



# Seismic and Geologic Hazards

## SEISMICITY

Like much of California, Moreno Valley is located in a seismically active region. As shown in Map S-1, the San Jacinto Fault Zone traverses the northeastern boundary of the city. One of the most seismically active structures in southern California, the San Jacinto fault zone has produced 10 historical earthquakes with a magnitude greater than 6 and has been categorized as an Alquist-Priolo Earthquake Fault Zone by the State of California. Alquist-Priolo Zones identify surface traces of known active faults that pose seismic hazards and buffers around the known traces. New housing construction within these zones is prohibited unless a comprehensive geologic investigation shows that the fault does not pose a hazard to the proposed structure.

The San Jacinto Fault Zone is composed of several parallel faults that together constitute the zone. There are three branches of the San Jacinto Fault in the southeast corner of the study area. The western branch is sometimes referred to as the Casa Loma Fault, which is identified on maps primarily southeasterly of the City limits; the eastern branch, the Claremont Fault. The Farm Road Fault was identified in 1992 in the southeastern portion of the study area. The Casa Loma fault within the City limits is not identified as an Alquist-Priolo Earthquake Fault Zone as insufficient information is available to determine if the fault is active.

Given the extent of known faults in the planning area, the potential for seismic hazard is high. These hazards may be addressed through adherence with existing building codes including the requirements of California Building Code Chapter 18, and state and

local regulations, though exposure to seismic risks cannot be completely eliminated.

## GROUND SHAKING AND SURFACE RUPTURE

Ground shaking is the effect of surface motion generated by an earthquake that results in the vast majority of damage during seismic events. Several factors control how ground motion interacts with structures, making the hazard of ground shaking difficult to predict. Seismic waves propagating through the Earth's crust are responsible for the ground vibrations normally felt during an earthquake. Structures within the city could be affected by ground shaking during a seismic event associated with the San Jacinto Fault Zone. Additionally, seismic events associated with the active San Andreas Fault located approximately 15 miles northeast and the active Elsinore Fault located approximately 17 miles southwest could also generate ground shaking within the city.

## LIQUEFACTION

Liquefaction is a seismic phenomenon in which loose, saturated, granular soils behave similarly to a fluid when subject to high-intensity ground shaking. Liquefaction occurs when three general conditions exist: shallow groundwater; low-density non-cohesive (granular) soils; and high-intensity ground motion. Liquefaction is typified by a buildup of pore-water pressure in the affected soil layer to a point where a total loss of shear strength occurs, causing the soil to behave as a liquid. Studies indicate that saturated, loose to medium dense, near surface cohesionless soils exhibit the highest liquefaction potential, while dry, dense, cohesionless soils and cohesive soils exhibit low to negligible liquefaction potential. As shown in Map S-2, the majority of the city is classified as having low or moderate potential for liquefaction. Small amounts of

land within the western and southern portion of the city are classified as having high potential for liquefaction, and small amount of land along the southern border is classified as having very high potential for liquefaction.

## LANDSLIDES

Landslides occur when masses of rock, earth, or debris move down a slope, including rock falls, deep failure of slopes, and shallow debris flows. Landslides are influenced by human activities such as grading and other construction activities, irrigation of slopes, mining activity, and by natural factors such as precipitation, geology/soil types, surface/subsurface flow of water, and topography. Frequently, they may be triggered by other hazards such as floods and earthquakes. The majority of the city is relatively flat and has been assigned a landslide susceptibility class of 0 (No Risk) by the California Geological Survey (Map S-3). However, some areas within the northern, northeastern and southeastern portions of the city and within the Sphere of Influence have been assigned landslide susceptibility classes ranging from V (Moderate Risk) to X (High Risk). Some areas within the central portion of the city have also been assigned a landslide susceptibility classes ranging from V (Moderate Risk) to X (High Risk).



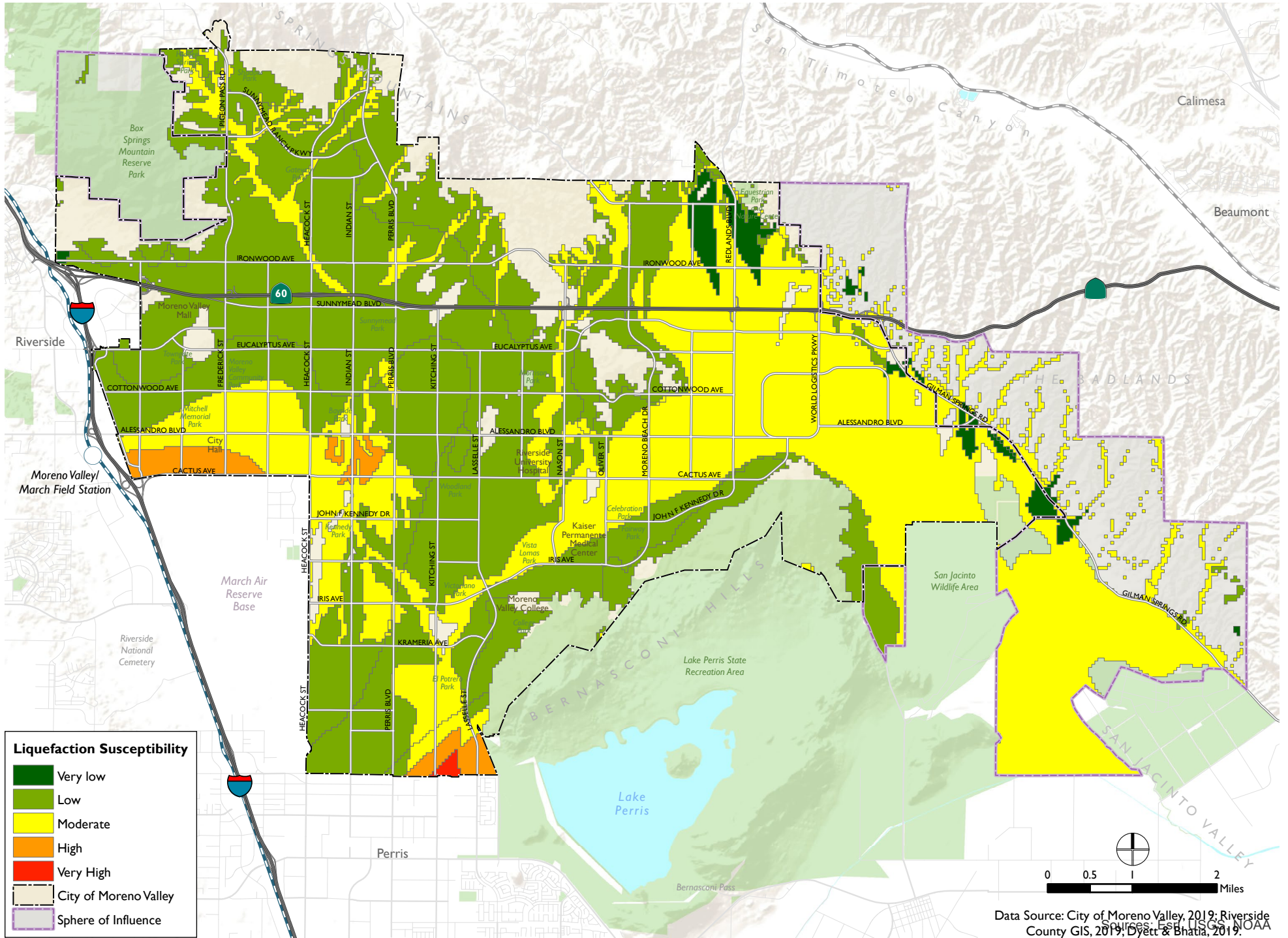
The San Jacinto Fault Zone traverses the northeastern border of the city, putting the area at higher risk for seismic activity.







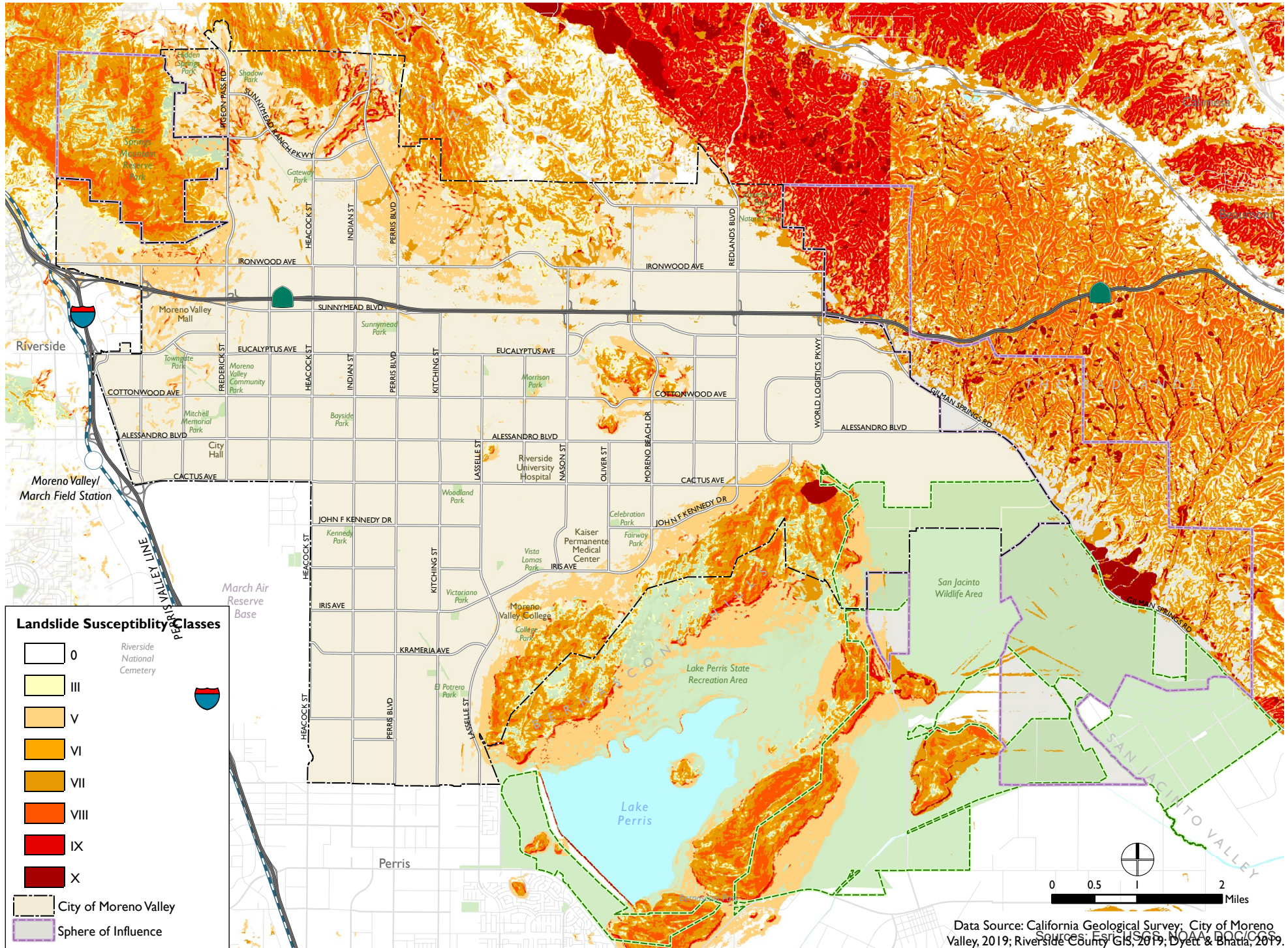
# Map S-2: Liquefaction Hazards



Data Source: City of Moreno Valley, 2019; Riverside County GIS, 2019; Dyett & Bhatia, 2019.



# Map S-3: Landslide Hazards





## Flood Hazards

### DRAINAGE

Moreno Valley generally drains from north to south into the San Jacinto River, Canyon Lake, and ultimately to Lake Elsinore via three major storm drain channels: the Sunnymead Storm drain, the Kitching Storm drain, and the Perris Valley Storm drain.

- ◆ The Sunnymead Storm Channel is a concrete-lined channel that extends from SR-60 and crosses the planning area in a southwesterly direction. The Channel accepts storm water runoff from the Box Springs Mountains and areas south of the mountains. The runoff flows into the Sycamore Canyon Watershed. This storm water runoff eventually flows into the Santa Ana Watershed.
- ◆ The Kitching Channel is an open channel that averages a 12-foot bottom, 7-foot deep trapezoidal channel. Kitching Channel and its storm drains system constitutes the backbone of the eastern half of the Sunnymead Master Drainage Plan. The Channel drains in a southerly direction approximately from SR-60 through the central portion of Moreno Valley and into the Perris Valley Storm drain and ultimately into the San Jacinto River Watershed.
- ◆ The Perris Valley Storm drain is an open channel. Lateral A runs west to east between Krameria Avenue and Nandina Avenue. Lateral A enters the main channel west of Lasselle Street. Eventually, the storm drain empties into the San Jacinto River Watershed.

### FLOODING

Like many communities in the region, Moreno Valley has a history of flooding, primarily in areas that are not fully developed and where storm drain system is not yet built out. Between 2005 and 2015, six major storm events resulted in flood damage to residential and commercial structures as well as transportation and utility infrastructure totaling over \$59 million. Since 2005, the City has invested over \$25M in new and updated storm drain infrastructure to mitigate flooding issues.

Storms can result in flooding of drainage channels and areas immediately adjacent floodplains, while sheet flows can occur if the capacities of defined watercourses are exceeded. Ponding may also occur if water flow is obstructed due to humanmade obstacles such as the embankments of SR-60 and other roadways. The Federal Emergency Management Agency (FEMA) issues Flood Insurance Rate Maps (FIRM) identifying areas prone to flooding and characterizing flood hazard risk. As shown on Map S-4, a large portion of the eastern part of the city is located within the 500-year flood plain, meaning that properties have a one-in-500 chance of flooding in a given year. Smaller areas, primarily in the southern part of the city are located in the 100-year flood plain.

The Riverside County Flood Control and Water Conservation District (RCFCWCD) is the agency responsible for the regional flood control system. RCFCWCD has prepared three Master Drainage Plans (Sunnymead Area, West End, and Moreno), each of which covers a different portion of the city. RCFCWCD currently owns and maintains a number of regional flood control facilities, while the City controls a number of local facilities. New development is required to build master drainage plan facilities and/or pay fees that are used to build the facilities. Additionally, new development throughout the city is

required to implement stormwater best management practices (BMPs) that can help reduce the flooding impact of a storm event. To ensure compliance, the City makes the Low Impact Design BMP Design Handbook and Checklist from the Riverside County Water Quality Management Plan available to project applicants.

### DAM INUNDATION

Dam inundation is also a potential flood hazard in portions of planning area. Dam failure can result from causes such as earthquakes, erosion, improper siting, rapidly rising floodwaters, or structural/design flaws, and can result in severe flooding in downstream areas. Failure of the Pigeon Pass Dam (Poorman's Reservoir) in the north western part of the city could result in extensive flooding along the downstream watercourse; however, the reservoir does not retain water throughout the year and the risk of flooding due to failure is limited to the period during and immediately after major storms. Failure of the Perris Dam would only affect a very small area south of Nandina Avenue along the Perris Valley Storm Drain and the Mystic Lake area in the southeast corner of Moreno Valley.

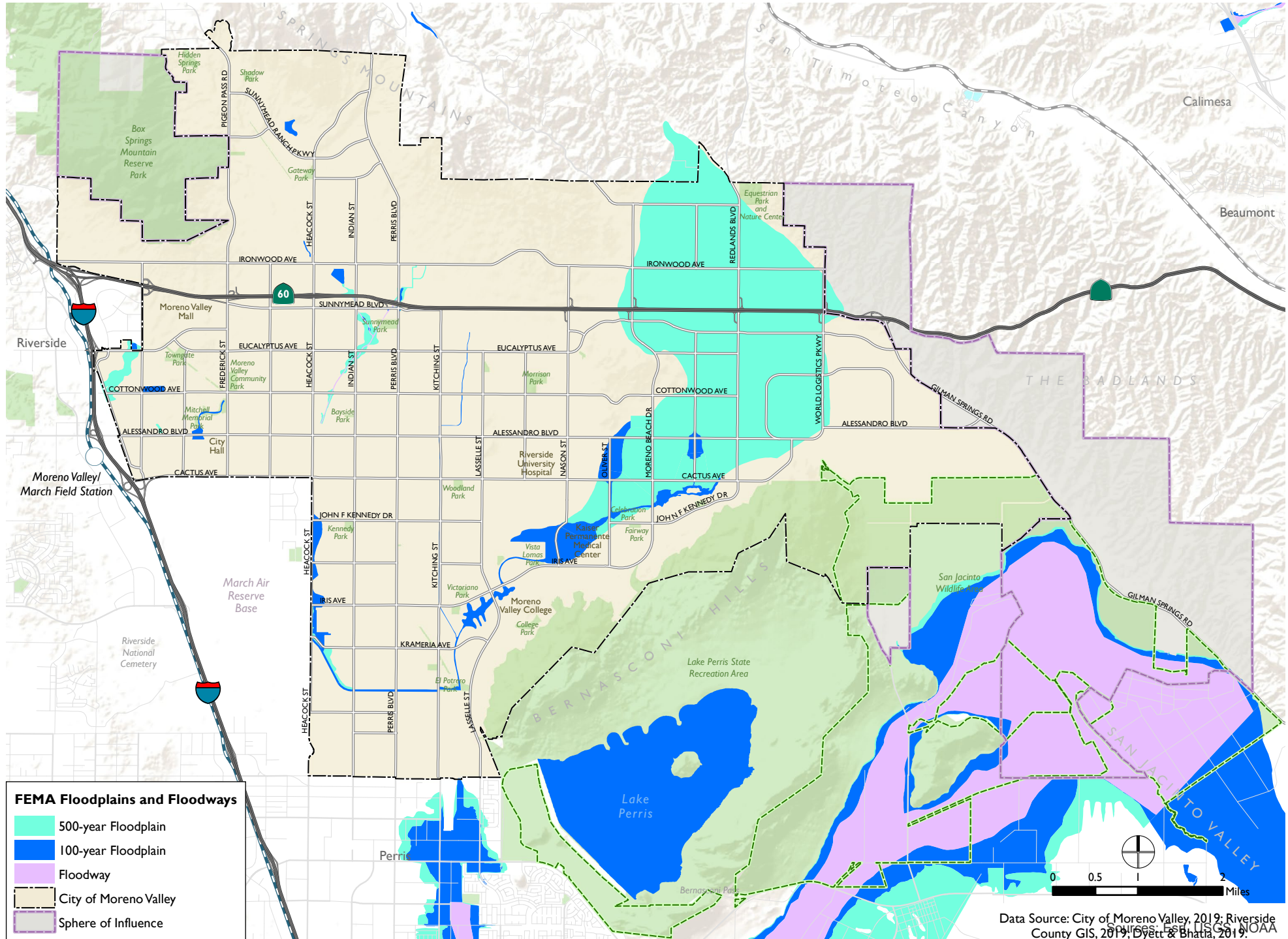


The RCFCWCD manages flood control projects such as the construction of the Nason Basin, above. In 2003, the District completed the construction of the 16-acre basin, which reduces the 100-year flows by more than 70%.

Photo credit: RCFCWCD, rcflood.org



# Map S-4: Flood Hazard Areas



Data Source: City of Moreno Valley, 2019; Riverside County GIS, 2019; USGS, NOAA

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## Wildfire Hazards

### SETTING AND RISK

The California Department of Forestry and Fire Protection (CAL FIRE) has designated Fire Hazard Severity Zones (FHSZs) throughout the state based on factors such as fuel, slope, and weather to indicate varying degrees of fire hazard (i.e., moderate, high, and very high). FHSZ maps evaluate physical conditions that create a likelihood that an area will burn over a 30- to 50-year period. As an urbanized community, wildfire hazard is minimal in most of Moreno Valley; however, given the relatively low annual precipitation and high prevailing temperatures in the region, the annual grasses and sage brush that cover the rolling hills surrounding the city and areas with similar coverage within the City limit are highly prone to fire.

As shown on Map S-5, areas along the entire northern perimeter of the city and areas adjacent to the Bernasconi Hills in the southeastern part of the city are designated Very High FHSZs, as are areas along the eastern perimeter of the city. There is existing low density single-family residential development in and adjacent to these Very High FHSZs, notably in the vicinity of Petit Hill north of Ironwood and south of Iris and John F. Kennedy, where residential neighborhoods abut the Bernasconi Hills. Prolonged droughts coupled with high winds and dry vegetation create the highest fire risk in these areas, particularly in autumn and winter, when the Santa Ana winds typically blow and wildfire risk increases significantly. More to the interior of the city, a 75-acre area of rocky, vegetated terrain flanking Moreno Beach Drive south of SR-60 known as Moreno Peak is also designated a Very High FHSZ. Wildfire risk at this location is from wind-driven fires and human factors, including sparks from vehicles on adjacent roadways, fireworks, or campfires.

Left uncontrolled, wildfires have the potential to damage or destroy structures, roadways, and utility systems, disrupt the economy, and impact the City's ability to respond to emergencies. Without vegetation, recently burned areas may also be at greater risk from mud and debris flow, further compounding risk. In addition to the direct physical threat to life and property, smoke released during an event can have a detrimental effect on air quality and lead to health risks from smoke inhalation. Smoke can cause or exacerbate respiratory problems for sensitive individuals, and the fine particles in smoke can damage machinery or ground airplanes. People without access to medical care or those that have pre-existing conditions that make it difficult to evacuate or cope with increased smoke conditions are highly vulnerable to wildfires.

As identified in the Moreno Valley Local Hazard Mitigation Plan (LHMP), between 2003 and 2016, 803 wildland fires varying in size and impact occurred within the City of Moreno Valley, including 11 that were over 50 acres in size with an estimated total incident cost of over \$1.1 million. The LHMP and the Riverside County Multi-Jurisdictional Hazard Mitigation Plan (MJHMP) both identify wildfire as one of the natural hazards with the highest probability of occurring, and the hazard with the third highest severity. According to the California Fourth Climate Change Assessment, overall burned area may increase by as much as 60 percent during Santa Ana Wind events (typically October to March), and 75 percent during periods without Santa Ana Winds (typically April to September). Models also suggest that the region will see a 13.4 percent increase in average annual acres burned above historic levels by mid-century. By the end of the century, this increase is projected to decrease to 2.3 percent above historic levels due to wildfire fuel reductions associated with increased drought and extreme heat conditions.

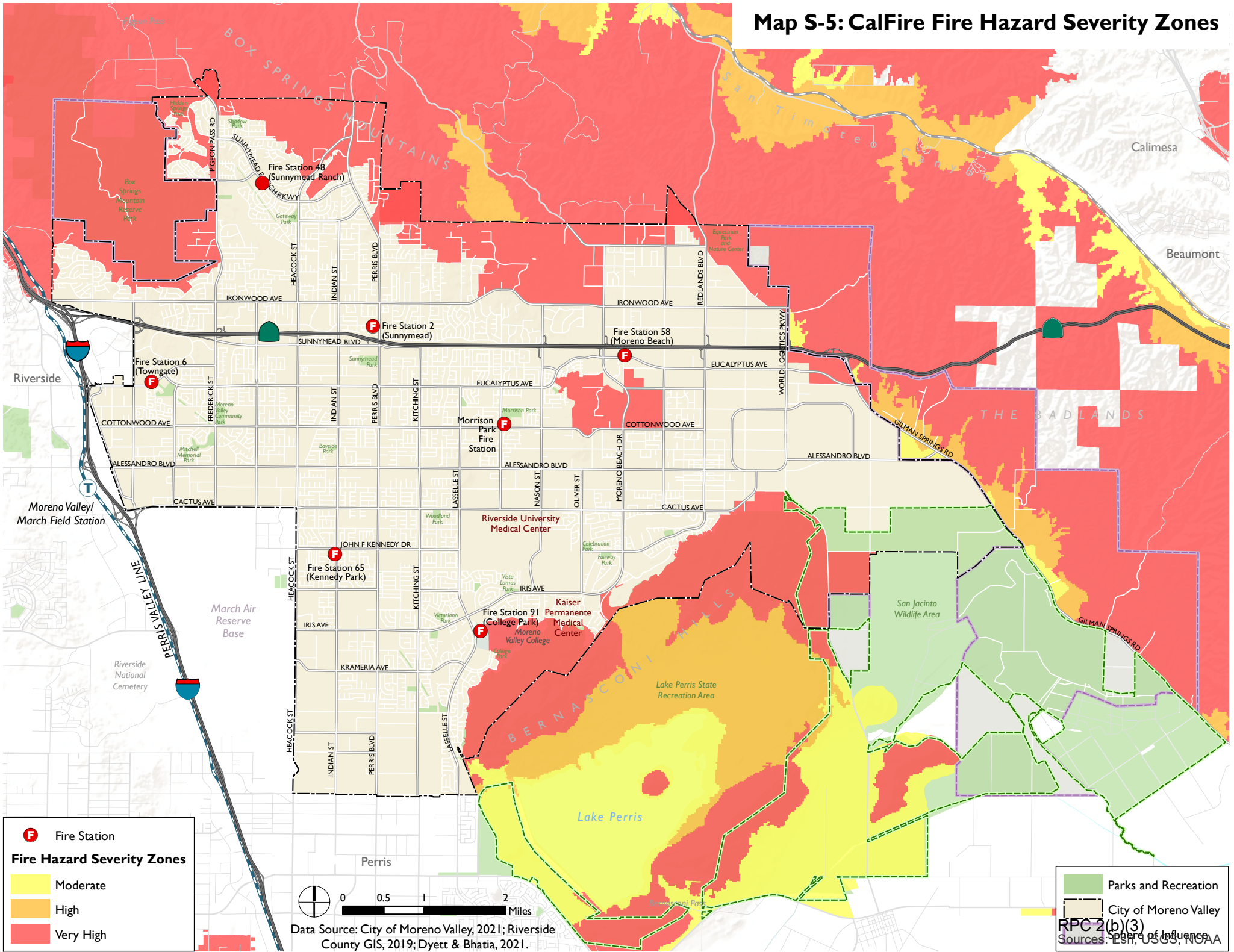
### WILDLAND URBAN INTERFACE AREAS

To address this risk, the City cooperates with CAL FIRE and the Riverside County Fire Department through cooperative fire protection agreements. Portions of the planning area within the SOI are designated State Responsibility Areas (SRA), where the State of California is financially responsible for the prevention and suppression of wildfires, while the Moreno Valley Fire Department has primary responsibility for Local Responsibility Areas (LRA) within the City limit. In California, most wildfire damage occurs in wildland urban interface areas, where homes and woodland vegetation are directly adjacent. Wildland urban interface areas exist on the north, east, and south edges of the planning area, including Box Springs Mountain and San Timoteo Canyon to the north, the "Badlands" to the east, and Lake Perris State Park to the south. Portions of these areas within the City limit are partially developed with low density single-family housing, while portions in the SOI are largely undeveloped.

Within the City limit, large tracts of land in wildland urban interface areas are designated Parks/Open Space on the General Plan land use map, which does not permit residential development and existing development includes low density single-family homes. There are no critical police or fire facilities in wildland urban interface areas; however, a portion of the Moreno Valley College Campus is located within a Very High FHSZ in the south of the city and major roadways including Redlands Boulevard, Pigeon Pass Road, and World Logistics Parkway also run through Very High FHSZs. Undeveloped lands in wildland urban interface areas within the City limit are designated Hillside Residential or Rural Residential, which permit only very low density residential development.



# Map S-5: CalFire Fire Hazard Severity Zones



The City has adopted specific requirements for development in these areas. All new construction in these areas is required to prepare a fuel modification plan before approval of tentative maps and grading permits. Moreno Valley has also established a hazard abatement program, which is overseen by MVFD. This program is designed to create defensible space, or a buffer between a building and the flammable vegetation that surrounds it, in order to stop or slow the spread of wildfire and protect property.

With adoption of the 2040 General Plan, the City will also require preparation of a fire protection plan (FPP) approved by the fire code official prior to approving new development in Very High FHSZs. FPPs must include mitigation measures designed to address the unique problems resulting from the location, topography, geology, flammable vegetation, and climate of the proposed site. They must also consider water supply, access, building ignition and fire resistance, fire protection systems and equipment, defensible space, and vegetation management, and must be consistent with the requirements of California Building Code Chapter 7A, the International Wildland-Urban Interface Code, and the Moreno Valley Municipal Code.

## WATER SUPPLY

The City requires a minimum flow required for fire protection in accordance with the adopted amended 2019 California Fire Code and the ISO standards. Any new development in VHFHSZs must meet this standard or be able to mitigate this through other fire protection requirements. The City is served by two water service providers—Eastern Municipal Water District, serving the bulk of the city and Box Springs Mutual Water Company, serving the Edgemont area. The providers have varying capacity to deliver water flows for fire suppression purposes. New development in hillside areas of the city will also be required to meet applicable standards for minimum fire flow.

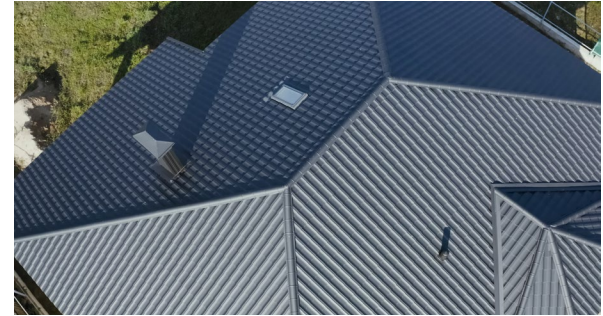
## FIRE ACCESS STANDARDS

Clear emergency vehicle access to buildings is critical for public safety. Such access is regulated by the adopted and amended California Fire Code and Moreno Valley City Standard Engineering Plans. Under the current Fire Code, all portions of a building shall be within 150 feet of a serviceable fire access road. The City has adopted the California Fire Code (CFC) with amendments to address local fire hazard concerns. Specific requirements for fire access include:

- ◆ *Roadway Design.* Access roads and public and private streets shall not exceed a 12 percent grade, shall be capable of supporting 75,000 pounds, and shall be built with all-weather driving capabilities.
- ◆ *Subdivision Access.* Subdivisions must have a minimum of two points of vehicular ingress and egress, as determined by the Fire Code Official and City Traffic Engineer.
- ◆ *Road Widths.* Road widths shall be consistent with City standards and allow for two-way traffic.
- ◆ *Bridge Design.* Per the California Fire Code, access bridges meet nationally recognized design standards, including a capability of supporting 75,000 pounds.
- ◆ *Project Perimeter.* Projects must provide adequate vehicular access for firefighting vehicles to the perimeter of a project that is adjacent to a fuel modified area or fire hazard area.

## BUILDING SIGNAGE STANDARDS AND REGULATIONS

Moreno Valley has adopted the latest edition of the California Fire Code, with all appendices, and amended it to address local concerns. MVFD reviews plans for structures and buildings citywide, including fire-prone areas. Checklists are used to address fire



Metal roofs can be a safer decision in wildfire prone areas than other roofing materials.

code requirements, including but not limited to street and building signage, water supply, water infrastructure, fire sprinkler requirements, building requirements (fire sprinklers, smoke detectors, roofing, etc.), access roads, and vegetation management, among others.

The City enforces uniform building address and street sign letters as found in the California Fire Code and Uniform Building Code, which establishes requirements for the design and display of approved address numbers, building numbers, or approved building identification on new and existing buildings to ensure legibility and visibility from the street or road fronting the property.

## VEGETATION MANAGEMENT AND CLEARANCE STANDARDS

The Moreno Valley Municipal Code requires the preparation and implementation of fuel modification plans for all new development in areas containing combustible vegetation. The Code requires that these plans be consistent with the Riverside County Fire Department Fuel Modification Technical Policy, that they be approved by the fire code official prior to issuance of a grading permit, and that they be updated as needed to address changing conditions. The Code



also establishes minimum distances for firebreaks on agricultural properties and clearances from combustible materials, heavy vegetation, and mature tree trunks on hillside residential properties. Additionally, MVFD maintains a Hazardous Vegetation and Rubbish Abatement Program to ensure proactive vegetation management through enforcement of actions applicable to all vacant and unimproved parcels on a year-round basis and requires inspection for clearance of tumbleweeds annually each Fall.

## Hazardous Materials

The Riverside County Department of Environmental Health Hazardous Materials Branch serves as the Certified Unified Public Agency (CUPA) and is responsible for overseeing the six hazardous materials programs in the County. The Branch is responsible for inspecting facilities that handle hazardous materials, generate hazardous waste, treat hazardous waste, own/operate underground storage tanks, own/operate aboveground petroleum storage tanks, or handle other materials subject to the California Accidental Release Program. In addition, Riverside County maintains a hazardous materials emergency response team that responds to hazardous materials and other environmental health emergencies 24 hours a day, 7 days a week. All MVFD Firefighters are mandated to maintain certification as Hazardous Materials First Responder-Operational.

Hazardous materials are used in Moreno Valley for a variety of purposes including manufacturing, service industries, various small businesses, agriculture, medical uses, schools, and households. Hazardous materials are also used at the March Air Reserve Base adjacent to the city, and may be transported to and from the base on City roadways. Accidents can occur in the production, use, transport and disposal of these

hazardous materials. The probability of accidental spills is accentuated by the fact that the region is susceptible to earthquakes. The city and surrounding area have a history of pipeline ruptures, spillage and vandalism to natural gas and sewer lines. A gas line explosion could cause significant damage to buildings and infrastructure, and a mainline event could disrupt gas delivery. Pipeline incidents could cause cascading hazards such as flooding, transportation and hazardous materials incidents.

## Wind Hazards

Throughout the region and in Moreno Valley, high winds can pose a risk to public safety, particularly between October and March when the Santa Ana winds can blow up to 100 miles per hour. These winds, which typically occur several times per year, have been known to topple power lines, trees, and streetlights. They can also spread uncontrolled wildfire and hinder access for firefighters. Residents should exercise caution during major windstorms, and the City can work to minimize risk by educating the public about wind hazard preparedness and site design strategies that minimize harmful impacts.



High winds in Moreno Valley, January 2021.  
Photo credit: Francisco de Santiago, Youtube.

### Goal S-1: Protect life and property from natural and humanmade hazards.

#### *Geologic and Seismic Hazards*

#### **POLICIES**

- S.1-1:** Continue to restrict the development of habitable structures within Alquist-Priolo Earthquake Fault Zones consistent with State law.
- S.1-2:** In areas of high liquefaction risk (see Map S-2), require that project proponents submit geotechnical investigation reports and demonstration that the project conforms to all recommended mitigation measures prior to City approval.
- S.1-3:** Require geotechnical studies for new development in areas where sewers are not available to ensure that the surrounding soil can support alternative wastewater disposal systems.
- S.1-4:** Ensure that structures intended for human occupancy are designed and constructed to retain their structural integrity when subjected to seismic activity, in accordance with the California Building Code.
- S.1-5:** Continue to regulate development on hillsides where average slope is greater than 10 percent and limit the removal of natural vegetation in hillside areas when retaining natural habitat does not pose threats to public safety.

## ACTIONS

**S.1-A:** Implement the seismic upgrade projects identified in the LHMP for overcrossing bridges at SR-60/Moreno Beach, SR-60/Redlands Avenue, and SR-60/World Logistics Parkway to ensure the seismic safety of critical transportation infrastructure in the city.

**S.1-B:** Use the building inspection program to inventory and evaluate earthquake hazards in existing buildings, especially buildings with unreinforced masonry (URM), using the most current seismic design standards and hazard reduction measures. Explore measures to encourage building owners to upgrade and retrofit structures to render them seismically safe.

## *Flooding Hazards*

## POLICIES

**S.1-6:** Coordinate with the Riverside County Flood Control and Water Conservation District to address storm drainage and flood control on a sub-regional basis in order to optimize the use of existing and planned conveyance facilities.

**S.1-7:** Design, construct and maintain street and storm drain flood control systems to accommodate 10-year and 100-year storm flows respectively, employing “green infrastructure” techniques as feasible and appropriate. The storm drain system shall conform to Riverside County Flood Control and Water Conservation District master drainage plans and the requirements of the Federal Emergency Management Agency.

**S.1-8:** Permit in the 100-year floodplain only that development which represents an acceptable use of the land in relation to the hazards involved and the costs of providing flood control facilities. Locate critical facilities, such as hospitals, fire stations, police stations, public administration buildings, and schools outside of flood hazard areas.

**S.1-9:** Encourage project designs that minimize drainage concentrations, minimize impervious coverage, utilize pervious paving materials, utilize low impact development (LID) strategies, and utilize best management practices (BMPs) to reduce stormwater runoff and minimize increases in downstream runoff resulting from new development.

**S.1-10:** Through development agreements and compliance with adopted master drainage plans and existing regulations, require that new development provide necessary storm drainage improvements and ensure that upstream stormwater generators fully address stormwater needs on their property.

**S.1-11:** Continue participation in the National Flood Insurance Program (NFIP) and the Community Rating System to ensure that the City is incentivized to reduce the risk of damage from flooding and improve flood preparedness.



Seismic retrofit of the Perris Dam. Photo credit: California Department of Water Resources, 2019.

## ACTIONS

**S.1-C:** Following adoption of the General Plan, work with the Riverside County Flood Control and Water Conservation District to update master drainage plans as needed to accommodate anticipated development.

**S.1-D:** Seek funding to implement the storm drain and flood control improvements detailed in master drainage plans including the Moreno, Sunnymead, West End, and Perris Valley Master Drainage Plans and the Local Hazard Mitigation Plan.

**S.1-E:** In updating the Capital Improvement Plan, consider and incorporate flood control improvements identified in master drainage plans, specifying funding and timing of prioritized improvements. Coordinate the City’s Capital Improvement Plan with planned County improvements.

**S.1-F:** Periodically review the risk of increased flooding hazards due to climate change and develop strategies to adapt to changing flood hazard conditions, including those related to monitoring, emergency preparedness, vegetation management, and development policies, and ensure that the City’s hazard information is up to date regarding climate trends.



## Wildfire Hazards

### POLICIES

**S.1-12:** Work to prevent wildland fire and to protect lives, property, and watersheds from fire dangers.

**S.1-13:** Jointly with State, County, local and other agencies, inform property owners of wildfire risks and measures to reduce those risks.

**S.1-14:** Require new development in Very High FHSZs to prepare a Fire Protection Plan that minimizes risks by:

- ◆ Assessing site-specific characteristics such as topography, slope, vegetation type, wind patterns etc.;
- ◆ Siting and designing development to avoid hazardous locations (eg. through fire breaks) to the extent feasible;
- ◆ Incorporating fuel modification and brush clearance techniques in accordance with applicable fire safety requirements and carried out in a manner which reduces impacts to environmentally sensitive habitat to the maximum feasible extent;
- ◆ Using fire-safe building materials and design features, consistent with the adopted Municipal Code and Fire and Building Code standards;
- ◆ Using fire-retardant, native plant species in landscaping; and
- ◆ Complying with established standards and specifications for fuel modification, defensible space, access, and water facilities.

**S.1-15:** Avoid, where feasible, locating new development in areas subject to high wildfire risk. If avoidance is not feasible, condition such new development on implementation of measures to reduce risks associated with that development.

**S.1-16:** Require that all new development located in a Very High Fire Hazard Severity Zone (VHFHSZ) or a State Responsibility Area (SRA) is served by adequate infrastructure, including safe access for emergency response vehicles, visible street signs, and water supplies for fire suppression.

**S.1-17:** Require new development in VHFHSZs to enter into a long-term maintenance agreement for vegetation management in defensible space, fuel breaks, and roadside fuel reduction.

**S.1-18:** Continue to require proactive weed abatement, brush thinning, and removal services on new and existing development in High and Very High Fire Hazard Severity Areas in order to curb potential fire hazards.

**S.1-19:** Cooperate with the Riverside County Fire Department and CALFIRE to ensure that all portions of the Planning Area are served and accessible within an effective response time and to address regional wildfire threats.

**S.1-20:** Work with responsible agencies and nongovernmental organizations to plan for post-fire recovery in a manner that reduces further losses or damages from future fires.



### ACTIONS

**S.1-G:** Maintain and make publicly available an up-to-date a map of high and very high fire hazard areas, consistent with CALFIRE designations.

**S.1-H:** Consider developing alternative fire protection standards suitable for Rural Residential areas not exposed to high wildland fire hazards.

**S.1-I:** Disseminate information on fire weather watches and fire risks via the City's website and encourage all Moreno Valley residents to engage in risk reduction and fire preparedness activities.

## Wind Hazards

### POLICIES

**S.1-21:** Monitor issues related to damage from windstorms and undertake precautionary measures as needed, such as tree trimming.

**S.1-22:** Set new schools, housing, and care facilities a minimum of 100 feet back from high voltage power lines or substations.

## Humanmade Hazards

### POLICIES

- S.1-23:** Continue to require remediation of hazardous material releases from previous land uses as part of any redevelopment activities.
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- S.1-24:** Regulate development on sites with known contamination of soil or groundwater to ensure that construction workers, future occupants, adjacent residents, and the environment are adequately protected from hazards associated with contamination.
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- S.1-25:** Consistent with State regulations, require proper storage and disposal of hazardous materials to reduce the likelihood of leakage, explosions, or fire, and to properly contain potential spills from leaving the site.
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## Emergency Management

With the potential for natural and humanmade hazards in the planning area, it is critical that the City plan proactively to ensure the safety of residents in times of disaster. This involves ensuring that all parts of the city are accessible for both evacuation and emergency access, including areas of new development and areas in the north of the city with fewer access points.

The purpose of emergency preparedness is to protect the health, safety and welfare of the general public both during and after natural, technological, or attack-related emergencies. To handle such events effectively requires coordination with a range of public and private sector partners as well as various City departments such as the Police, Fire, Community Development, Emergency Services, and Public Works

departments. The City recognizes the importance of emergency preparedness through the design and implementation of its Emergency Operations and Local Hazard Mitigation plans. These plans are based on the functions and principles of the Standard Emergency Management System (SEMS) and the National Incident Management System (NIMS).

The California Emergency Services Act requires the City to manage and coordinate the overall emergency and recovery activities within its jurisdictional boundaries. Under SEMS, the City is responsible at two levels, the field response and local government levels. At the field response level, the City and all other agencies use the Incident Command System (ICS) to aid in a standardized emergency response. At the local government level, a designated Emergency Operations Center (EOC) located within the Moreno Valley Fire Department is used as the central location for gathering and disseminating information and coordinating all jurisdictional emergency operations within the area. During disasters, the City of Moreno Valley is required to coordinate emergency operations with the Riverside County Operational Area and, in some instances, other local governments. Local agencies are a part of broader Emergency Management Systems, overseen by the State of California's Southern Region Emergency Operations Center.

The State of California Multi-Hazard Mitigation Plan, also known as the State Hazard Mitigation Plan (SHMP), was approved by FEMA in 2018. The SHMP represents the State's primary hazard mitigation guidance document and builds upon the California's commitment to reduce or eliminate potential risks and impacts of natural and human-caused disasters to help communities with their mitigation and disaster resiliency efforts. The adoption of the SHMP qualifies the State for federal funds in the

event of a disaster. Locally, the City of Moreno Valley adopted a Local Hazard Mitigation Plan (LHMP) in 2017. The purpose of the LHMP is to articulate a plan for reducing and/or eliminating risk in the community. The LHMP assesses risks associated with earthquake, wildfire, flooding, drought, landslide, insect infestation, extreme weather, severe wind, hazardous materials accidents, terrorist attack, and other hazards, identifying mitigation goals, objectives, and projects to reduce the risk. Moreno Valley is also a signatory of the Riverside County Unit Strategic Fire Plan, the guiding document for pre-fire mitigation and response management to reduce wildfire impacts. Primary risk components addressed in the Unit Plan include communications infrastructure, recreational areas, and homes.

### TRAINING

MVFD is committed to developing the knowledge, skills, and abilities of all employees. The Department's Training Plan provides for initial and recertification courses as mandated by policy, law, or technical specialty to ensure quality service to the public. Employees receive training through CAL FIRE's Position Qualification System, which is compliant and aligned with the National Incident Management System (NIMS), ensuring that personnel have at least the minimum education, experience, and evaluation requirements for each ICS position. MVFD employees receive standardized California State Fire Training courses, established, developed, and delivered by the Office of the State Fire Marshall.

### EVACUATION ROUTES

The LHMP contains a map of emergency evacuation routes in the community that includes I-215, SR-60 and major roadways through the city. The evaluation network consists of 129 miles of roadway designated



as potential evacuation routes in the event of disaster, including 34 bridges and 127 water crossings. Approximately 11 percent of the network is located within a wildfire or landslide hazard zone and 25 percent of the network is located within a flood hazard zone.

An analysis of existing development patterns and roadway connectivity completed with the use of graphic information systems (GIS) software indicates that some residential areas in northern and southeastern portions of the city have constrained emergency access, including developments in the Sunnymead Ranch, Moreno Valley Ranch, and Hidden Springs developments. These are typically locations where residential development pre-dates incorporation into the City of Moreno Valley and where homes are constructed on cul-de-sacs with a single point of connection to the municipal roadway network. Approval of new development in these areas is conditioned on review by MVFD and the Moreno Valley Department of Public Works to ensure adequate emergency access. Additionally, Plan



The City of Moreno Valley's Emergency Alert and Warning Notification System is utilized to rapidly send notifications to all residents and businesses in an affected area in the event of an emergency or disaster.

policy provides for use of the City's early warning notification system to provide proactively alert to residents of areas with constrained access in the event of a disaster requiring emergency evacuation.

Areas at greatest risk from fault rupture, flooding, and wildfire are generally concentrated in the north, northeastern, and eastern portions of the city. Under emergency evacuation scenarios involving one or more of these events, access via Reche Canyon Road, Redlands Boulevard, SR-60, and Gilman Springs Road is most likely to be impacted. An analysis of multiple factors, including household access to vehicles, network constraints, distance to available exit gateway, and traffic signal timing indicates that roadway capacity will allow for evacuation of the northwestern area of the city to be completed in approximately 2.5 hours and evacuation of the northwestern area to be completed in approximately 1.5 hours.

Evacuation times could be improved with the implementation of technological and design strategies. For example, the use of painted medians instead of raised medians on roadways in areas of highest risk shown on Map S-6 would effectively allow for reversible lanes that create additional outbound capacity. Application of this strategy would approximately double evacuation capacity in the northwestern portion of the city. Further, remote control of signal timing from the City's Traffic Management Center (TMC) allows for real-time modifications to signal timing that can speed evacuation in the event of emergency. Approximately half of the traffic signals in the City are currently connected to the TMC and Plan policy provides for the implementation of this technology in vulnerable areas as a priority going forward. Plan policy also provides for exploration of additional actions to facilitate emergency evacuation, including the study

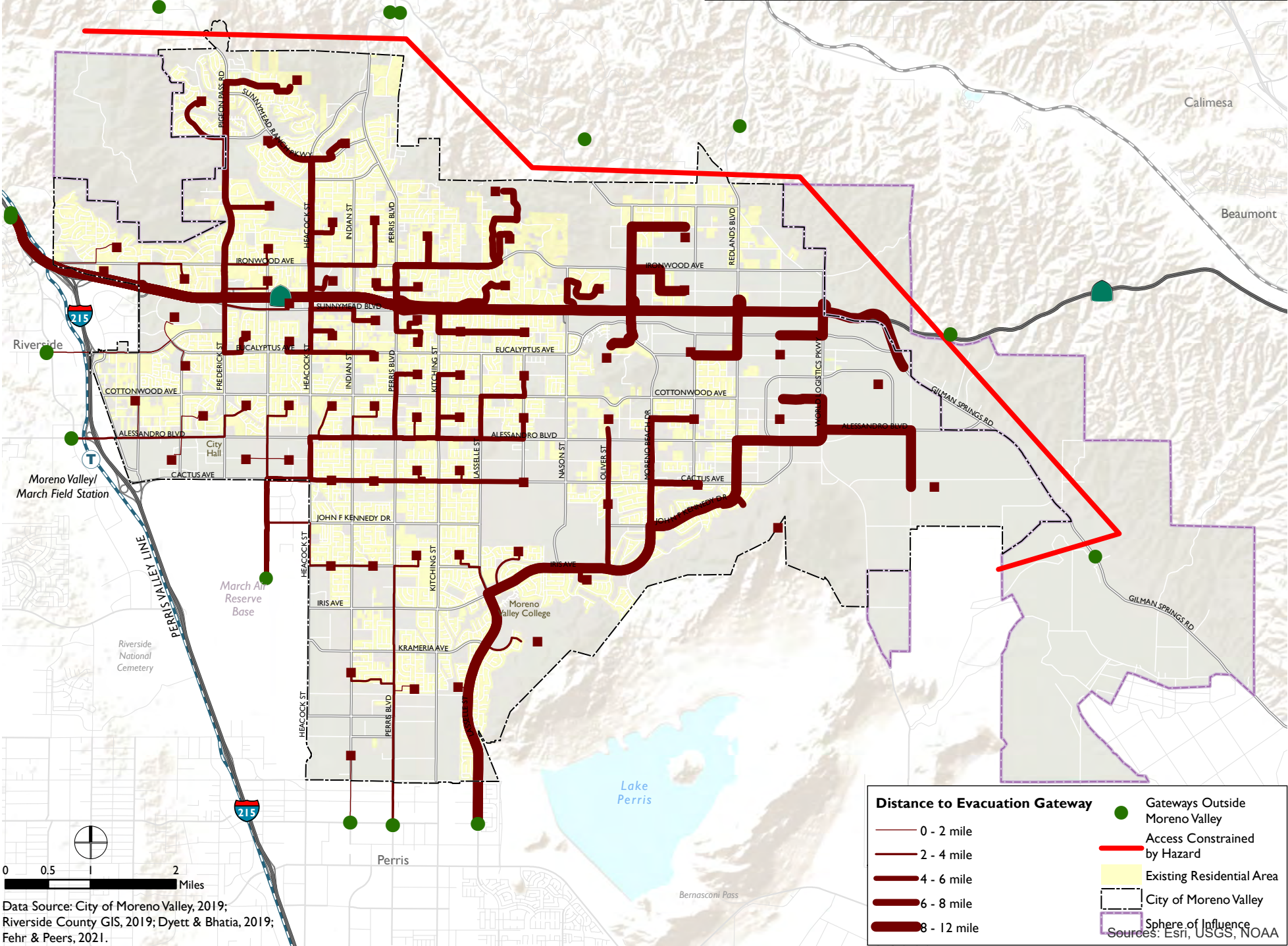
of improved roadway connections, including Morton Road/Gernert Road in unincorporated Riverside County to the west of Moreno Valley.

## DISASTER RESPONSE VOLUNTEERS

The City of Moreno Valley also relies on emergency volunteer programs, including the following:

- ◆ *Emergency Response Force (ERF)* – ERF consists of professionally trained, multi-level volunteer emergency personnel. ERF assists during emergency and disaster situations, often reporting directly to the incident commander. ERF members also provide first aid during large public events and gatherings such as the 4th of July festivities. Members receive a wide array of emergency and disaster training including Care and Shelter Operations, Damage Assessment, Medical and Triage, Emergency Response to Terrorism, Automated External Defibrillator (AED), CPR/ First Aid, Traffic Control, Search and Rescue, and Evacuation techniques.
- ◆ *Community Emergency Response Team (CERT)* – CERT volunteers must attend the 21-hour course to participate on the volunteer team. Graduates are trained to help themselves, their families and their neighborhoods during a disaster and are also trained to work effectively with emergency responders. Examples of training provided in the 21-hour FEMA course are: disaster preparedness, triage and rapid treatment techniques, damage assessment, rescuer safety, search and rescue techniques, cribbing and leveraging, terrorism awareness, and disaster fire suppression.
- ◆ *Moreno Valley Amateur Communications Emergency Services/Radio Amateur Civil Emergency Services (MV ACES/RACES)* – In an emergency, amateur radio

# Map S-6: Emergency Evacuation Risk Assessment



Data Source: City of Moreno Valley, 2019;  
 Riverside County GIS, 2019; Dyett & Bhatia, 2019;  
 Fehr & Peers, 2021.



(ham radio) operators who belong to our Moreno Valley ACES/RACES group, provide emergency communication for the City. Using special equipment, these volunteers, are also capable of sending live pictures from the incident site to the City's emergency operations center via the ham radio.

Public education and awareness programs are given priority before any emergency occurs and are crucial to all emergency management phases. Pre-disaster awareness and education programs are viewed as equal in importance to all other preparations for emergencies and receive an adequate level of planning.

*In 2018, the City began the LISTOS public education program to help raise awareness of emergency and disaster preparedness measures in the community. Staff takes information out to the community and offers an 8-hour "Alertar y Preparar" training course for individuals and families. After participating in LISTOS discussions, community members are encouraged to engage in other opportunities such as CERT.*



ACES/RACES (top) and CERT (below) volunteers.

## Goal S-2: Provide effective response to disasters and emergencies

### POLICIES

**S.2-1:** Use the adopted Local Hazard Mitigation Plan and Emergency Operations Plan to guide actions and investments for emergency preparedness and response.

**S.2-2:** Maintain area-wide mutual aid agreements and communication links with partner agencies and other participating jurisdictions.

**S.2-3:** Locate critical facilities, such as hospitals and health care facilities, emergency shelters, fire stations, police stations, emergency command centers, and other emergency service facilities and utilities so as to minimize exposure to flooding, seismic, geologic, wildfire, and other hazards.

**S.2-4:** Maintain and periodically update the Emergency Operations Plan to effectively prepare for, respond to, recover from, and mitigate the effects of natural or human caused disasters that require the planned, coordinated response of multiple agencies or jurisdictions.

**S.2-5:** Partner with Caltrans and neighboring jurisdictions on measures to protect critical evacuation routes such as SR-60 and I-215 and work with local agencies to develop contingency plans for operations when these and other roads are inoperable due to flooding or wildfire.

**S.2-6:** Continue to engage the Police and Fire departments in the development review process to ensure that projects are designed and operated in a manner that minimizes the potential for criminal activity and fire hazards and maximizes the potential for responsive police and fire services.

**S.2-7:** Where possible, avoid the installation of raised and planted medians in areas shown on Map S-6 unless installation is required pursuant to City Standard Plans. The use of painted medians in these areas will allow for reversible lanes that create additional outbound capacity to facilitate emergency evacuation.

**S.2-8:** Promote a greater community awareness and understanding of natural and humanmade hazards and steps that can be taken to reduce personal risk by:

- ◆ Continuing FEMA Community Emergency Response Team Training to educate volunteers about disaster preparedness and train them in basic disaster response skills, such as fire safety, light search and rescue, team organization, and disaster medical operations.
- ◆ Providing emergency preparedness presentations to service clubs, homeowner's associations and other organizations to enhance preparedness.

**S.2-9:** Minimize risk and threat of infection or disease by encouraging and promoting participation in annual/seasonal immunization efforts.

## ACTIONS

- S.2-A:** Collaborate and coordinate with the Riverside County Public Health Department to promote community awareness regarding prevention and protections from communicable disease and/or pandemic flu, including the provision of information to the public in English and Spanish.
- 
- S.2-B:** Provide information on major evacuation routes and notification systems used for emergency alerts to residents and businesses in Moreno Valley.
- 
- S.2-C:** Use the early warning notification system to notify residents by phone, text, or email of the need to evacuate in the event of emergency and the location of evacuation centers, particularly residents of vulnerable areas and neighborhoods with constrained emergency access.
- 
- S.2-D:** Prioritize the connection of traffic signals in areas shown on Map S-6 to the City's Traffic Management Center to allow for real-time modifications to signal timing that can speed evacuation in the event of emergency.
- 
- S.2-E:** Work with Riverside County, railroad operators, and other emergency response agencies to address disconnected routes and explore roadway improvements that can provide better emergency access under emergency evacuation scenarios.
- 

**S.2-F:** Evaluate options for ensuring emergency power at critical and community facilities, including microgrids, solar capture and storage, distributed energy, and back-up generators. Consider the ability to reduce utility costs and carbon emissions in the assessment.

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**S.2-G:** Consider creating neighborhood level plans to improve initial emergency response, subsequent recovery, and ongoing self-sufficiency within the city.

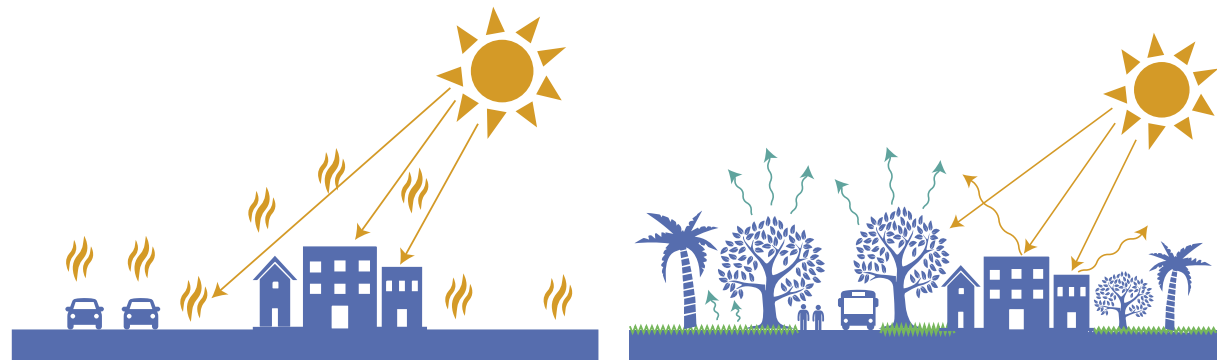
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## Community Resilience to Climate Hazards

As global temperatures rise, Moreno Valley is predicted to experience a range of climate-related impacts. The average annual maximum temperature is projected to be 5 degrees hotter in Moreno Valley between 2040 and 2060 than it is today, and the increase in temperature will likely result in heat waves, drought, and diminished air quality in addition to

increased rainfall intensity, more frequent wildfires, and more extreme weather events. These changes pose a risk to human health—especially for seniors or people with respiratory conditions or for those who work outdoors or are unable to take shelter from high heat. Additionally, in urbanized areas the “heat island effect” can make outdoor gathering places uncomfortable or even unhealthy.

The “heat island effect” is an urban condition that occurs because man-made materials, like asphalt, concrete, and brick, absorb and retain more of the sun’s heat than natural elements like trees, fields, and bodies of water. This leads to urbanized areas being hotter than surrounding open space or agricultural lands, and staying hotter even after the sun goes down. Urban heat islands can exacerbate already dangerous summer temperatures and put more strain on the electricity grid through higher air conditioning use. Shade trees are part of the solution. In a desert city like Moreno Valley, that might mean planting mostly drought-tolerant native trees that cast light, lacy shadows and interspersing them with leafier trees in parks, plazas, and placed where people gather for maximum benefit and minimal use of water resources.



Urban heat island effect, demonstrated in the diagram above, is a condition in which man-made materials like asphalt, concrete, and brick absorb and retain more of the sun’s heat than natural elements. Planting more trees and using UV-reflective materials and coatings on buildings can help reflect and absorb that heat through evaporation, transpiration, and albedo.



Studies have shown that 25 percent tree canopy coverage in urban areas can reduce temperatures by as much as 8 degrees compared with bare, unplanted areas. Other solutions include the use of UV-reflective materials and coatings, porous pavement, or evaporative cooling towers. Landscaping, building materials, and site design techniques that provide passive cooling and reduce energy demand are also beneficial.

Looking to the future, Moreno Valley will continue to collaborate with other public agencies, organizations, and institutions in the region in developing and implementing programs that are environmentally, economically, and socially beneficial. Raising public awareness of climate-related impacts and measures that community members can take to protect themselves is also a critical part of the approach. The overarching goal is to prepare residents for a changing climate and build resilience among all segments of the population, particularly those at greatest risk from climate hazards.



### Goal S-3: Build community resilience to climate change

#### POLICIES

**S.3-1:** Continue to collaborate in regional climate action planning initiatives.

**S.3-2:** Partner with local utilities, regional agencies, and local jurisdictions to assess the vulnerability of energy infrastructure and identify improvements that increase resilience of local energy infrastructure.

**S.3-3:** Consider climate impacts, risk, and uncertainty in designing and evaluating capital improvement program design and adjust infrastructure design standards and project locations to address asset- and site-specific vulnerabilities.

**S.3-4:** Employ best practices and protocols for outdoor safety on City operations and projects to accommodate City staff and City contractors during high temperature days and heat waves.

**S.3-5:** Expand access to and awareness of cooling centers and resilience hubs throughout the city, especially for outdoor workers, seniors, and the homeless and other vulnerable populations.

**S.3-6:** Encourage the use of landscaping, building materials, and site design techniques that provide passive cooling and reduce energy

demand. In particular, promote the use of voluntary measures identified in the California Green Building Code (Title 24, Part 11 of the California Code of Regulations) to minimize heat island effects, including hardscape and roof materials with beneficial solar reflectance and thermal emittance values and measures for exterior wall shading.

**S.3-7:** Require new development to provide and maintain shade trees suitable to local climatic conditions. A climate-appropriate strategy may involve planting mostly drought-tolerant native trees that may have less foliage, interspersed with leafier trees at points where people gather.

**S.3-8:** Assess the feasibility of implementing urban heat island mitigation technologies in public gathering places, including UV-reflective materials and coatings, porous pavement, evaporative cooling towers, or other technologies that can reduce surface and air temperature and mitigate for the effects of extreme heat.

**S.3-9:** Use the Alert MoVal system to notify residents by phone, text, or email of extreme weather conditions such as heat waves, and the availability of shelters, cooling centers, and resilience hubs.

**S.3-10:** Encourage maintenance or removal of overgrown or dead trees that may pose a falling hazard in windy conditions.

## ACTIONS

- S.3-A:** Identify additional locations for cooling centers and resilience hubs in Moreno Valley and ensure the locations develop backup power sources in the event of a power outage.
- 
- S.3-B:** Prepare a Landscape Manual or enhance landscape standards in the Municipal Code to mitigate urban heat island effects. In addition to identifying a climate-appropriate planting palette and recommended plant mix, targets for street tree canopy, shade structure coverage, and asphalt paving coverage should be identified and the reflectance of stone and rock ground cover in heat generation should be considered.
- 
- S.3-C:** Explore establishing a tree planting and maintenance program in partnership with local community groups or non-profit organizations.
- 
- S.3-D:** Work with Riverside Transit Agency (RTA) to study the feasibility of bus shelter design that offers protection and relief from heat, including the incorporation of drinking fountains and shade trees with drip irrigation.
- 

## Airport/Aviation Safety

Airport operations pose risks to people and property located nearby and those to the safety of people on board aircraft. In the General Plan, safety impacts are mitigated primarily through land use policies that specify the types of land uses near the airport, thus limiting the number of people exposed to the risk of an accident and protecting airspace from land uses that can create hazards to flight. Other strategies to address risk include reducing the potential for bird strikes and electromagnetic interference that can disrupt airport operations systems.

The March Air Reserve Base (MARB) and March Inland Port (MIP) is located along the southwest border of Moreno Valley. MARB/MIP is a joint-use airport, used for both military and civilian purposes. Originally a March Air Base, MARB/MIP was established by a joint use agreement between the Department of Defense and March Joint Powers Authority (JPA) in 1997. The JPA is the recognized local reuse agency charged with planning for the economic redevelopment of surplus properties at the base. Under the agreement, the public and military entities share essential aviation facilities such as the control towers and runways, as well as maintenance of facilities, under this joint use arrangement. March Inland Port Airport Authority (MIPAA), established by the JPA, is responsible for the development and operations of the public use airport.

The Riverside County Airport Land Use Commission adopted an update to the Airport Land Use Compatibility Plan (ALUCP) for the MARB/MIP in 2014. The ALUCP is primarily based upon the U.S. Air Force's Air Installation Compatibility Use Zones Study for the March Air Reserve Base (AICUZ). The

ALUCP incorporates noise and safety protection measures equivalent to or greater than recommended in the AICUZ. While no modifications to the existing airport runways or approaches are anticipated, the ALUCP studied potential future military and civilian aircraft activity to inform the development of unique Airport Compatibility Zones each with their own land use restrictions in consideration of projected future use by both military and civilian aircraft. The compatibility zones (shown on Map S-7) and their associated restrictions account for noise and overflight factors as well as safety and airspace protection factors. Within the City limit, there is a special zoning overlay for the AICUZ that limits public exposure to aircraft accidents and noise and encourages future development that is compatible with the continued operation of March Air Force Base. Ongoing coordination with the March Air Reserve Base, the March Joint Powers Authority, and the March Inland Port Airport Authority will help to reduce the exposure of people and property to hazards from any flight accidents, as well as reduce the risk of an accident for aircraft in flight over the city.



March Air Reserve Base seen from above, 2015.



**Goal S-4: Minimize airport safety hazards and promote compatibility with airport operations.**

**POLICIES**

**S.4-1:** Limit hazards from flight operations in Moreno Valley through consistency with the March Air Reserve Base/Inland Port Airport Land Use Compatibility Plan (March ALUC Plan).

**S.4-2:** Review all projects within the March Air Reserve Base/Inland Port Airport Influence Area for conformance with the compatibility criteria outlined in the March ALUC Plan.

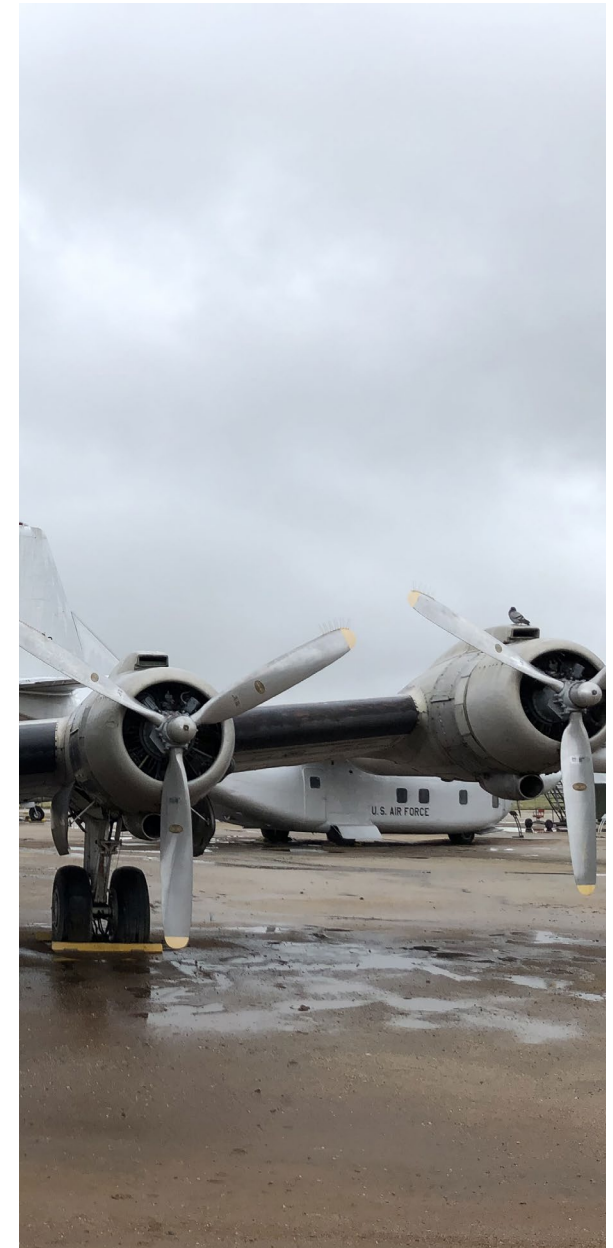
**S.4-3:** Minimize the potential for development adjacent to the March Air Reserve Base/Inland Port Airport to adversely affect airport operations such as by reducing the potential for bird strikes and electromagnetic interference.

**S.4-4:** Coordinate with the March Air Reserve Base, the March Joint Powers Authority, and the March Inland Port Airport Authority to ensure that roadways are designed to safely accommodate airport vehicles and that airport-related traffic is routed to minimize hazards to or conflicts with Moreno Valley residents and businesses.

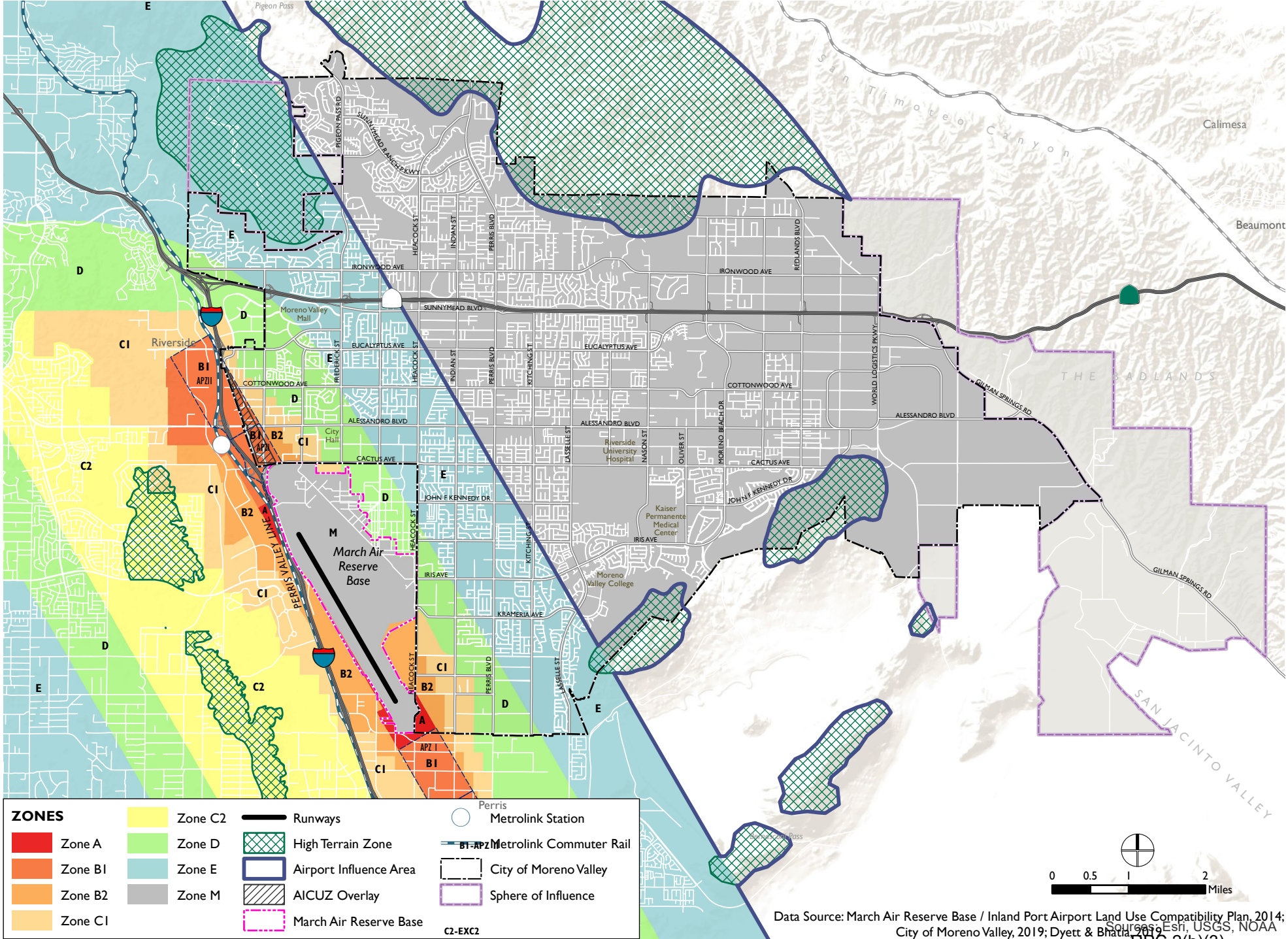
**S.4-5:** Use education and practical ways of reducing exposure to electromagnetic fields (EMFs) near transmission lines and other sources.

**ACTIONS**

**S.4-A:** Update applicable site development standards in the Development Code to incorporate measures for landscape design and maintenance on properties immediately adjacent to the MARB so as to reduce the potential for bird strikes. Standards should address planting palette, water features and maintenance practices.



# Map S-7: Airport Land Use Compatibility Zones



Data Source: March Air Reserve Base / Inland Port Airport Land Use Compatibility Plan, 2014; City of Moreno Valley, 2019; Dyett & Bhatia  
 Sources: Esri, USGS, NOAA  
 RPC 2(b)(3)