher temperatures.[13]

In the event of extreme heat that causes power outages, the loss of power would have the most significant impact impacts on utilities, such as electricity and water, in addition to public health, public safety, and school facilities. Power outages, without back-up generation, could result in the loss of foundational critical services that are necessary to function: electricity, water, medical care, and police and fire protection services. Loss of services would have wide-reaching impacts for services and community members, especially those with medical conditions, older adults, and

[13] County of San Diego. 2018. Multi-Jurisdictional Hazard Mitigation Plan. October. Accessed July 2023. https://www.sandiegocounty.gov/content/dam/sdc/oes/emergency_management/HazMit/2018/2018%20Hazard%20Mitigation%20Plan.pdf.

children. Loss of power due to extreme demand placed on the grid is a potential secondary impact and primarily given a medium score. Water and power are also critical to emergency response to the impacts of extreme heat, which is why the potential impact score is high.

3.1.4 Adaptive Capacity

The Sustainable Santee Plan, adopted in December 2019, is the City's roadmap to reducing GHG emissions, and includes GHG emissions forecasts, targets, reduction measures, and adaptation strategies to climate change impacts, including extreme heat. The City identified the following strategies to protect the health and safety of residents from extreme heat:

- Map neighborhoods that could be more vulnerable to the effects of climate change, including heat, to identify high-risk areas of Santee
- Create cooling centers at public spaces, such as libraries, for populations without air conditioning
- Implement cooling technologies, such as cool roofs and cool pavements
- Strategically place shade near buildings, in parking lots, and along bike and pedestrian pathways
- Use reverse 911 to notify residents of serious events or natural disasters and encourage residents to register into AlertSanDiego, the regional notification system for emergency or disaster warnings

The Sustainable Santee Plan also promotes reducing heat impacts by increasing tree canopy cover through planting trees and vegetation and replacing paved areas with light-reflecting materials, cool roofs, and cool pavement. Trees and vegetation lower surface and air temperatures by providing shade. This can help mitigate impacts of extreme heat, especially urban heat island effect, while also decreasing energy demand by providing shade and cooling temperatures. Urban heat island effect occurs when natural land cover is replaced with non-permeable surfaces, concentrations of pavement, and other hard surfaces that absorb and retain heat.

The City has a Cool Zone Program, which designates cool zone sites with air conditioning where residents, such as older adults, and others can gather during the summer to escape the heat and cool off before going back outside. Cool zones provide access to air conditioning to those who may not have it and encourage residents to share air conditioning by visiting the designated center, therefore lowering individual energy use and helping conserve energy for the entire community. Although not all locations are pre-identified, City Hall is often a designated cooling center, in addition to the Santee Cool Zone (Library and Community Center) and Lakeside Cool Zone in the neighboring City of Lakeside. During an extreme heat event, the City will identify additional locations of cooling centers based on availability and other variables. This information is conveyed to the public through the City's Public Information Officer in coordination with the Emergency Manager and City Manager. Further, the City's Public Information Officer, in coordination with

the County, releases information to the public about extreme heat events, including early warnings, so residents can prepare and access resources accordingly. Information about the Santee Cool Zone, as well as other cool zones throughout the county, can be found on the City's website.

The Santee Fire Department provides several resources on its Public Education and Emergency Preparedness web page including , preparedness tips and recommendations from the Unified San Diego County Emergency Services Organization, County Office of Disaster Preparedness, State of California, American Red Cross, and Federal Emergency Management Agency (FEMA). It identifies supplies, equipment, and special recommendations for children and people with disabilities, emergency kits, and actions one can take during power outages.

Some critical facilities are equipped with back-up generators that provide an alternate source of power in the event of an outage, ensuring critical services continue to operate. Specific public safety buildings and operations (sheriff's office, detention facilities, and fire stations) are equipped with back-up generators, as is Padre Dam Municipal Water District (PDMWD) and potentially a local pump station.

Chapter 8.06 of the Santee Municipal Code is the City's Urban Forestry Ordinance, which sets forth tree-related policies, regulations, and maintenance standards on public property and public right-of-way. It also articulates policies for tree planting as a condition of residential, industrial, and commercial development. The ordinance ensures that Santee will continue to realize the benefits of urban forestry and that trees are properly maintained through care, maintenance, diversity of tree species, landscaping, planting, and removal. It also supports the City's commitment to the generally accepted Tree City USA status and Growth Award status as designated by the National Arbor Day Foundation and the California Department of Forestry and Fire Protection, respectively. Chapter 13 of the Santee Municipal Code is the Zoning Code, which guides the growth and development of Santee. Relevant to this Vulnerability Assessment, the Santee Zoning Code includes requirements for parks and open space districts and landscape and irrigation regulations. Through the Santee Zoning Code relevant to parks and open space districts, the City seeks to promote a mix of open space with development to conserve and preserve natural resources, avoid hazards, provide low-intensity development, and protect residents from the impact of hazards. Parks, open space, and urban tree cover work together to combat the impacts of extreme heat.

The City could also evaluate infrastructure vulnerability based on current degradation and expected climate-related impacts; prioritize and plan for infrastructure improvements that increase fire safety and reduce energy, especially in vulnerable neighborhoods; and identify alternative routes where infrastructure damage may occur.

3.1.5 Vulnerability Score

Table 3, Vulnerability Assessment Results: Extreme Heat, provides the vulnerability scoring for vulnerable populations and critical facilities in response to extreme heat risks in Santee. The reasoning for the scoring provided in Table 3 is discussed below.

Extreme heat poses the most significant threat to people, especially vulnerable residents, and climate change is expected to exacerbate extreme heat. Vulnerable populations were given high scores for potential impact and primarily medium to high scores for adaptive capacity, which resulted in relatively high vulnerability scores (vulnerability scores of 3 to 5; **Table 3**). Of all the sensitive populations, people who are most at risk of experiencing more intense, life-threatening cases of heat-related illnesses are more likely to experience the impacts of extreme heat.

People experiencing homelessness may experience more heat-related illnesses, such as heat stroke, due to their limited ability to seek refuge from above-average heat during times of extreme temperatures. Outdoor workers, especially those who are not used to working in high-heat conditions or are unaware of heat-related hazards, may experience more heat-related illnesses, such as respiratory issues resulting from poor air quality caused by higher temperatures. People without life-supporting resources may experience more heat-related illnesses, such as heat exhaustion and fatigue, due to their limited ability to install and/or afford air conditioning in their homes.

Critical facilities were primarily given medium vulnerability scores (vulnerability scores of 2 to 4; **Table 3**). This is due to the statewide concern regarding climate change and rising temperatures. The State of California recognizes temperatures continue to rise, heat waves are more frequent, and precipitation continues to be highly variable. California's Fourth Climate Change Assessment produced climate projections that indicate temperatures will continue to increase and the number of extreme heat days will increase exponentially in many regions. By the middle or end of the century, greater impacts could occur on critical facilities and the built environment. A high potential impact score was given to utilities. Although extreme heat in the near-term may pose minimal threat to buildings themselves, it can result in secondary impacts, such as demand for power that outpaces supply, causing outages and disruptions. Potential disruptions could have a high impact on utilities because utilities are responsible for power and water, which are both necessary for cooling. Because outages and disruptions are considered a secondary impact, a medium impact score is given to critical facilities categories other than utilities, which would be slightly more impacted.

To mitigate the impacts of extreme heat, City Hall and the Santee Library serve as designated cool zone cooling centers, decreasing the vulnerability and providing capacity to mitigate impacts of extreme heat. The cooling centers and extreme heat warnings help keep residents safe during extreme heat events. Medium to high adaptive capacity scores were given to vulnerability populations, acknowledging the multiple resources provided to residents but also allowing for

opportunities to increase the number of cool zones or provide additional programs that increase access to air conditioning, especially for people with AFNs.

Given that most critical facilities, such as City operational buildings, PDMWD facilities, and public safety buildings, are equipped with back-up generators, these facilities were given high adaptive capacity scores. The City could increase its resiliency by further identifying facilities without generators and equipping more facilities with generators. At the time of this assessment, specific details about generators and cooling at public health facilities, schools, and transportation facilities was unknown. Due to the nature of the services provided at public health facilities and schools, they presumably are equipped with generators and, therefore, received a medium score. This provides opportunities for collaboration with these entities to increase resilience. However, capabilities were lesser known for the transportation category and given a default low score. Presumably, additional facilities could benefit from widespread distribution of generators or heat mitigation capabilities.

Table 3. Vulnerability Assessment Results: Extreme Heat

Category	Potential Impact	Adaptive Capacity Score	Vulnerability Score
Sensitive Populations			
People with AFNs	High	Medium	4
People with Existing Chronic Health Conditions	High	High	3
People with Low Incomes	High	High	3
People Experiencing Homelessness	High	Low	5
Outdoor Workers	High	Medium	4
Older Adults	High	High	3
Children	High	High	3
People without Life-Saving Resources	High	Medium	4
Critical Facilities			
City Operations	Medium	High	2
Public Safety Facilities – Generator	Medium	High	2
Public Health Facilities	Medium	Medium	3
Community Centers	Medium	High	2
Utility Facilities – Generator	High	High	3
Critical Transportation	Medium	Low	4
Schools	Medium	Medium	3

Notes: AFNs = access and functional needs

3.2 Wildfire

3.2.1 Exposure

Section 4.3, Urban/Wildland Fire Hazards, and Figure 4.6, Fire Hazard Map, of the Safety and Environmental Justice Element profiles fire hazard risk in Santee. According to the County Office

of Emergency Services, wildfires are the most prevalent and costly acute shock ("shock" referring to an incident that negatively impacts the community) facing the county, which includes Santee.

Climate change can exacerbate wildfire risk. Wildfire risk is expected to continue to increase as a result of warmer temperatures, more frequent drought, changes in precipitation, and expanding wildland-urban interface (WUI). According to the state's Fourth Climate Change Assessment, wildfire risk will continue to increase as the climate warms. Santa Ana winds, which are hot, strong, and gusty winds that produce extreme dryness, have fueled—and will continue to fuel—the most catastrophic wildfires in the county. According to local climate projections, conditions that are optimal for the spread of wildfire—(1) changes in precipitation (measurable precipitation becoming less frequent), (2) changes in water availability (drought becoming more common), and (3) changes in weather (air becoming drier, temperatures becoming hotter, winds becoming stronger)—will become more prevalent. The county is expected to experience an increase in wildfire risk, especially during "peak season" in December and January, as a result of climate change.

As analyzed in Section 4.3, Urban/Wildland Fire Hazards, of the Safety and Environmental Justice Element, Santee is susceptible to wildfire, and very high fire hazard severity zones (VHFHSZ) are within and around the city boundaries. Fire hazard severity zones evaluate fire hazards, meaning the physical conditions that create a likelihood and expected fire behavior over a 30- to 50-year period without considering short-term modifications or mitigation strategies. These zones are based on factors such as fuel (i.e., vegetation), slope, and fire weather. These zones are used to designate defensible space standards and WUI building codes in General Plans and other policy documents. All new buildings within a State Responsibility Area, Local Responsibility Area, VHFHSZ, or WUI designated by the enforcing agency must comply with all sections of the WUI Fire Area Building Standards. These standards provide a reasonable level of exterior wildfire exposure protection for buildings within these hazard areas and establish minimum standards for materials and material assemblies to lessen the vulnerability of a building by resisting the intrusion of flames and burning embers projected during a conflagration or wildfire.

Santee's 16.5 square miles are made up of residential, commercial, and industrial land uses with a significant WUI. The VHFHSZs are along the northern boundary that Santee shares with unincorporated county land, as well as along the eastern, western, and southwestern boundaries.

3.2.2 Sensitivity

Climate change can exacerbate the risk of wildfire and the risk to sensitive populations. The population most at risk of wildfire impacts include residents living in or near the VHFHSZs, primarily concentrated in the northern part of Santee and around the southwestern, western, and eastern city boundary. Land uses within the VHFHSZ include undeveloped/vacant land, parks and open space, and single- and multi-family residential, with a few schools, facilities, and utilities. According to the Sustainable Santee Plan, about one-third of Santee consists of open space, which contain grasses,

shrubs, and trees that may fuel wildfire. Vulnerable populations include households in poverty, older adults living alone, outdoor workers, people experiencing homelessness, people with reduced mobility, including people with disabilities, and people who do not have access to a personal vehicle and who may have difficulty evacuating—all of which are communities that may have a potential inability to respond to wildfire threats or evacuation mandates.

The populations most sensitive to wildfire include those living in or near the VHFHSZs, as well as those with mobility challenges, lack of access to medical care, and with financial limitations. Outdoor essential workers and individuals with respiratory conditions, such as asthma, are particularly vulnerable to wildfire smoke. Wildfires can generate significant amounts of smoke that can travel long distances, in some instances spreading across state and national boundaries. Living conditions and housing types also influence levels of protection from smoke; for example, mobile homes and older homes with unsealed windows are more sensitive than modern homes that feature airtight windows and air purification systems.

According to the County's MJHMP, approximately 130 of Santee's critical facilities are at risk of wildfire and structural fire. Supplemental analysis for this Vulnerability Assessment identifies City Hall, several schools, and SR-52 near or within the VHFHSZ.

As wildfires increase in frequency and intensity as a result of climate change, disruptions in electrical infrastructure are likely to become more common. When there is a high risk for a wildfire, SDG&E, Santee's electric utility, may temporarily shut off power to prevent the electric system from becoming the source of ignition. Electric utility infrastructure has historically been responsible for less than 10 percent of reported wildfires; however, fires attributed to power lines comprise roughly half of the most destructive fires in California history.[14] These events, termed "public safety power shutoffs," can pose a serious risk for populations that are medically sensitive (those who rely on medication and respirators that require power generation) and have low incomes.

3.2.3 Potential Impact

Drought, changes in precipitation, and extreme heat can create conditions that increase the risk of wildfire. Uncontained wildfire can threaten human health and life and property and homes and result in evacuations. Wildfire poses great risk to residents living or working within the VHFHSZs. Impacts of wildfire can include land or structure damage, property loss, poor air quality, burn damage, habitat destruction, displacement, and fatalities.

The County's MJHMP identifies wildfire as a major public health concern for the San Diego region. This is because wildfire can impact the health of multiple regions due to wildfire smoke traveling long distances and worsening air quality for days and even weeks. According to the

[14] California Public Utilities Commission. 2021. "Utility Public Safety Power Shutoff Plans (De-Energization)." Accessed July 2023. https://www.cpuc.ca.gov/psps.

MJHMP, wildfire smoke can increase one's exposure to gases and chemicals, such as carbon monoxide, ground level ozone, and toxic chemicals (e.g., pesticides, plastics, and paints) released from burned building and other human-made materials. Smoke can also penetrate buildings, impacting people across a wide area.[15]

Wildfire can exacerbate existing air quality issues in Santee, posing a health risk for sensitive populations. Smoke and poor air quality can increase respiratory and cardiovascular hospitalizations; emergency department visits; medication dispensations for asthma, bronchitis, chest pain, chronic obstructive pulmonary disease (commonly known as COPD), and respiratory infections; and medical visits for lung illnesses.[15] Those with pre-existing medical conditions or who work outdoors, populations over 65 years of age, and children may be at additional risk of poor air quality.

Critical facilities within VHFHSZs are at risk of damage or destruction. According to the County's MJHMP, potential exposure for critical facilities at risk of wildfire and structural fire can cost upwards of $247 million dollars.[16] Supplemental analysis was conducted to identify critical facilities within or near VHFHSZs. Using data collected from Santee's GIS, Homeland Infrastructure Foundation-Level Datasets, and publicly available datasets, two schools were identified as within or on the border of the VHFHSZ, City Hall was identified on the border of the VHFHSZ, and another two schools were identified outside but near the VHFHSZ.

3.2.4 Adaptive Capacity

Due to the wildfire risk facing Santee, multiple resources are available to residents to help build resilience to the impacts of wildfire. Section 4.3, Urban/Wildland Fire Hazards, of the Safety and Environmental Justice Element outlines the public education and awareness programs available for members of the public. Examples include the older adult smoke detector program, cardiopulmonary resuscitation (CPR) training, fire station tours, and older adult outreach and safety education, among others.

The City has a Public Education and Emergency Preparation section on its Fire Department web page. Here, residents can find information about emergency preparedness, fire codes and regulations, fire education, fire safety tips, wildfire preparation, emergency kit preparation, and personal disaster plans, as well as access to Ready San Diego and AlertSanDiego. Ready San Diego is a comprehensive website with disaster preparedness resources for families, kids, businesses, schools, and organizations. The County Office of Emergency Services provides training programs; emergency maps, including wildfire hazard maps; preparedness planning resources; and registration for AlertSanDiego. Ready San Diego contains wildfire prevention

[15] CDC (Centers for Disease Control and Prevention). 2020. "Climate Health: Wildfires." Accessed July 2023. https://www.cdc.gov/climateandhealth/effects/wildfires.htm.
[16] County of San Diego. 2018. "Multi-Jurisdictional Hazard Mitigation Plan." Accessed July 2023. https://www.sandiegocounty.gov/content/dam/sdc/oes/emergency_management/HazMit/2018/2018%20Hazard%20Mitigation%20Plan.pdf.

resources for home and yard, disaster kits, and wildfire resilience reports and tips. Specifically, it includes links to information on creating and maintaining defensible space (particularly in drought conditions), fire-resistant vegetation, personal disaster plan templates, and wildfire preparedness guidance. The City annually hosts its Open House/Safety Fair in October during National Fire Prevention Month. At the event, members of the public can tour the fire station, view fire engines, meet local firefighters, and learn about fire prevention.

According to Ready San Diego, state law requires that residents treat 100 feet of defensible space around their homes. This includes such steps as mowing and properly maintaining lawn and weeds, pruning or removing ignitable trees and shrubs, stacking firewood away from the home, and making sure the home's address is visible to emergency vehicles.

Further, the Sustainable Santee Plan addresses increased wildfire risk as a result of climate change by recommending the following implementation strategies:

- Educate the public on the importance of fire safety
- Include buffer zones between vegetation and structures and infrastructure
- Identify fire-prone habitats and evaluate and plan for increased risk of larger and more frequent wildfires

The Santee Municipal Code includes building standards and fire regulations for construction. The Santee Fire Code is Chapter 11.18 of the Santee Municipal Code, which is an adoption of the California Fire Code. The code includes regulations related to portable outdoor fireplaces, fire service features (fire apparatus access roads, gates, maps), fire protection systems (fire sprinklers, alarms, installations), special fire protection requirements, and explosives and fireworks. Notably, the code has requirements for defensible space and WUI areas. The City requires 100 feet minimum defensible space, necessitating fuel modification between structures and wildland areas. The code also requires fire protection plans, specific construction methods and requirements, construction materials, and other development requirements for new development within fire hazard severity zones or the WUI. More information about the Santee Fire Code and WUI regulations can be found in Section 4.3, Urban/Wildland Fire Hazards, of the Safety and Environmental Justice Element (the wildfire hazard profile and analysis). Information about firefighting water supply is also included in Section 4.3, Urban/Wildland Fire Hazards, of the Safety and Environmental Justice Element.

3.2.5 Vulnerability Score

Table 4, Vulnerability Assessment Results: Wildfire, provides the vulnerability scoring for vulnerable populations and critical facilities in response to wildfire risks in Santee. The reasoning for the scoring provided in Table 4 is discussed below.

Wildfire poses a significant threat to people, especially vulnerable populations, and climate change is expected to increase the frequency and intensity of wildfires across the state. Vulnerable

populations were given high scores for potential impact and primarily medium scores for adaptive capacity, which resulted in relatively high vulnerability scores (vulnerability scores of 4 to 5; Tab**le 4**). The following people, including sensitive populations and critical facilities within the VHFHSZ, are among the most vulnerable to wildfire and were given high potential impact scores:

- People without life-supporting resources, such as those who are unable to travel via evacuation routes due to limited access to reliable transportation or those who are unable to relocate to areas beyond VHFHSZs due to financial constraints, may have issue responding to more frequent, more severe wildfires.

Critical facilities, even if outside a VHFHSZ, can be affected by primary or secondary wildfire impacts. Further, the County identifies wildfire as the most prevalent shock facing the area. Therefore, by default, potential impact scores were rated as high across all critical facility categories. Medium adaptive capacity scores were given to public health facilities, critical transportation, and schools because the authority of those facilities is outside the City's local control, and the analysis assumes that some level of capacity or protection are provided by the City and County's public educational resources and the defensible space requirements. To further protect people and all categories, the City can focus on coordination and collaboration between entities through the implementation of Safety and Environmental Justice Element policies.

Table 4. Vulnerability Assessment Results: Wildfire

Category	Potential Impact	Adaptive Capacity Score	Vulnerability Score
Sensitive Populations			
People with AFNs	High	Medium	4
People with Existing Chronic Health Conditions	High	High	3
People with Low Incomes	High	Medium	4
People Experiencing Homelessness	High	Low	5
Outdoor Workers	High	Medium	4
Older Adults	High	Medium	4
Children	High	Medium	4
People without Life-Supporting Resources	High	Low	5
Critical Facilities			
City Operations	High	High	3
Public Safety Facilities	High	High	3
Public Health Facilities	High	Medium	4
Community Centers	High	High	3
Utility Facilities	High	High	3
Critical Transportation	High	Medium	4
Schools	High	Medium	4

Note: AFNs = access and functional needs

3.3 Extreme Precipitation

3.3.1 Exposure

Extreme precipitation may exacerbate riverine flooding (discussed in Section 4.1, Flood Hazards, of the Safety and Environmental Justice Element) and result in increased flooding in and around the flood zone, as well as localized flooding outside the flood zone. Severe weather, such as atmospheric rivers, powerful rainstorms, and subsequent flooding, will occur more frequently throughout California as a result of climate change, due to warmer weather and more moisture in storm systems. Climate change has the potential to cause more frequent and heavy precipitation incidents that result in damages from floods. These heavy precipitation incidents could result in additional flows into Santee's primary waterways—San Diego River, Forester Creek, Sycamore Creek, and intermittent creeks paralleling Big Rock Road and Fanita Drive—with the potential for overtopping or other types of dam failure. Street flooding is also possible during severe summer or winter storms, which can ensue on an annual basis.

Cal-Adapt measures both annual precipitation and maximum one-day precipitation to evaluate extreme precipitation. Climate change is expected to result in fewer but more intense rainstorms in which rainfall is rapid during a short amount of time. This pattern results in little change to average annual precipitation; in fact, average annual precipitation may not change significantly in the next 50 to 75 years. Rather, precipitation will be delivered in fewer, more intense storms within a shorter wet season.

However, because California's climate varies between wet and dry years, the state's research demonstrates that for much of the state, wet years will become wetter and dry years will become dryer. Subsequent dry years can increase the risk of drought (see Section 3.4, Drought). In Santee, average annual precipitation is expected to decrease. Historically, annual precipitation has averaged 13.8 inches. Under both the mid-century and end-of-century scenarios, annual precipitation is expected to decrease as a result of warming temperatures and changing storm patterns. By mid-century (2035–2064), average annual precipitation could decrease by 0.4 to 0.6 inch, depending on the emissions pathway. By the end of the century (2070–2099), average annual precipitation could decrease by 0.7–1.1 inches, depending on the emissions pathway.

According to Cal-Adapt, the projected maximum 1-day precipitation (i.e., the greatest amount of rain over a 24-hour period within the year) may increase by over 1 inch in Santee. By mid-century, maximum 1-day precipitation in Santee is expected to increase by over 1.43 inches in a medium-emissions scenario and 1.45 inches in a high-emissions scenario. Maximum 1-day precipitation in Santee could reach 1.44 inches in a medium-emissions scenario and 1.50 inches in a high-emissions scenario by end of century.

3.3.2 Sensitivity

Residents living in the floodplain, especially those in low-lying areas and individuals with physical disabilities that limit their mobility, may be vulnerable to extreme precipitation events that necessitate evacuation. Even just a few inches of moving water can be unsafe for children and people with disabilities. Santee's homeless population is at particular risk from flooding due to encampments located in or near the floodplain. The communities that are most vulnerable to the impacts of extreme precipitation are people experiencing homelessness, without life-supporting resources, with limited access to technology, and who are linguistically or socially isolated—all of which are communities that may have a potential inability to receive and/or interpret flood warnings or evacuation notices.

Critical assets in low-lying areas may be sensitive to extreme precipitation. Analysis performed during the 2018 MJHMP update identifies the following critical facilities as vulnerable to flood and flash flood hazards: at least eight schools and/or educational institutions; up to six government buildings, including fire stations, public works facility, and multiple sheriff's office buildings; four utilities stations; six healthcare-related facilities; three businesses; and one community services center. These facilities can be vulnerable to flood risk exacerbated by climate change, such as short but extreme rain events.

3.3.3 Potential Impact

Extreme precipitation events may result in flooding that can threaten human life. Due to the likelihood of flooding and increases in extreme precipitation, impacts on vulnerable populations could be likely in a major event and would result in impacts on public health and safety. Low-income residents without renters' insurance may experience significant financial impacts if extreme precipitation events resulted in the flooding of their property. Furthermore, flooded homes may also result in the growth of mold and mildew, which are allergenic and potentially harmful. Stormwater runoff can also contain a variety of contaminants and pollution, threatening public health and safety.

The types of critical facilities located in the 100-year and 500-year floodplains include educational institutions, government buildings, utilities, healthcare facilities, and private and nonprofit facilities. In the absence of mitigation, such as elevation and flood-proofing, these critical facilities could be susceptible to flood damage in the event of an extreme storm. Significant amounts of rain may fall in a short amount of time resulting in increased runoff, which can overwhelm the stormwater management system and cause water to inundate roads and property. Evacuation personnel may need to be dispatched to evacuate people experiencing homelessness from the floodplain. Shallow flooding

may result in mold and mildew in flooded buildings, allow for the spread of contaminants including gasoline and chemicals, and create a breeding ground for mosquitoes.[17]

3.3.4 Adaptive Capacity

The City has multiple planning resources, building codes and ordinances, and development standards that increase the capacity to adapt to the impacts of climate change. For example, Chapter 11.36, Flood Damage Prevention, of the Santee Municipal Code defines special flood hazards in Santee and regulates development and uses within those zones. The City's San Diego River Floodplain Study defines special hazard areas and requires new construction to be elevated to a minimum of 1 foot above the 100-year floodplain. Other drainage and hydrology reports and analyses include the following:

- Citywide Drainage Study (1990), which describes hydrologic and hydraulic characteristics of Santee and recommends necessary improvements.
- Supplemental Storm Drain System Study (1992), an analysis of the area south of Mission George Road and West Cottonwood Avenue where deficient storm drain facilities were identified. This study defines improvements and design criteria and costs for improvements that will help adequately convey the flow to the San Diego River.
- Maps of local hydrology, existing drainage facilities, deficient master drainage facilities, and FEMA Flood Rate Insurance Maps (FIRM).
- Fanita Lakes Drainage Study (2007), a proposed lake to serve as the primary stormwater best management practice (BMP) for a proposed 2,600-acre development, which is on the site of the recently approved Fanita Ranch Project.

A comprehensive update to the City's Master Drainage Study is currently underway and will combine the City's Master Drainage Study and Supplemental Storm Drain System (Mission Gorge Road) Report into one report. It is anticipated to be adopted in the summer of 2023. The City also provides on its website informational tips for preventing and reducing flooding impacts on personal property, such as erosion and mudslides. The City has also provided sandbags for residents during flood season.

Ready San Diego has a flooding page on its website, where residents can access resources to report damages occurring from a storm; tips for protecting property, including where to purchase sandbags; Department of Public Works service requests; flood control webcams; survey records searches to identify public drainage facilities on private property; and homeowners' guides to erosion control and flood debris.

[17] FEMA (Federal Emergency Management Agency). 2005. Reducing Damage from Localized Flooding: A Guide for Communities. FEMA 511. June. Accessed July 2023. https://www.fema.gov/pdf/fima/FEMA511-complete.pdf.

County residents are informed of flood warnings disseminated by the Emergency Alert System through local radio, television stations, and the National Oceanic and Atmospheric Administration (NOAA) Weather Radio. The County provides real-time information about high flood water, road closures, and evacuation routes. Warnings can also be issued to affected residents and businesses through the AlertSanDiego Program. The Alert Flood Warning System in the county consists of over 120 alert flood warning stations, which include 25 stream gauges, 10 reservoir level sensors, 99 rainfall sensors, and three weather stations sharing data with the National Weather Service. As mentioned in Section 4.1, Flood Hazards, of the Safety and Environmental Justice Element, one stream gauge is in Santee along the San Diego River at West Hills Parkway (Old Master). This stream gauge detects flooding, including extreme floods caused by excessive precipitation and severe weather patterns as a result of climate change.

Further, the City participates in the County's MJHMP, which identifies natural hazard risks throughout the county, including flooding and extreme precipitation, and recommends mitigation measures to reduce the risk to people and critical facilities. This Safety and Environmental Justice Element incorporates by reference the MJHMP and the identified capacities to reduce risk.

Chapter 11.36, Flood Damage Prevention, of the Santee Municipal Code states that areas of special flood hazards are subject to the code and outlines methods for reducing flood losses. The code establishes the basis for areas of special flood hazard, designates the floodplain administrator, and contains standards for construction, including requirements for anchoring, construction materials and methods, and elevation and flood-proofing. It also includes development standards for utilities, subdivisions, mobile and manufactured homes, and recreational vehicles, as well as provisions for extremely hazardous floodways. Chapter 11.38, Drainages and Watercourses, of the Santee Municipal Code sets forth construction requirements and prohibitions for development within a floodplain, including elevation standards.[18]

The City has a Stormwater Pollution Prevention Program that asks all residents, businesses, City facilities, developers, and landowners participate in preventing water pollution by implementing BMPs. The City has minimum requirements for BMPs outlined in the Santee Guidelines for Surface Water Pollution Prevention (2015). The guidelines support Chapter 9.06, Stormwater Management and Discharge Control, and other water quality protection provisions of the Santee Municipal Code. The guideline instructs what dischargers must do to comply with ordinances and to receive permits for projects and activities. Minimum BMP requirements must be met for industrial, commercial, and municipal facilities; residential areas; construction sites; and development projects. Minimum BMPs are outlined by each land use category.

Both the City and the County provide abundant resources to residents, including advance notifications systems and alerts and flood reduction measures for personal property, and has

[18] City of Santee. 2021. Santee Municipal Code. Accessed July 2023. http://qcode.us/codes/santee/?view=desktop.

provided sandbags during flood seasons. However, the City can continue to assess accessibility and availability of these resources, particularly for sensitive populations. As far as the adaptive capacity of critical facilities, the City has multiple codes, ordinances, and development standards that address flooding. These planning documents regulate development within the floodplain and require elevation of new construction 1 foot above the 100-year floodplain. Other City programs and participation in the County's MJHMP help increase the resilience of critical facilities to withstand flooding events.

3.3.5 Vulnerability Score

Table 5, Vulnerability Assessment Results: Extreme Precipitation, provides the vulnerability scoring for vulnerable populations and critical facilities in response to extreme precipitation in Santee. The reasoning for the scoring provided in Table 5 is discussed below.

Extreme precipitation and intense storm events can cause localized street flooding, although flood impacts during storm events will most likely occur in and around the floodplain. Vulnerable populations were given medium and high potential impact scores and high scores for adaptive capacity, which resulted in relatively low vulnerability scores (vulnerability scores of 2 to 3; **Table 5**). The following people are the most at risk of experiencing economic instability or insecurity and are more likely to experience the impacts of storm events:

- People without life-supporting resources, such as those who are unable to travel via evacuation routes due to limited access to reliable transportation or those who are unable to afford safe and secure housing due to financial constraints, may experience challenges responding to more frequent and intense precipitation and floods.
- People experiencing homelessness may experience more severe flood-related impacts, such as higher incidence of vector-borne illnesses and greater loss of human life, due to their deficiency of physical space to seek shelter from changing environmental conditions.

The asset categories most likely to be impacted by extreme precipitation are the residents and the critical facilities located near and within the 100-year and 500-year floodplains. Critical facilities within the floodplains include schools/educational institutions; City operations/government buildings, including fire stations, public works facility, and sheriff's office buildings; utility stations; healthcare-related facilities; and private and nonprofit facilities. These categories were given high impact scores. This assessment also assumes some impact on transportation infrastructure in the event of localized flooding. For example, a section of SR-52 runs parallel to the floodway and crosses the flood zone, although its elevation is likely to prevent significant damages. A medium score is provided, assuming some impacts could occur in a severe event. High adaptive capacity scores were given to City operations, public safety, utilities, and critical transportation. Medium scores are given to public health, schools, and community centers to account for the protections provided by the City's resources, but ultimately, authority and adaptive capacity are outside the City's local control (**Table 5**).

Table 5. Vulnerability Assessment Results: Extreme Precipitation

Category	Potential Impact	Adaptive Capacity Score	Vulnerability Score
Sensitive Populations			
People with AFNs	High	High	3
People with Existing Chronic Health Conditions	Medium	High	2
People with Low Incomes	Medium	High	2
People Experiencing Homelessness	High	High	3
Outdoor Workers	Medium	High	2
Older Adults	Medium	High	2
Children	Medium	High	2
People without Life-Supporting Resources	High	High	3
Critical Facilities			
City Operations	High	High	3
Public Safety Facilities	High	High	3
Public Health Facilities	High	Medium	4
Community Centers	Low	Medium	2
Utility Facilities	High	High	3
Critical Transportation	Medium	High	2
Schools	High	Medium	4

Note: AFNs = access and functional needs

3.4 Drought

3.4.1 Exposure

The PDMWD provides water, wastewater collection and treatment, water recycling, and recreational facilities to East County residents, including the cities of Santee and El Cajon and unincorporated communities of Flinn Springs, Harbison Canyon, Blossom Valley, Alpine, Dehesa, and Crest. The PDMWD imports 100 percent of drinking water supply from the San Diego County Water Authority (SDCWA). The water the PDMWD imports primarily comes from the State Water Project and the Colorado River Aqueduct via the Metropolitan Water District of Southern California.

Prolonged drought conditions can result in decreasing availability of water supplies. The County's 2021 Vulnerability Assessment and Adaptation Report covers the county's exposure to the effects of climate change, including drought and water supply, and identifies the Sierra Nevada as a key contributor of water supply for the region. Sierra Nevada snowmelt provides water to Southern California and other areas of the state via the State Water Project. However, the volume of snowpack is susceptible to climate change and rising temperatures.[19] The decline in the snowpack disrupts the timing of groundwater and surface water recharge, making it harder to store and use

[19] County of San Diego. 2021. Vulnerability Assessment and Adaptation Report. 27. Accessed July 2023. https://www.sandiegocounty.gov/content/dam/sdc/pds/GPUpdate2021/VulnerabilityAssessmentandAdaptationReport-Draft.pdf.

water during warm or drought conditions. High temperatures are also expected to affect the Colorado River streamflow.

Regionally, droughts are projected to become more frequent and intense in the county and throughout Southern California by mid-century. Cal-Adapt provides projections on the maximum length of a dry spell, or days with precipitation of less than 1 millimeter, for each year through mid- and end of century. Historically, Santee has averaged a 126-day dry spell for each year between 1961 and 1991. Dry spells are projected to increase by 4 to 8 days by mid-century and 6 to 14 days by end of century, depending on the emissions pathway.

3.4.2 Sensitivity

Water is critical to public health and safety, the economy, and community well-being. The PDMWD's 2020 Urban Water Management Plan (UWMP) estimates its population served in 2020 was 92,434. Drought conditions can increase demand for water supply, and water prices may rise in response to water shortages. Low-income households are particularly sensitive to increased water prices in drought as they often spend a greater percentage of their income on utilities, including water service. The communities that are most vulnerable to the impacts of drought are people experiencing homelessness, people without life-supporting resources, and people with low incomes—all of which are communities that may have a potential inability to access and/or afford increased prices set by utilities due to water scarcity.

Drought and limited water supply can impact businesses that rely on water; however, due to the array of job sectors in Santee, this impact is very likely to be low. According to the City's Housing Element, the City's largest job sectors are educational services, healthcare, and social assistance (24 percent); professional, scientific, management, and administrative services (13 percent); and retail trade (12 percent). Agriculture, a water-dependent sector, is the smallest economic sector at less than 1 percent, while construction and manufacturing each comprise 8 percent of the economic sectors in Santee.[20]

Potable water supply is imported from the State Water Project (North Bay, South Bay, and California Aqueducts) and the Colorado River (Los Angeles and Colorado River Aqueducts) by the Metropolitan Water District of Southern California. The PDMWD's potable water system consist of 14 pumping stations, 30 storage reservoirs, 19 pressure zones, 20 pressure reducing stations, and 398 miles of distribution mains.[21] As described in the Section 4.1, Flood Hazards, of the Safety and Environmental Justice Element, the PDMWD maintains seven water reservoirs in Santee: the Charles C. Price Reservoir, with a capacity of 15.5 million gallons; the Northcote Reservoir, with a capacity of 0.71 million gallons; and the Fanita Terrace Reservoir, the only water

[20] U.S. Census Bureau. 2019. "American Community Survey (ACS) 2014–2018 Estimates." Accessed July 2023. https://www.census.gov/programs-surveys/acs/technical-documentation/table-and-geography-changes/2018/5-year.html.
[21] San Diego County Water Authority. 2021. "2020 Urban Water Management Plan." March. Accessed July 2023. https://www.sdcwa.org/wp-content/uploads/2021/03/Draft-2020-UWMP.pdf.

tank in Santee that holds recycled water, storing up to 1.5 million gallons. The PDMWD is planning two additional potable water reservoirs, likely a 3-million-gallon facility that would be required for the Mesa Reservoir and a 4-million-gallon facility that would be required for the Fanita Ranch Reservoir. In addition to imported water, the PDMWD's water supplies also include recycled water and a very small amount of groundwater used to supplement the recycled system.

3.4.3 Potential Impact

The magnitude of a drought's impact is directly related to the severity and length. The severity of a drought depends on water availability and moisture deficiency and the size and location of the affected area. The longer the drought persists and the larger the area impacted, the more severe the potential impacts. Hot and dry conditions that persist into spring, summer, and fall can aggravate drought conditions, making the effects of drought more pronounced as water demands increase during the summer months. Impacts increase with the length of a drought, as carryover supplies in reservoirs are depleted and water levels in groundwater basins decline. [22]

Droughts can cause drinking water shortages and declines in water quality as sediments and other contaminants aggregate in depleted reservoirs, leading to increased reservoir maintenance needs. This is a greater concern for small water systems in rural areas and private residential wells. Water quality deterioration can occur during droughts due to lower levels of precipitation and limited water storage supply.

Droughts also increase the chances of catastrophic wildfire risks. Drought is a major determinant of wildfire hazard, in that it creates a greater propensity for fire starts and larger, more prolonged conflagrations fueled by excessively dry vegetation, along with reduced water supply for firefighting purposes. As illustrated by the state's catastrophic 21st century wildfire seasons, devastating urban/wildland fire episodes occurred during or following a drought, when dead timber and brush and dry vegetation created conditions favorable for massive fire outbreaks.[23]

The Pacific Institute and Environmental Justice Coalition for Water released a 2017 report, accessible on the California Adaptation Clearinghouse's website, called Drought and Equity in California. It is the first statewide analysis of impacts of the 5-year and ongoing drought on California's most vulnerable communities. The report identifies impacts of drought on people, including water supply shortages and rising costs, which affect people's access to safe, affordable water in their homes.[24] Often, low-income communities are disproportionately burdened by rising costs, which can place pressure on the local economy and low-income households. In some cases, droughts can also cause significant increases in food prices to the consumer due to shortages.

[22] California Department of Water Resources (DWR). 2022. "Drought." Accessed July 2023. https://water.ca.gov/water-basics/drought.
[23] DWR. 2022. "Drought In California." Accessed July 2023. https://water.ca.gov/-/media/DWR-Website/Web-Pages/Water-Basics/Drought/Files/Publications-And-Reports/DroughtBrochure2021update_ay11.pdf.
[24] Pacific Institute. 2017. "Drought and Equity in California." January. Accessed July 2023. https://pacinst.org/wp-content/uploads/2017/01/PI_DroughtAndEquityInCA_Jan_2017.pdf.

Examples of other economic impacts include costs to homeowners due to loss of residential landscaping, degradation of urban environments due to loss of landscaping, and higher electricity costs due to the loss of hydropower supplies.

Drought conditions stress the reliance on imported water supply and the county's limited local water supply. In the event of a severe drought, utilities may have to implement customer demand reductions. As the wholesale provider for the region, the SDCWA recognizes that climate change will impact the availability of water supply, potentially triggering a water shortage. The PDMWD relies on imported water, and extreme drought conditions could limit the availability of imported supply at the source. According to the PDMWD's 2020 UWMP, climate change is likely to add uncertainties to water supply planning and future supply availability. The PDMWD's Water Shortage Contingency Plan identifies various water shortage levels and conservation measures for each level. In a severe drought, reductions may be made to irrigation and landscaping, and conservation measures may even apply to public works projects and actively irrigated environmental mitigation projects. Water supply shortages could impact the ability of critical facilities to continuously operate and provide necessary civil services.

3.4.4 Adaptive Capacity

The Sustainable Santee Plan includes the following strategies to help mitigate the impacts of drought:

- Educate the public about water conservation;
- Encourage low-impact development;
- Expand water recycling and gray-water systems;
- Promote sub-metering in multi-family housing units; and
- Promote conversion of turf grass to xeriscaping.

The City releases information to the public about water conservation and water quality. The Stormwater Division posts tip sheets about minimizing hose use, vehicle washing, landscaping, harvesting rainwater, repairing leaks, adjusting sprinklers and watering times, installing drip systems, and implementing smart irrigation controllers. Contact information is also provided for WaterSmartSD, SaveOurWater, and the PDMWD.

Through the Public Information Office, the City has posted drought response summaries on its website. For example, the City posted an overview of the measures it took to reduce water usage during the statewide 2015 drought. Water conversation measures implemented by the City included installing drip irrigation, using reclaimed water, using smart irrigation controllers, replacing landscaping with drought-tolerant vegetation, installing artificial turf, installing drip systems, and conducting daily inspections to identify water system leaks at parks, rights-of-way, and landscape maintenance districts.

The PDMWD provides a number of conservation programs to help customers become more water efficient and reduce water use. Specifically, the PDMWD offers rebate programs when programs are funded, for water saving devices and turf replacement and has numerous programs to promote

water-efficient landscaping. The free Residential Landscape Survey Program will identify potential leaks, recommend water conserving devices, assess irrigation efficiency, and determine a proper landscape watering schedule, all customized to the customer's home. This program is available for single-family, multi-family, commercial, and industrial use properties. Customers can apply for the program through the PDMWD's website. The PDMWD also hosts water-efficient landscaping workshops, water-smart landscaping makeover series, and landscape design and irrigation classes. Links to examples of water-efficient landscaping, a landscape watering calculator, and a do-it-yourself water audit are available on the PDMWD's website. The PDMWD also has an education section of its website for children, containing workbooks by grade level about the water cycle, water conservation, and the California Water System. The PDMWD also offers tours of water recycling facilities and pump stations during which visitors can get a behind-the-scenes look at the operations of wastewater and water systems.

The PDMWD's 2020 UWMP includes a drought risk assessment that evaluates the impacts of a 5-consecutive-year drought. This period represents the driest 5-year historical sequence for the PDMWD. The water demands during a 5-consecutive-year drought are anticipated to range between 18,148 acre-feet per year (first year) to 18,885 acre-feet per year (fifth year) by year 2045. Based on the SDCWA's supply availability through the year 2045, the PDMWD is projected to have sufficient supply available to meet water demands through 2045 for a 5-consecutive-year drought. In addition, the SDCWA invested in carryover storage supplies to help achieve reliability in dry years and multiple-dry years. The carryover storage supply program includes both in-region surface water storage and out-of-region groundwater storage in California's Central Valley. The PDMWD also has capacity to implement water conservation and outreach efforts during drought conditions that would result in lower demand increases than those normally associated with hot, dry weather.

According to the PDMWD's 2020 UWMP, the PDMWD is focused on water supply diversification to reduce risks associated with reliance on imported water. Notable strategies include the following:

- By 2020, local water supplies, including the Carlsbad Desalination Plant, recycled water, groundwater and surface water reservoirs, increased to meet more than one-third of the region's water supply demands.
- Potable reuse projects are local, drought-proof sources of water that are projected to make up 17 percent of the county's drinking water supply by 2035.
- The PDMWD is currently working with Helix Water District, the City of El Cajon, and the County on the East County Advanced Water Purification Project. This project would purify recycled water to create up to 30 percent of East County's drinking water supply. Together with projects including Pure Water San Diego and Pure Water Oceanside, the East County Advanced Water Purification Project will play a crucial part in reducing the county's reliance on imported water. It is expected to come online in 2025.

The County's MJHMP includes the following goals and actions to respond to natural hazards, such as climate change:

- Encourage residents to adopt drought-tolerant landscaping or xeriscape practices;
- Promote use of reclaimed water for all landscaping efforts; and
- Support groundwater recycling efforts.

Chapter 13.36, Landscape and Irrigation Regulations, of the Santee Municipal Code outlines the landscape and irrigation regulations. These regulations encourage the use of recycled water and update landscape design standards for new development in Santee. The regulations require efficient and appropriate irrigation equipment, establish maximum applied water allowances, prohibit overspray, include audit and maintenance provisions to meet the state's Model Water Efficient Landscape Ordinance, encourage the use of recycled water, and include minimum landscaping requirements. Further, the City's Guidelines for Implementation of the City of Santee Water Efficient Landscape Ordinance establishes a structure for planning, designing, installing, maintaining, and managing water-efficient landscape practices in new construction and rehabilitated projects. It establishes provisions for water management practices and water waste prevention.

3.4.5 Vulnerability Score

Table 6, Vulnerability Assessment Results: Drought, provides the vulnerability scoring for vulnerable populations and critical facilities in response to drought effects in Santee. The reasoning for the scoring provided in Table 6 is discussed below.

Drought poses the most significant threat to people, especially sensitive groups, and rising temperatures have the potential to exacerbate drought. Vulnerable populations were given high scores for potential impact and medium to low scores for adaptive capacity, which resulted in relatively high vulnerability scores (vulnerability scores of 4 and 5; **Table 6**). Across the state, drought will continue to be a leading hazard of concern and have an impact on people and water-dependent industries. In Santee, drought will likely have the most impact on the following people without life-supporting resources:

- People without life-supporting resources may experience more intense drought-related impacts, such as lack of affordability (inaccessibility to water), diminished living conditions (displacement from homes), and mental health impacts (anxiety/depression disorders) due to their limited ability to access and/or afford clean water in their homes.
- People experiencing homelessness may experience more severe drought-related impacts, such as higher incidence of heat stroke and greater loss of human life, due to their deficiency of physical space to seek shelter from changing environmental conditions.

Water utilities will be the most impacted by drought. Although drought may have minor (little to no) impacts on other critical facility asset categories in the short-term, the state and the Southern California region will need to continue to plan for the impacts of drought in the mid- to long-term under different

climate change scenarios. State modeling projects an increased number of dry days, dry years, and strings of dry years resulting from more frequent and more intense drought.[25] As a leading hazard of concern for California, medium impact scores are given to critical facilities (**Table 6**).

Both the City and the PDMWD provide multiple resources to the public, and the drought assessment in the 2020 UWMP identifies sufficient water supplies in the event of a 5-year drought. However, the impacts of drought in the short- and long-term in order require continual assessment and planning to drought resiliency. Adaptive capacity score is rated as a medium as the City and PDMWD will need to identify long-term priorities to address climate change-related effects on drought (**Table 6**).

Table 6. Vulnerability Assessment Results: Drought

Category	Potential Impact	Adaptive Capacity Score	Vulnerability Score
Sensitive Populations			
People Experiencing Homelessness	High	Low	5
People without Life-Supporting Resources	High	Low	5
People with AFNs	High	Medium	4
People with Low Incomes	High	Medium	4
Outdoor Workers	High	Medium	4
Older Adults	High	Medium	4
Children	High	Medium	4
People with Existing Chronic Health Conditions	High	High	3
Critical Facilities			
City Operations	Medium	Medium	3
Public Safety Facilities	Medium	Medium	3
Public Health Facilities	Medium	Medium	3
Community Centers	Medium	Medium	3
Utility Facilities	High	Medium	4
Critical Transportation	Medium	Medium	3
Schools	Medium	Medium	3

Note: AFNs = access and functional needs

3.5 Section 3 Summary

Section 3 summarized the exposure potential and sensitivity of vulnerable populations and critical facilities to the four climate change hazards (extreme heat, wildfire, extreme precipitation, and drought) analyzed in this Vulnerability Assessment. Using the exposure and sensitivity to each hazard, the analysis identifies the potential impact of the hazard on vulnerable populations and critical facilities. The potential impact and the adaptive capacity are examined to score the overall vulnerability of vulnerable populations and the City's critical facilities to these hazards. Table 3 through Table 6 depict

[25] State of California. 2019. "Fourth Climate Change Assessment." Accessed July 2023. https://www.climateassessment.ca.gov/state/.

how the potential impact and adaptive capacity scores were used to determine overall vulnerability scores using the Vulnerability Scoring Rubric on Figure 4. **Table 7, Vulnerability Assessment Results for All Hazards**, summarizes the vulnerability scores for vulnerable populations and critical facilities in Santee, as identified in Table 3 through Table 6.

Table 7. Vulnerability Assessment Results for All Hazards

Category	Vulnerability Score			
	Extreme Heat	Wildfire	Extreme Precipitation	Drought
Sensitive Populations				
People with AFNs	4	4	3	4
People with Existing Chronic Health Conditions	3	3	2	3
People with Low Incomes	3	4	2	4
People Experiencing Homelessness	5	5	3	5
Outdoor Workers	4	4	2	4
Older Adults	3	4	2	4
Children	3	4	2	4
People without Life-Supporting Resources	4	5	3	5
Critical Facilities				
Public Health Facilities	3	4	4	3
Schools	3	4	4	3
Utility Facilities	3	3	3	4
Critical Transportation	4	4	2	3
City Operations	2	3	3	3
Public Safety Facilities	2	3	3	3
Community Centers	2	3	2	3

Note: AFNs = access and functional needs