

APPENDIX C: Vulnerability Assessment

Climate Change Vulnerability

Changes to the global climate system are expected to affect future occurrences of natural hazards in and around Yucca Valley. Many hazards are projected to occur more frequently and intensely in coming years and decades, and in some cases, these trends have already begun. According to California's *Statewide Summary Report: Fourth Climate Change Assessment*,¹ Yucca Valley can expect the following changes to climate-related hazard events:

- Both droughts and floods are expected to become more frequent as precipitation is expected to occur in fewer, more intense storms because of climate change. Although Yucca Valley is likely to experience little change in overall precipitation levels from climate change, the region is also expected to see an increase in the number of extreme precipitation events. As a result, floods are expected to occur more often in Yucca Valley and climate change may expand the areas considered prone to flooding. Climate change is expected to increase the frequency and severity of droughts that cause soil to dry out and condense. When precipitation does return, more water may run off the surface rather than being absorbed into the ground, which can lead to floods.
- Warmer temperatures are projected to cause an increase in extreme heat events, which in Yucca Valley is a day with a high temperature of at least 101.9 degrees Fahrenheit (°F). Depending on future greenhouse gas (GHG) emission levels, the countywide number of extreme heat days is expected to rise from a historical average of 4 to between 27 and 38 by the middle of the century (2041 to 2060), and to between 30 and 68 by the end of the century (2070 to 2099). In addition to increases in extreme heat events, Yucca Valley is expected to see an increase in the average annual high temperatures. Extreme heat poses a significant human health risk, especially to senior citizens, outdoor workers, and persons who do not have access to adequate cooling, including people experiencing homelessness. Some infrastructure and community service systems may be disrupted by very high temperatures, constraining their ability to meet community needs.
- Climate change can increase the rates of infection for various diseases because many of the animals that carry diseases are more active during warmer weather. There are a number of diseases that are linked to climate change and can be harmful to the health of Yucca Valley community members, such as hantavirus pulmonary syndrome, Lyme disease, West Nile fever, and influenza. Many of these diseases are carried by animals, such as mice and rats, ticks, and mosquitos, which are usually seen as pests even if they do not cause infections. Warmer temperatures earlier in the spring and later in the fall can cause these animals to be active for longer periods, increasing the time that these diseases can be transmitted.

¹ Bedsworth, Louise, Dan Cayan, Guido Franco, Leah Fisher, Sonya Ziaja. (California Governor's Office of Planning and Research, Scripps Institution of Oceanography, California Energy Commission, California Public Utilities Commission). 2018. *Statewide Summary Report. California's Fourth Climate Change Assessment*. Publication number: SUMCCCA4-2018-013.

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- Yucca Valley is expected to see an increase in wildfires due to hotter, drier weather. Although the risk is greatest in the mountainous areas to the west and south (e.g., San Bernardino Mountains, Joshua Tree National Park), Yucca Valley may still experience an increase in wildfire activity, especially in the areas of chaparral, scrub, and grassland along hillsides. Across the region, more frequent and intense wildfires may also create poor air quality for Yucca Valley.
- Severe weather events, such as strong storms and high winds, may become more frequent and intense because of climate change. Climate change is expected to cause an increase in intense rainfall, which is usually associated with strong storm systems. Heavy rainfall may contribute to an increased risk of landslides or mudslides in the hills around Yucca Valley. In San Bernardino County, most severe weather is linked to high winds. During high wind events, dust storms could pose a serious issue for the community. Though less frequent than windstorms, the damage from dust storms can be more severe, reducing visibility, damaging buildings, and negatively impacting the health of those in the community. Snowfall or extreme cold may also become more frequent and intense because of climate change. While climate change is expected to increase average temperatures, the number of severe winter storms affecting Yucca Valley may also increase. As a result, intense storm systems could create severe winter weather conditions in the area that can cause extensive damage to buildings and infrastructure and pose danger for driving conditions and human health. The types of dangers posed by severe weather vary widely and include injuries or deaths, damage to buildings and structures, roads blocked by debris, and fires sparked by lightning.

Vulnerability Assessment Results

Under California law, the Safety Element is required to include a vulnerability assessment that looks at how people, buildings, infrastructure, and other key community assets may be affected by climate change. The Town conducted a Climate Change Vulnerability Assessment in spring of 2021, to analyze Yucca Valley's susceptibility to climate-related hazards. The Town of Yucca Valley's vulnerability assessment, prepared in accordance with the most recent available guidance in the *California Adaptation Planning Guide*, assesses how eight different climate-related hazards (air quality, drought, extreme heat and warm nights, flooding, human health hazards, landslides, severe weather, and wildfire) may affect 58 different population groups and community assets. Each population or asset received a score of V1 (minimal vulnerability) to V5 (severe vulnerability) for each climate-related hazard. The vulnerability assessment indicates that Yucca Valley's populations and assets are most vulnerable to extreme heat, flooding, landslides, and wildfire.

Populations in Yucca Valley tend to be most vulnerable to extreme heat, human health hazards, and wildfire, which directly affect health outcomes. As discussed previously, the most vulnerable communities include households in poverty, seniors living alone, outdoor workers, and persons experiencing homelessness. Other populations, especially those located on single-access roads, are also highly vulnerable to landslides, severe weather, flooding, and wildfire.

Throughout the town, energy delivery is vulnerable to multiple hazards, including severe weather, such as high winds that can trigger public safety power shutoff (PSPS) events, extreme heat that reduces the capacity and strains the system, and wildfires that damage the system, ultimately disrupting energy service. These hazards can also damage communication infrastructure, decreasing network capacity. There may be a higher demand for communication services during

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severe weather, potentially putting stress on the network and increasing the risk of service interruptions. Extreme heat can lead to power outages by causing mechanical failure of grid equipment, heat damage to power lines, and by creating a high demand for electricity to power air conditioners, placing stress on the network. This is likely to lead to greater service disruptions.

An increase in droughts, extreme heat, and wildfire create higher vulnerabilities for chaparral, woodland, shrubland, and grassland ecosystems. Drought and extreme heat can stress vegetation, weakening or killing a variety of native species and habitats. Although chaparral, woodland, shrubland, and grassland in the region are adapted to infrequent, low-intensity wildfire, many native species are still vulnerable to large and intense wildfire events. Large-scale wildfires can cause old growth pinyon-juniper woodland to be replaced by post-fire shrubland, decreasing the diversity of plants in these ecosystems. Moreover, grasslands pose an extreme risk from their high, easily ignitable fuel loads and the invasion of non-native species has greatly increased the risk of severe wildfire events. Pests, such as shot hole borers, have increased because of drought and higher temperatures that impact tree health, and make them more vulnerable to pests. Ecosystems vulnerable to these pests include pinyon-juniper woodlands. Such pests can decimate woodland habitats and these species may not be able to recover. This can in turn affect local economic activities in Yucca Valley, such as outdoor recreation and tourism activities, as well as commercial activity from visitors that travel through the town to get to state and national parks and forests.

PSPS events can also create vulnerabilities for Yucca Valley community members. The vast majority of homes and businesses do not have backup power supplies, so a loss of electricity can cause a loss of refrigeration for food and medical supplies, limit cooking, cause loss of heating or cooling (particularly dangerous during extreme heat or cold events), lighting, and limited or no access to the Internet or other information systems. Many businesses are forced to close during a PSPS, causing economic hardships and depriving community members of important services, such as grocery stores, gas stations, and banks/ATMs. PSPS events may also be harmful to people who depend on electrically powered medical devices. Some property owners have purchased backup power generators, although these produce high levels of noise, pollution, and odors.

The Safety Element includes goals and policies to increase community resilience and help lower vulnerability scores, particularly for the populations and assets that received a score of V4 or V5 in the vulnerability assessment. Implementation strategies that support these goals and policies are identified in the Implementation Strategy section of the General Plan.

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The table below shows the results of the vulnerability assessment prepared for Yucca Valley, in accordance with the requirements of Senate Bill 379. For each population or asset that may be vulnerable to each climate-related hazard, the population or asset is scored on a scale of zero to five:

- 0: Not vulnerable
- V1: Minimal vulnerability
- V2: Low vulnerability
- V3: Moderate vulnerability
- V4: High vulnerability
- V5: Severe vulnerability

The vulnerability scores reflect both the severity of climate-related impacts and the ability of populations and assets to resist and recover from these effects. Refer to the “Climate Change” and “Vulnerable Populations and Assets” sections of the Safety Element for additional details on the vulnerability assessment method.

POPULATIONS AND ASSETS	AIR QUALITY	DROUGHT	EXTREME HEAT & WARM NIGHTS	FLOODING	HUMAN HEALTH HAZARDS	LANDSLIDES	SEVERE WEATHER	WILDFIRE
POPULATIONS								
Children age <10	V5		V5	V3	V3	V3	V2	V5
Cost-burdened households	V4	V4	V4	V4	V2	V3	V2	V3
Households in poverty	V5	V5	V5	V5	V4	V4	V4	V5
Immigrants and refugees	V5		V5	V4	V5	V4	V4	V5
Linguistically isolated populations	V3		V3	V2	V4	V4	V4	V3

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POPULATIONS AND ASSETS	AIR QUALITY	DROUGHT	EXTREME HEAT & WARM NIGHTS	FLOODING	HUMAN HEALTH HAZARDS	LANDSLIDES	SEVERE WEATHER	WILDFIRE
Low-income households	V4	V5	V5	V4	V4	V3	V3	V4
Outdoor workers	V5	V5	V5	V3	V5	V2	V4	V5
Overcrowded households	V3		V5	V3	V4	V4	V2	V3
Persons experiencing homelessness	V5		V5	V5	V5	V4	V5	V5
Persons living on single-access roads	V1		V1	V3		V4	V3	V4
Persons with chronic illnesses	V5		V5	V4	V4	V4	V5	V5
Persons with disabilities	V3		V5	V4	V3	V4	V4	V5
Persons without access to lifelines	V3		V5	V5	V3	V4	V4	V5
Renters	V3	V4	V3	V3	V2	V3	V4	V3
Seniors (65+)	V4		V5	V4	V4	V4	V3	V5
Seniors living alone	V5		V5	V5	V5	V5	V4	V5
Undocumented persons	V4		V5	V4	V5	V4	V5	V4
Airports			V3	V4			V2	V3
Biking and hiking trails			V1	V2		V4	V2	V4
Bridges			V3	V4		V3	V4	V3

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Communication facilities			V2	V1		V4	V3	V4
Electrical substations and transmission lines			V4	V3		V3	V5	V5
Electric vehicle charging stations			V3	V3		V3	V4	V3
Evacuation routes				V5		V5	V3	V5
Flood-control infrastructure						V3		
Major roads and highways			V2	V5		V5	V3	V4
Natural gas pipelines			V3	V3		V3		V4
Parks and open space		V4	V2	V3		V4	V4	V3
Single-access roads			V2	V4		V3	V5	V5
Solid waste facilities and closed landfills				V3		V3	V2	
Transit routes and stops				V3		V2		V2
Water and wastewater infrastructure		V3		V5		V4	V3	
Community centers and libraries			V3				V3	
Commercial centers			V3				V3	

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Emergency shelters/cooling centers			V3				V3	
Government buildings			V3				V2	
Homes and residential structures			V3	V4		V4	V4	V3
Homeless shelters			V3				V3	
Medical and care facilities			V1	V3			V2	
Public safety buildings			V1			V3	V2	
Schools			V3			V3	V2	
Major employers			V2	V2	V2	V2	V2	V1
Outdoor recreation	V4		V4	V3	V3	V4	V2	V4
Twentynine Palms Military Base			V2			V3	V2	
Tourism	V5		V3	V3	V3	V3	V3	V3
Chaparral		V3	V4	V1		V3	V3	V4
Desert scrub		V2	V2	V1		V2	V1	V4
Grassland		V4	V3	V1		V3	V3	V3
Pinyon-juniper woodlands		V5	V4	V1		V4	V3	V5
Shrubland		V3	V4	V1		V3	V3	V4

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Communication services			V3	V3		V3	V4	V3
Emergency medical response	V3		V2	V3	V4	V3	V3	V3
Energy delivery	V1	V3	V5	V4		V3	V5	V5
Government administration and community services			V1	V2	V2	V1	V2	V2
Public safety response	V3	V2	V1	V3	V4	V4	V3	V4
Public transit access	V3		V3	V4	V2	V3	V4	V3
Solid waste removal			V3	V3	V2	V3	V2	V3
Water and wastewater		V4	V3	V4		V4	V3	V3