Watershed Emergency Response Team (WERT)
2024 Line Fire

CA-BDF-012520

November 6, 2024

California Department of Conservation
California Geological Survey

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REPORT TITLE: Watershed Emergency Response Team (WERT) Evaluation – 2024 Line Fire

LIMITATIONS: This report presents the results of a rapid assessment to help communities prepare after wildfire by documenting and communicating postfire risks to life, property, and infrastructure posed by debris flow, flood, and rockfall hazards. The findings included in this report are not intended to be fully comprehensive or conclusive, but rather to serve as a preliminary tool to assist responsible jurisdictions and agencies in the development of more detailed postfire emergency response plans.

PREPARED BY:

DocuSigned by:
Derek Cheung 11/6/2024
DF2A4D08B280424...
Derek Cheung
Staff Hydrologist
California Geological Survey

Signed by:
Kevin Callahan 11/6/2024
DCEB6862E6CB411...
Kevin Callahan, PE 72202
Civil Engineer
California Geological Survey

DocuSigned by:
David Longstreth 11/6/2024
54E8C8D3098D441...
David Longstreth, CEG 2068
Senior Engineering Geologist
California Geological Survey

DocuSigned by:
Jonathan Woessner 11/6/2024
E8CEE9366E9E423...
Jonathan Woessner, RPF 2571
Forester III
California Department of Forestry and Fire Protection

Line Fire – WERT REPORT EXECUTIVE SUMMARY

CA-BDF-012520 - WERT Evaluation

Mission Statement: The California Watershed Emergency Response Team (WERT) helps communities prepare after wildfire by rapidly documenting and communicating postfire risks to life, property, and infrastructure posed by debris flow, flood, and rockfall hazards.

The findings included in this report are not intended to be fully comprehensive or conclusive, but rather to serve as a preliminary tool to assist San Bernardino County Offices of Emergency Services, San Bernardino County Fire, CAL FIRE, City of Highland, local first responders, San Bernardino County Public Works and Flood Control, California Department of Transportation, the California Governor's Office of Emergency Services, the United States Department of Agriculture Natural Resources Conservation Service, the United States Forest Service, utility companies, and other responsible agencies and entities in the development of more detailed postfire emergency response plans. It is intended that the agencies identified above will use the information presented in this report as a preliminary guide to complete their own more detailed evaluations, and to develop detailed emergency response plans and mitigations. This report should also be made available to local districts, residents, businesses, HOA's and property managers so that they may understand their proximity to hazard areas, and to guide their planning for precautionary measures as recommended and detailed in this document.

The Line Fire started on 5 September 2024, near Base Line Street in San Bernardino County. The fire covered 68 square miles or 43,978 acres as of 24 October 2024 at 98% containment. Because of widespread moderate to high soil burn severity in steep, upland slopes, downslope and downstream areas of the Line Fire are subject to postfire hazards such as sediment-laden flooding, debris flows, and increased erosion. Due to the potential for increased postfire runoff, sediment-laden flooding, and debris flows, and proximity of the Line Fire perimeter to residential areas and critical infrastructure, the burn area was assessed by an interagency WERT. The WERT rapidly evaluated postfire watershed conditions, identified potential **Values-at-Risk (VARs)** related to human life-safety and property, and evaluated the potential for increased postfire hazards. The WERT also provides recommended potential emergency protection measures to help reduce the risks to those values.

Summary of the Key WERT Findings

- The degree of fire-induced damage to soil is called "soil burn severity" and is a primary influence on increased runoff and sediment generation, and the occurrence of postfire watershed hazards (e.g., debris flows and flooding). Moderate and high soil burn severities typically create the most impacts. The Line Fire soil burn severity is 7 percent Unburned to Very Low severity, 23 percent Low severity, 50 percent Moderate severity, and 20 percent High severity.
- The WERT identified 66 VARs within and downslope/downstream of the fire. 22 VARs are shown as polygons which encompass multiple individual sites subject to similar hazard and

risk. The remaining 44 VARs are points, which are associated with discrete sites such as homes and road crossing structures.

- 14 of the VARs are exigent, which present a more urgent threat to life, safety, and/or property. 10 of the VARs were found to pose a high threat to property and are associated with inundation of structures adjacent to flow paths through the built environment, highway crossing structures, and water supply infrastructure. 1 of these VARs (LFV-10) was found to also pose a high threat to life safety and is associated with homes and an elementary school adjacent to potential flow paths through the build environment originating from Elder Gulch.
- The road network within and downstream of the Line Fire perimeter will be subject to increased potential for storm damage for the next two to five years. Specific crossing structures that provide ingress and egress to homes or road crossings of main channels are addressed as VARs. The WERT did not assess how flows may redivert within the built environment.
- Main thoroughfares, including State Hwy 330, Mill Creek Road / State Hwy 38, Highland Avenue, Base Line Street, Greenspot Road and Seven Oaks Road have several crossing structures subject to potential blockage and overtopping.
- Some homes and structures are at risk of flooding or debris flood/flows. These structures primarily exist adjacent to the Bledsoe Gulch and Elder Gulch drainage networks, adjacent to Plunge Creek and Oak Creek (near La Cresta Street), at multiple locations on Highland Avenue, Base Line Street, Greenspot Road, and Mill Creek Road, and along Kent and Cochrane Streets, Ravello Court and Capri Way.
- Model results are presented for postfire debris flow hazard and postfire flooding. The debris flow model results show a significant increase in postfire debris flow potential in steep, convergent slopes that are burned at moderate and high severity. The rapid hydrologic model results indicate low relative flood hazard along City Creek on the west side of the fire, and moderate at Hwy 330 crossings and along Bledsoe Gulch and other smaller drainages on the south side of the fire. Flood hazards are moderate-high along Elder Gulch and Oak Creek and high along Plunge Creek.
- Residents subject to postfire hazards need to have a clear understanding of the hazards and mitigation strategies (e.g., evacuation, deflection structures, culvert improvements) to effectively reduce risk to life, safety, and property.
- **To trigger the National Weather Service early warning system, the WERT suggests fire-wide rainfall/duration thresholds of 0.2 inches in 15 minutes, 0.3 inches in 30 minutes, and 0.6 inches in 60 minutes.**
  Close coordination between the San Bernardino CAL FIRE Units, San Bernardino County Fire, San Bernardino County Office of Emergency Services, the National Weather Service, local first responders, San Bernardino County Public Works, and the City of Highland will be necessary to effectively develop and implement a response plan that will minimize risk. WERT information provides critical intelligence for response planning and implementation.

Introduction

Background

The Line Fire started on 5 September 2024 near Base Line Street in San Bernardino County, California, due to arson. The fire grew rapidly through dense grass, brush, and timber in steep and complex terrain in an area that in an area that is frequently affected by wildfire activity. The fire ignited during a period of high heat, with dry and windy conditions in Southern California, facilitating its rapid spread of roughly 40,000 acres in 7 days. Forward progress of the fire was largely stopped by 19 September 2024; however, hot spots and optimal fire conditions caused the northeast portion of the fire to expand on 30 September 2024 by another 4,600 acres. Governor Newsom declared a State of Emergency for San Bernardino County due to the fire. As of 24 October 2024, the fire was 43,978 acres in size (68 square miles) and 98% contained. The incident had no fatalities and six firefighter and civilian injuries. The fire destroyed 1 structure and damaged 4 additional structures.

Based on previous instances of postfire watershed response, the CAL FIRE Agency Representative requested a WERT prescreen of the burned area. The California Geological Survey (CGS) remote screening recommended a rapid assessment with a Type-2 Watershed Emergency Response Team (WERT) and emergency rainfall thresholds were issued. Primary concerns for burned watersheds are the increased potential for damaging sediment and debris-laden flood flows, increased potential for debris flow occurrence, rockfall from steep slopes, and hillslope erosion resulting in excessive sedimentation due to storm runoff for several years following the fire. See footnote for definitions of different postfire runoff types[1]. During periods of thunderstorm activity, and as the wet season approaches (typically November through April), it is critical that responsible agencies and the residents who live in hazard areas within and downstream of the Line Fire implement emergency protection measures (EPMs) where appropriate, check weather conditions and forecasts, stay alert to National Weather Service (NWS) flash flood watches and warnings, and monitor local county resources for guidance on evacuations.

This report presents the results of the WERT, a rapid evaluation of postfire geologic and hydrologic hazards to life-safety and property (i.e., collectively known as “Values-at-Risk” or “VARs”) for private lands affected by the Line Fire. Figure 1 shows the acreage and percentage of the burned area by ownership for the fire. Almost 9 percent of the burned area is in private ownership and about 0.2 percent of lands are managed by incorporated cities, which combined make up state responsibility area (SRA). Approximately 91 percent of the burned area is in

[1] Definitions of different flow types applied in this document are as follows (after Pierson (2005) and Hungr et al. (2001)):
Floods – closely resemble normal streamflow with sediment concentrations less than 20% by volume, bedload transport composed of sands to cobbles, and more predictable Newtonian fluid behavior.
Debris floods – rapid, surging flow that is heavily charged with debris and sediment. Suspended sediment composed of sand-sized particles is common with bedload transport composed of cobbles to boulders. Approximately Newtonian flow behavior with 20% to 60% sediment concentration by volume. Transient debris dams of boulders and woody material are common. Highly erosive.
Debris flows – rapid, surging flow composed of a slurry of sediment and water with suspended gravels and boulders. Less predictable non-Newtonian flow behavior with sediment concentrations of >50% by volume. Can cause catastrophic damage from burial and impact that can infill and divert streams, and destroy automobiles, buildings, and infrastructure.

federal responsibility area (FRA), which necessitated an evaluation from the USFS Burned Area Emergency Response (BAER) Team.

The Line Fire WERT conducted field assessments from 23 to 27 September 2024. Increase in fire activity after the conclusion of the initial field assessments required additional field work on 9 October 2024 to assess additional VARs in the eastern portion of the burned area. Team members for the Line Fire WERT are listed in Table 1. WERT representatives interacted with San Bernardino County and City of Highland personnel and other stakeholders during the WERT assessment (see Appendix A for a list of key contacts). A data release to key personnel composed of a preliminary VAR table (.csv file) and geospatial VAR data in the form of a geodatabase occurred on 1 October 2024 and a second updated data release, which included additional VARs from the expanded burn area, occurred on 18 October 2024 and is composed of a final VAR table (Appendix B) and geodatabase.

Table 1. Line Fire WERT members.

Name	Position	Agency	Expertise-Position
David Longstreth; CEG 2068	Team Lead	CGS	Engineering Geology
Kevin Callahan; PE 72202; GE 2989	Team Member	CGS	Civil Engineering
Derek Cheung	Team Member	CGS	Hydrology
Brian Mattos, RPF 2476	Team Member	CAL FIRE	Forestry-Safety
John Ramaley, RPF 2504	Team Member	CAL FIRE	Forestry-Safety
Jonathan Woessner, RPF 2571	Team Member	CAL FIRE	Liaison
Adjunct Team			
David Cavagnaro	Adjunct Member	CGS	GIS
Meerea Kang	Adjunct Member	CGS	GIS
Deshawn Brown	Adjunct Member	CGS	GIS
Michael Falsetto	Adjunct Member	CGS	GIS

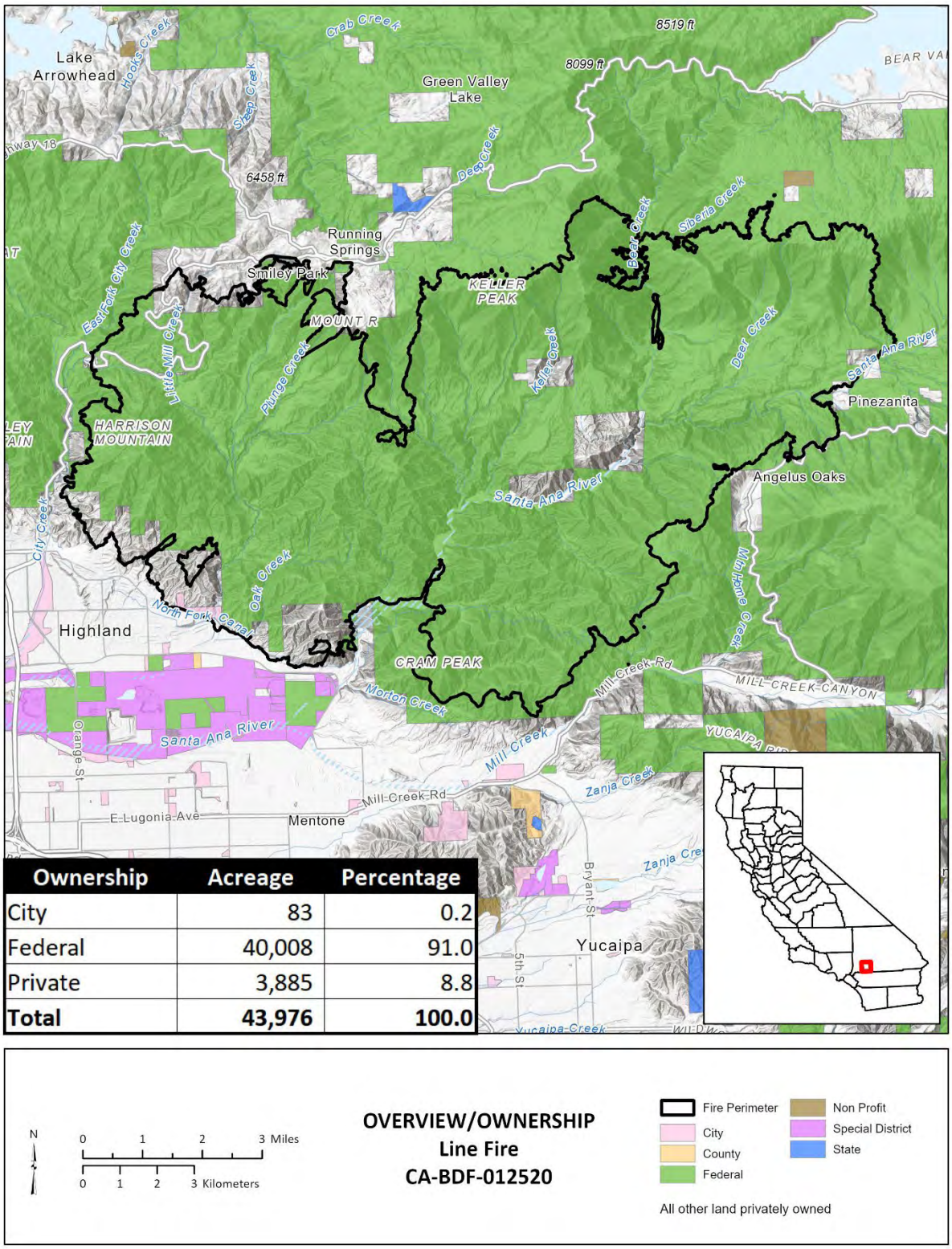


Figure 1. Ownership map of the Line Fire burned area.

Objectives and Scope

Primary objectives for the WERT are to conduct a rapid preliminary assessment that include the following components.

- Identify types and locations of on-site and downstream threats to life-safety, property, and critical infrastructure (i.e., Values-at-Risk or VARs) from postfire flooding, debris flows, rockfall, erosion, and other hazards that are elevated due to postfire conditions.
- Rapidly determine relative postfire risk to these values, using a combination of state-of-the-art analytical tools (for example the USGS postfire debris-flow likelihood model) and the best professional judgement of licensed geohazard professionals (i.e., Professional Geologists; Certified Engineering Geologists; Professional Civil Engineers).
- Develop preliminary emergency protection measures (EPMs) needed to avoid or minimize threats to life-safety and property.
- Communicate findings to responsible entities and affected parties so that the information and intelligence collected by the WERT can be used in response planning to reduce risk from postfire watershed hazards.
- It is important to emphasize that the WERT performs a rapid evaluation of postfire hazards and risk. A complete characterization of postfire hazards and/or in-depth design of protection measures is beyond the scope of the WERT evaluation. However, findings from the WERT evaluation can potentially be used to leverage emergency funds for emergency treatment implementation, and more detailed site investigation and/or treatment design.
- This document summarizes downslope/downstream VARs and makes specific and general recommendations to reduce exposure to postfire, life-safety and property hazards on county and private lands. **While the report can provide useful information to emergency planners and first responders, the GIS data, in the form of a geodatabase, produced by the WERT is the most important source of information for postfire response planning. Clear communication of life-safety and property hazards is an objective of the WERT process, and the use of these spatial data is a critical component for communicating hazards in a planning and operational context. These data have been shared with federal, state, and local responsible agencies.**

Physical Setting

Topography and Climate

The Line Fire burned primarily in the San Bernardino Mountains, a northwest trending range in the eastern part of the Transverse Ranges geomorphic province. This range is characterized by a steep southern flank cut by deep, narrow canyons and is bounded on the west and southwest by the San Andreas Fault. The fire burned upslope of the Seven Oaks Reservoir and the communities of Highland, East Highland and Seven Oaks, and largely in land designated as the San Bernardino National Forest. The burned area is roughly bounded by Highway 330 to the west, Highway 38 to the east, Highway 18 to the north, and the San Bernardino Valley to the south. Slopes in the fire footprint rise steeply from the San Bernardino Valley and occupy numerous watersheds that drain southward to the Santa Ana River. From west to east, watersheds of interest include City Creek, Bledsoe Gulch, Elder Gulch, Little Mill Creek, Plunge Creek, Oak Creek, and Santa Ana River. The topographic expression within and downstream/downslope of the fire is predominantly moderate- to steep-gradient slopes.

Ridgelines generally track northwest in the general trajectory of the San Andreas Fault. Elevations range from approximately 1,560 feet in Highland, at Plunge Creek along the southern edge of the burned area, to about 7,880 feet at Keller Peak at the northern edge of the burned area, east of Running Springs.

This area has a Mediterranean climate with mild to cold, wet winters and warm to hot, dry summers. Most of the annual precipitation in this region occurs from November through March. Long-term annual average precipitation ranges from approximately 14 inches in the lower elevations up to 35 inches in the higher elevation slopes of the burn area (PRISM Climate Group, 2024). Thunderstorms occur in the summer and fall months, typically associated with the North American Monsoon or decaying tropical systems. These thunderstorms can generate localized heavy rainfall and runoff. Only a small portion on the eastern end of the burned area has terrain above 7,500 feet, the approximate elevation at which a seasonal snowpack would typically develop (Hatchett, 2021), though this elevation can vary from year to year. A shallow, ephemeral snowpack may develop at lower elevations and can readily melt in rain-on-snow events, resulting in enhanced runoff.

Hydrology and Flood History

The 2024 Line Fire primarily burned headwater areas of the Santa Ana River watershed. Major watercourses within the fire include the Santa Ana River and its tributaries including City Creek, Plunge Creek, Mill Creek, and Oak Creek. These watercourses drain primarily to the south or southwest towards the City of Highland where they coalesce before proceeding towards the City of Riverside. The Santa Ana River is also impeded by the earth and rock fill Seven Oaks Dam before the river exits the mountain front. This dam drains 209 square-miles of upstream area with a gross capacity at spillway crest of roughly 145,600 acre-feet and a water surface area of roughly 780 acres (SBCPW, 2024). The facility's single purpose is flood protection for downstream communities of the Santa Ana Basin. Flows from the river are also delivered to several Southern California Edison hydroelectric plants located both up and downstream of the dam. Plunge Creek, Oak Creek and smaller watersheds including Cook Creek, Bledsoe Gulch, and Elder Gulch drain through the City of Highland before reaching the Santa Ana River.

Two stream gages believed to have unobstructed, natural flows are located along the southwestern boundary of the fire that drain into the Santa Ana River. Gage number 11055800 is located on City Creek approximately 2,000 ft downstream of the fire perimeter. The gage has confirmed data from 1920 to present and lists the top 3 highest flows occurring in 2005, 2003, and 2010, with estimated discharges of 9,900 ft^3/s, 8,000 ft^3/s, and 7,250 ft^3/s respectively (Figure 2). The second stream gage, gage number 11055500, is located just within the fire perimeter on Plunge Creek. This gage has confirmed data from 1919 to present and lists the top 3 highest flows occurring in 2010, 1938, and 1966 with estimated discharges of 5,740 ft^3/s, 5,340 ft^3/s, and 4,770 ft^3/s respectively (Figure 3).

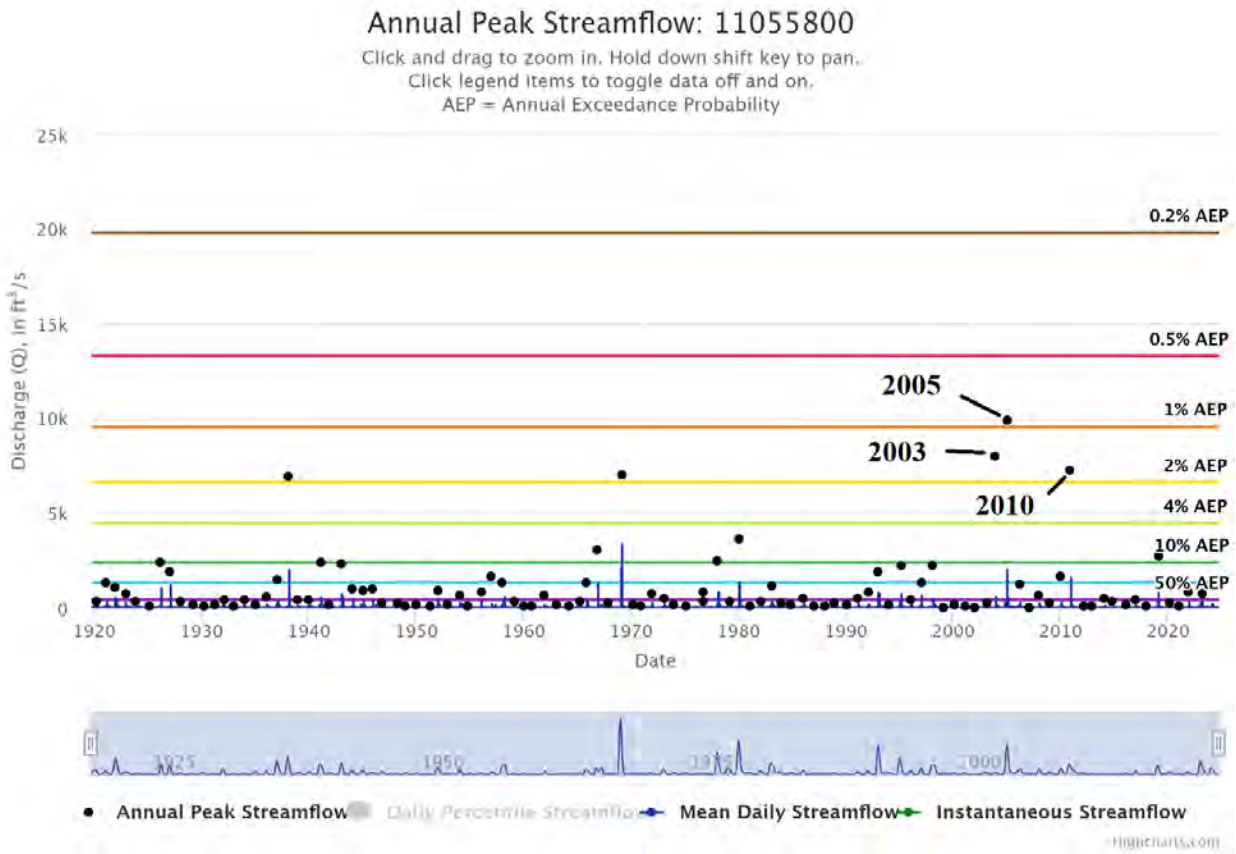


Figure 2. Annual peak streamflow for the USGS City Creek near Highland CA gage (11055800) that highlights the top 3 flow events from 1920 to present. (Source: StreamStats (streamstats.usgs.gov)).

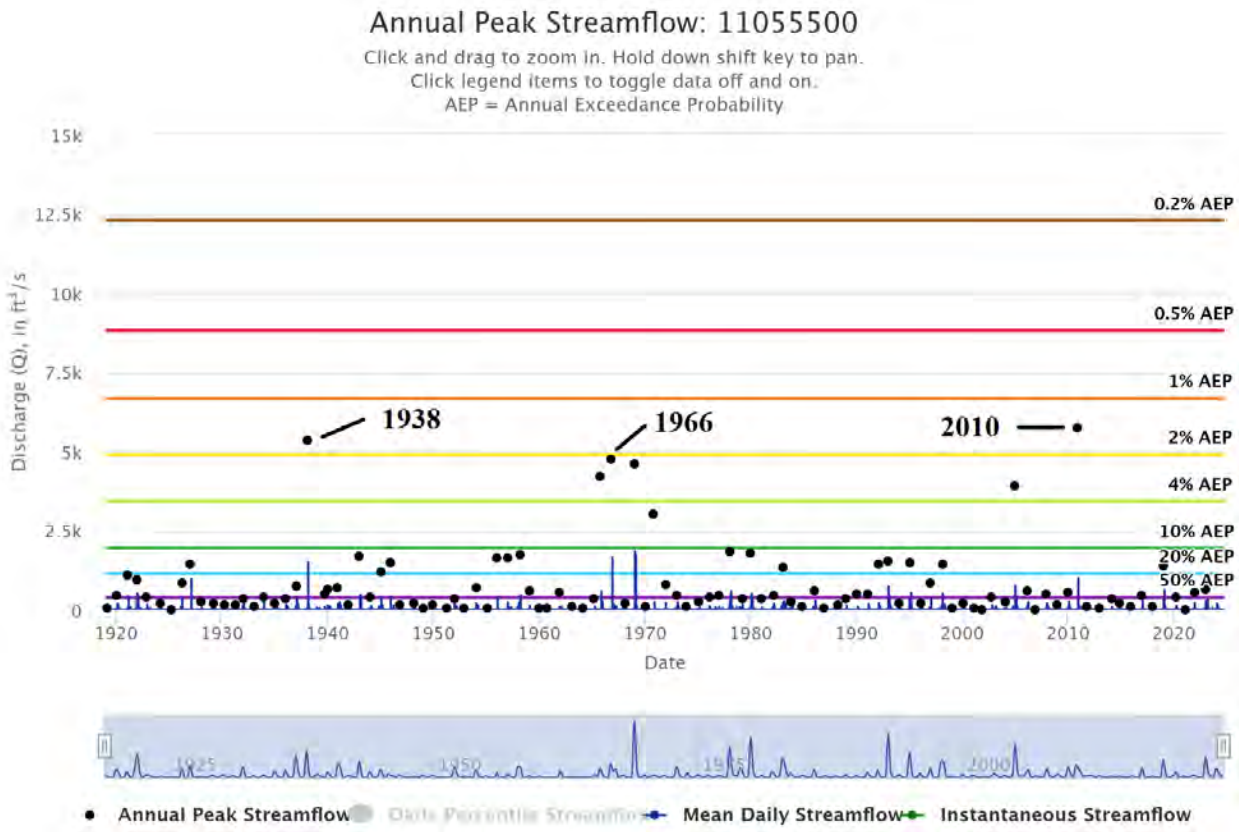


Figure 3. Annual peak streamflow for the USGS Plunge Creek near East Highlands CA gage (11055500) that highlights the top 3 flow events from 1919 to present. (Source: StreamStats (streamstats.usgs.gov)).

Prior to the WERT assessment, an afternoon convective storm event impacted the Line Fire burn area on 20 September, 2024. This storm delivered widespread rainfall across the burn scar with above-threshold rainfall where hourly accumulated rainfall reached roughly 0.55 inches in high-elevation areas and roughly 0.3 inches near the City of Highland. This storm caused widespread nuisance flooding and debris movement into basins and across road surfaces. A section of Greenspot Road (VAR LFV-46) experienced sediment deposition which impacted the City of Highland's only eastern ingress/egress route. 60-minute rainfall depths provided by NOAA were 0.50 inches near the City of Highland and 0.55 inches higher up in the watershed. An estimated 5,000 cubic yards of sediment was deposited within the Oak Creek debris basin. Sections of the v-ditch drainage system lining the mountain front behind homes were fully inundated. There were no reports of major damage.

Frequent historic flooding has been observed primarily in areas downstream of the burned area (San Bernardino County Flood Control District Zone 3). Moderate to heavy precipitation inundated parts of southern California between 16 December and 23 December 2010 leading to widespread flooding. During this 7-day period, the cities of Highland and San Bernardino received greater than 9 inches of rain, with upslope areas exceeding 20 inches. Roughly 50% of average annual precipitation fell during this period (NOAA, 2024). Damages in the City of Highland alone was estimated at $17 million, leading to an emergency declaration for 9 counties in the area (NBC, 2010). In 1969, two separate flood events occurred in January and February.

The January event experienced more intense rainfall than the February event but sustained less damages since county drainage structures were largely unobstructed and facilitated good flow conveyance (SPCPW, 2024). Combined, these floods caused greater than $54 million in damages, killed 13 people, and damaged hundreds of homes, businesses, and infrastructure (AFTF, 2010). Another major flooding event occurred in 1938. A series of storms delivered heavy rainfall throughout southern California over multiple days. This event killed 22 people, destroyed over 150 homes, damaged 800 miles of roadways, destroyed over 100 bridges, and impacted numerous other infrastructure types (AFTF, 2010). These floods generally share a few common characteristics including multiple days of intense rainfall in quick succession, damage to structures along floodplains, overwhelmed drainage infrastructure, and isolation of the cities of San Bernardino and Highland due to roadway impediments. None of these flood events are believed to be a direct result of fire.

There have been multiple confirmed and documented postfire debris flows within the San Bernardino Mountains in recent history. The 2003 Grand Prix - Old Complex experienced at least 74 debris flows where 68 of these occurred 2 months after fire ignition on 12/25/2003. These December 2003 debris flows killed at least 16 people, damaged or destroyed 52 homes, severely damaged a campground, and caused an estimated $38 million in damages (Oakley et al., 2017). A second debris flow event occurred 10 months later on October 20, 2004 with unknown effects. Both events were triggered by cool season weather systems. In general, the Grand Prix - Old Fire debris flows predominantly drained south towards the built environment.

The 2020 El Dorado Fire (adjacent to the eastern portion of the Line Fire) experienced at least 12 debris flows within 3 years after fire ignition. All 12 debris flows have documented impacts that mostly involved overtopped or damaged drainage structures and inundated roadways. The most damaging events occurred on 09/12/2022 where 4 large debris flows impacted the communities of Forest Falls and Oak Glen, resulting in 1 fatality, 30 damaged homes, and impacted businesses and water treatment facilities (CGS, 2023b; Percey, 2022). These documented debris flows caused millions of dollars in damages and were triggered by monsoon or tropical system thunderstorms over Yucaipa Ridge, a prominent ridge that is bound by the San Andreas Fault to the south and Mill Creek Fault to the north.

The 2020 Apple Fire in Riverside County, east of Oak Glen, also had documented postfire debris flows. The 2020 Apple Fire experienced at least 3 debris flows within 3 years after fire ignition. One debris flow caused millions of dollars in damage to the City of Banning’s water facilities in Banning Canyon (CGS, 2023a). These debris flows were triggered by monsoon and tropical system thunderstorms over Yucaipa Ridge. The environmental and geological settings of this fire are similar to that of the Line Fire, however it is believed the Yucaipa Ridge area may be slightly more susceptible to debris flows than most areas within the Line Fire due to its more pervasively sheared and shattered bedrock caused by tectonic activity.

Older postfire debris flows have also been documented near the Line fire. The 1997 Hemlock Fire experienced thunderstorms as intense as 0.31 inches in 3 minutes on 10/7/1997. Postfire debris flows occurred throughout the burn scar. Homes, apartments, and roadways were impacted along the northern areas of the cities of San Bernardino and Highland, causing roughly $2.5 million in damages (NWS, 2024). Postfire debris flow activity within and near the Line Fire is well known and therefore should be understood to be susceptible to future postfire debris flow events.

Geology and Landslides

Regional geologic mapping at 1:250,000 scale by Jenkins and Rogers (1967) and at 1:100,000 scale by Bedrossian et al. (2010) indicates that the Line Fire burn area occurs within the southeastern extent of the California Transverse Ranges Geomorphic Province (CGS, 2002) and in the San Bernardino Mountains (Figures 4a and 5a). The Transverse Ranges Geomorphic Province is a series of steep, east-west trending mountain ranges and valleys extending from the San Bernardino Mountains in the east to the Santa Ynez Range in the west. The San Andreas fault zone makes a large left bend across the Transverse Ranges and causes a zone of compression resulting in significant uplift within the range. The transverse ranges are uplifting at about 1.5 to 2.0 mm/yr and individual crustal blocks within the Transverse Ranges have undergone about 80-110 degrees of rotation since the middle to late Neogene (~15 m.y.a. to 2.5 m.y.a.) (Hammond et al., 2017; Spotila et al., 1998; Scott and Williams, 1978; Meigs and Oskin, 2002).

The bedrock units exposed in the burn area include: 1) Paleozoic metamorphic gneiss and schist, 2) Mesozoic igneous granite, granodiorite, diorite, and tonalite, 3) Quaternary sedimentary rocks, and 4) recent alluvium and colluvium.

The basement metamorphic rocks and granitic rocks are dense and incompressible, readily form steep slopes, and are prone to rockfall, talus slope formation, and shallow landslide processes. Bedrock is generally highly fractured in outcrop and combined with strong ground shaking generated on nearby active faults, deep-seated rockslides are common.

Recent alluvium and colluvium range from moderately consolidated to unconsolidated. Young unconsolidated deposits can be easily eroded and become bed load in flood flows or debris in hyperconcentrated flows. Some recent alluvial deposits contain boulders with diameters up to 5 feet. Detailed mapping of young alluvial deposits can help identify areas prone to flood and debris flow hazards and are well displayed in Bedrossian et al. (2010). The City of Highland is situated just below the burn area on a series of older alluvial fans that are currently eroded with active alluvial fans and washes (Figure 5a).

There is not much published landslide mapping in the burn area although landslide processes are clearly active in the region. Landslide and rockfall / debris flow inventories that cover the Line Fire burn scar were provided to the WERT via email in .kmz format by Mr. Dan Walsh, chief engineering geologist at San Bernardino County. Shallow debris slides, rockfall talus slopes, and debris flows are common in the steeply inclined canyons that drain to, through and around the City of Highland. Within and downslope of the burn area these include City Creek, Cook Canyon, Bledsoe Gulch, Elder Gulch, Plunge Creek, Oak Creek, the Santa Ana River, and Mill Creek. The City of Highland provided the WERT with information regarding a 2010 debris flood event following heavy December rains. The information included an incident map by CalFire that indicates areas of mud deposition within the City of Highland. Many of the deposition areas correspond to areas of values at risk (VARs) outlined in this WERT evaluation.

Ground shaking from nearby active faults is an important process in preparing slopes for landsliding and initiating landslides (Keefer, 1984). Landslide-prone materials can add to the increased erosion and runoff expected as a result of post-fire hydrologic changes. There are numerous active earthquake fault systems in and adjacent to the burn area. At least three splays of the San Andreas rift zone strike west northwest across the southern burn area in and near the City of Highland (Bedrossian and others, 2010). There are numerous other regional

seismic sources that are capable of producing strong ground motions in the burn area. During the 3-5 year recovery period that burned slopes are susceptible to post-fire response, flood flows can be further bulked with sediment and debris delivered to the channel networks by seismically-induced landsliding.

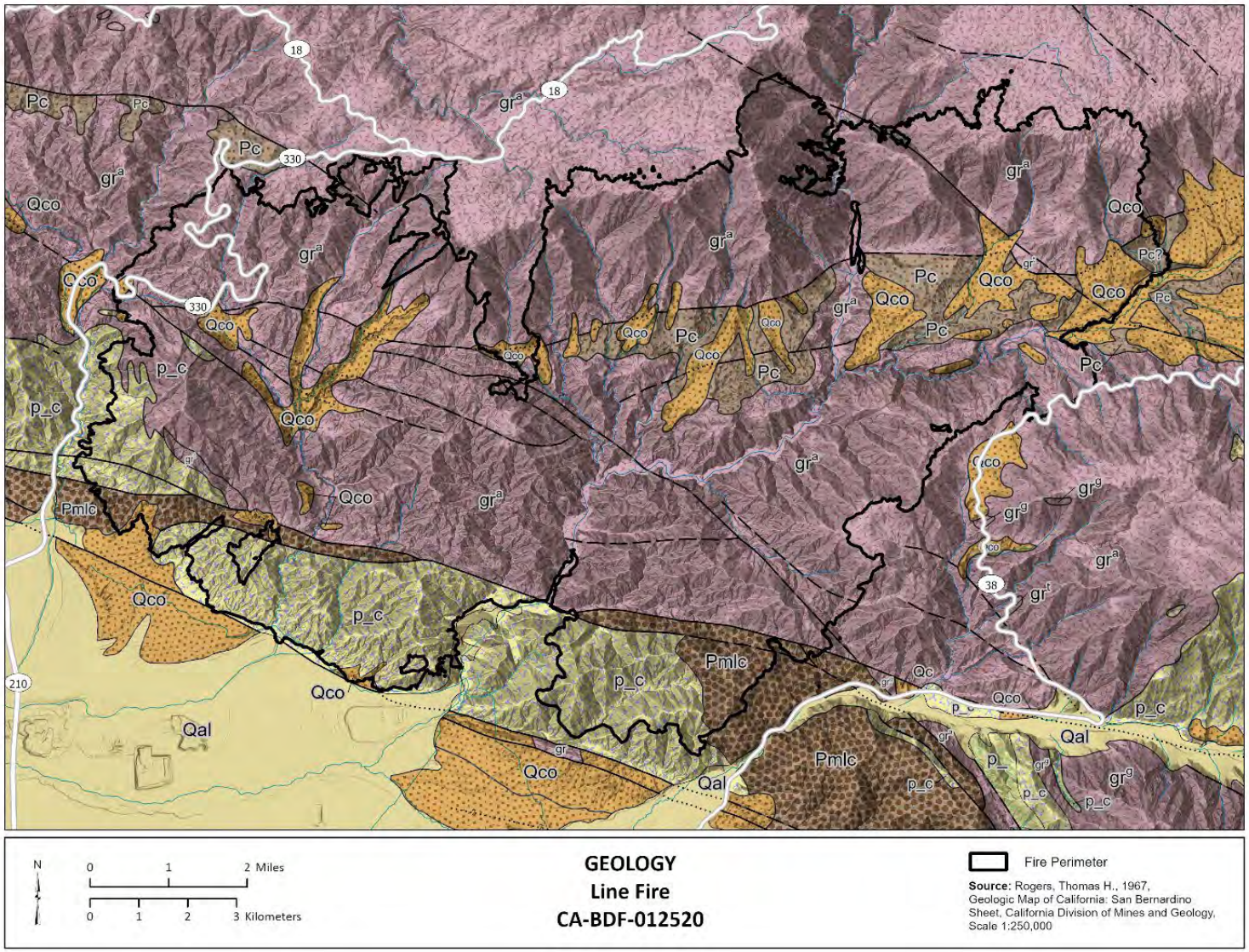


Figure 4a. Geologic map for the Line Fire.

Figure 4b. Legend for geologic map in Figure 4a for the Line Fire.

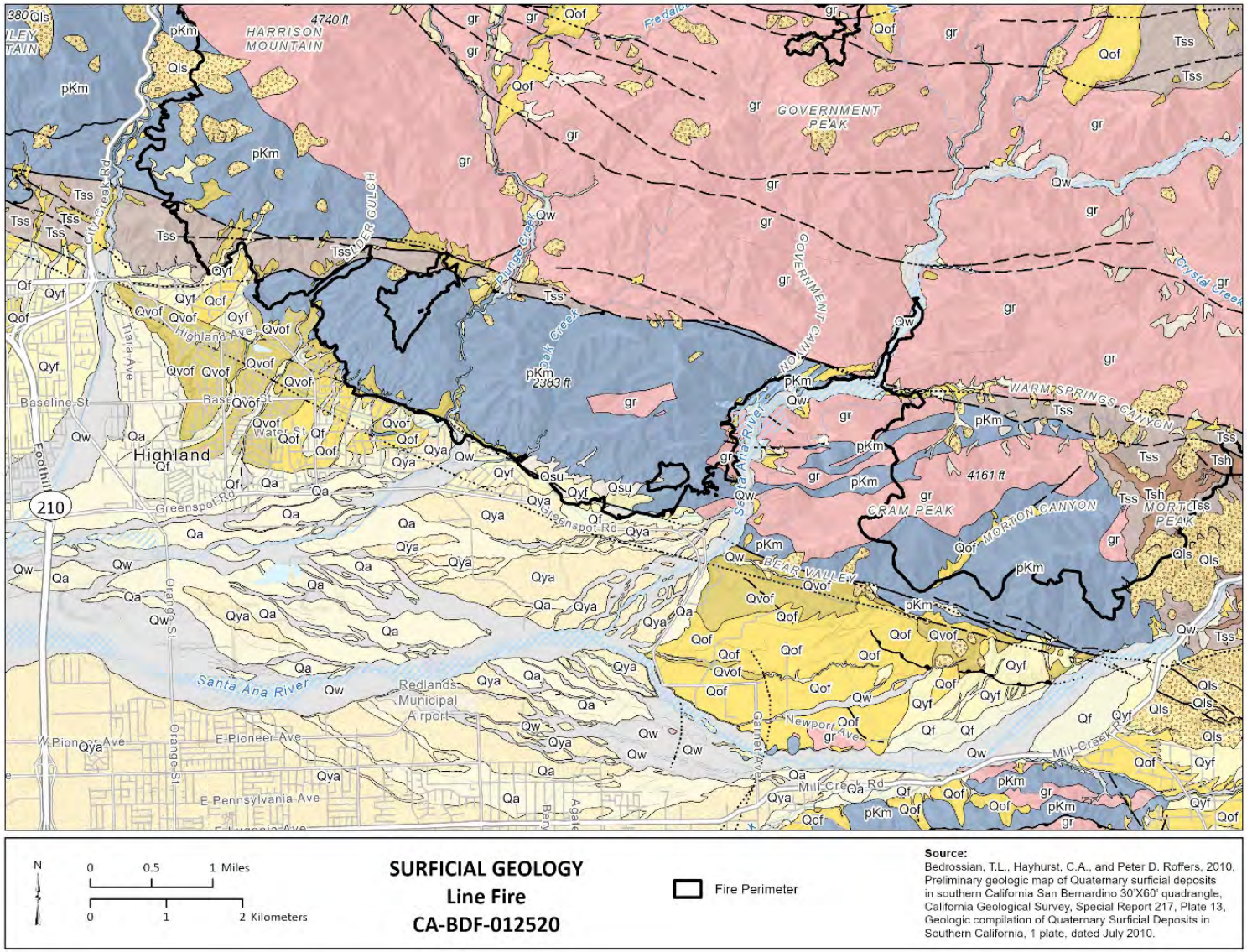


Figure 5a. Surficial geologic map for the Line Fire.

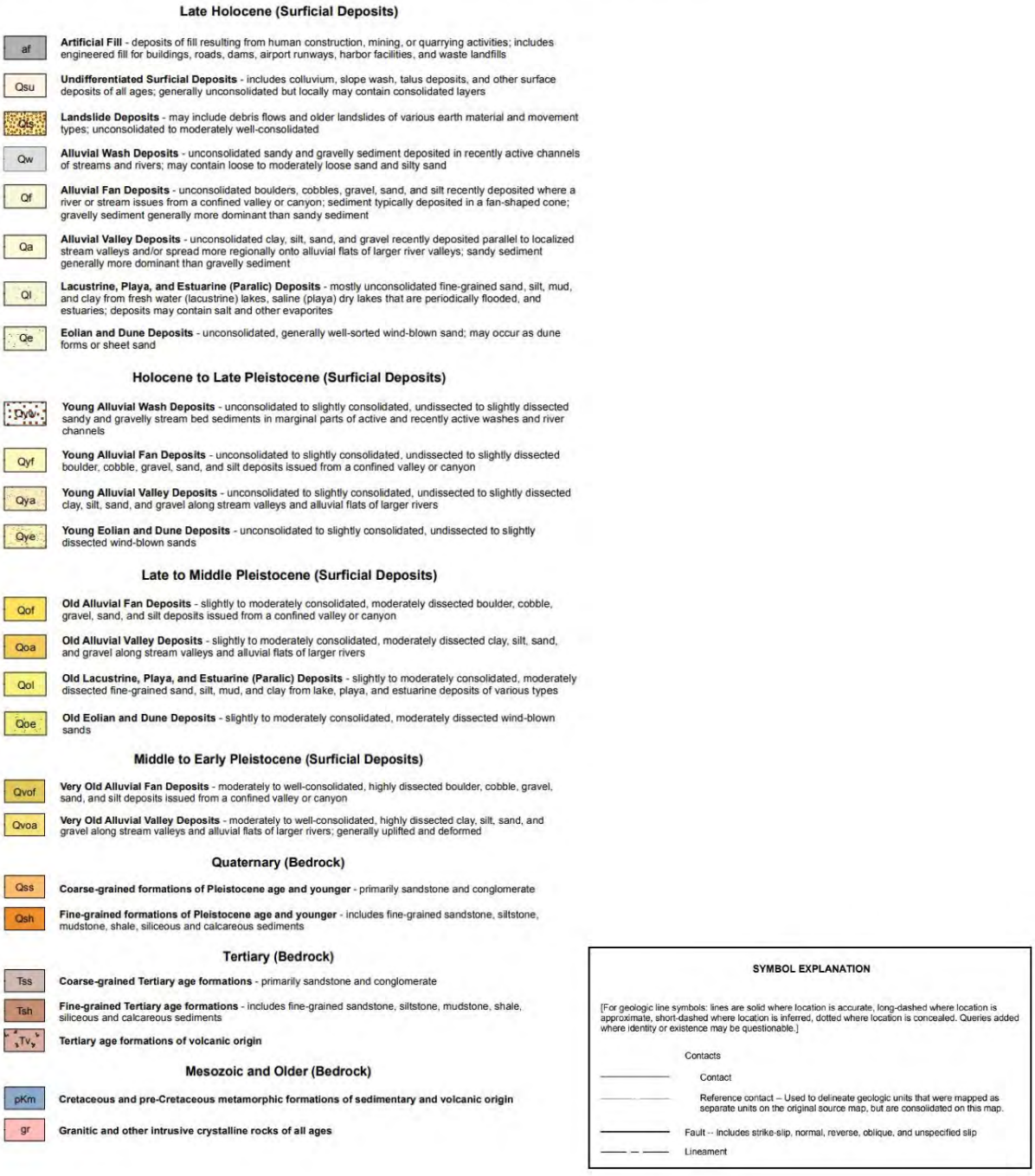


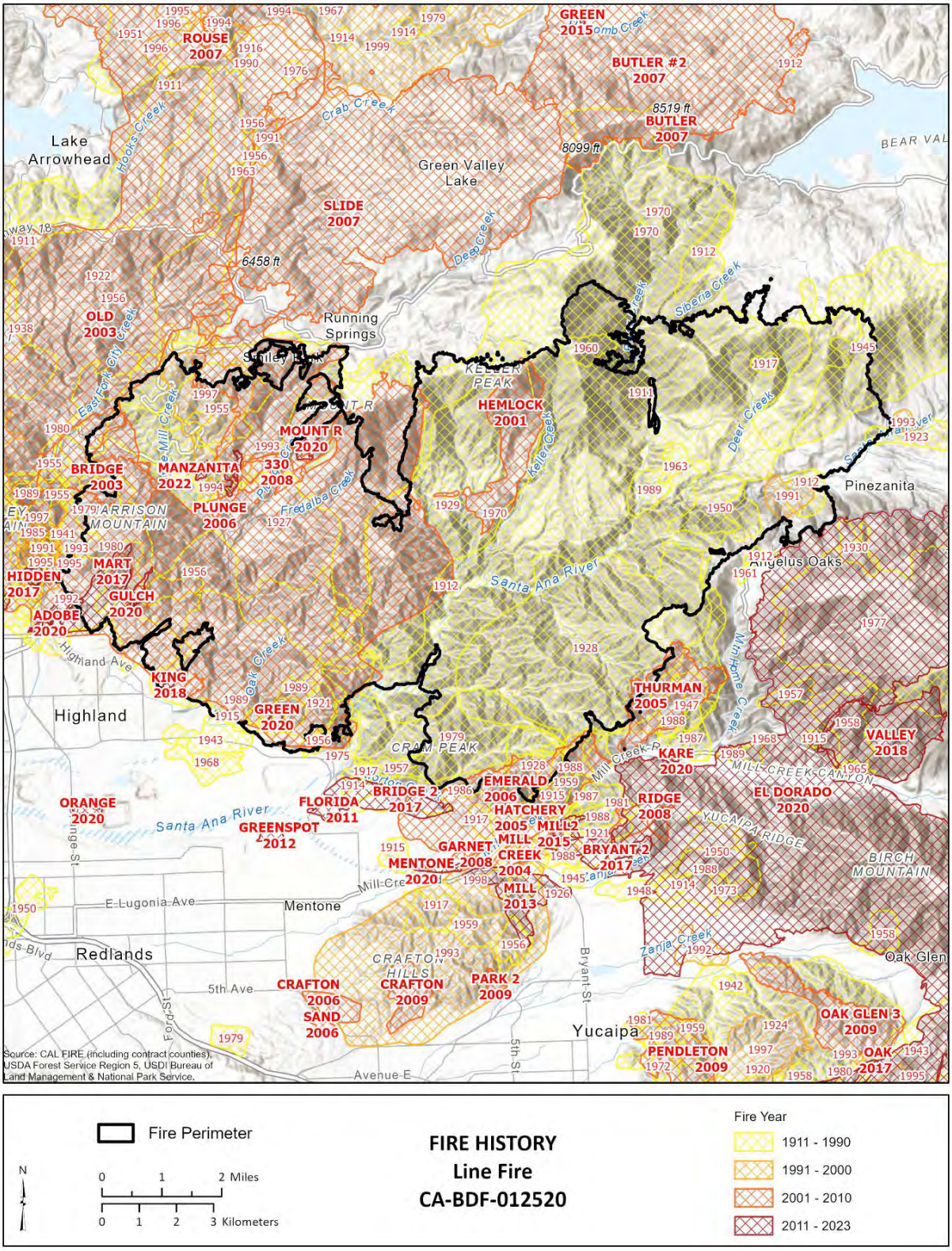
Figure 5b. Legend for geologic map in Figure 5a for the Line Fire.

Vegetation and Fire History

Vegetation within the Line Fire was characterized by a mixture of grass, chapparal, oak woodlands, and mixed conifer forest that occupy different ecotones extending from low elevations along the interface with the San Bernardino Valley to high elevations near the community of Running Springs. In general, shrublands dominate the majority of the burned area from low to mid-elevation slopes, and mixed conifer forests and woodlands covered the high elevation slopes (CAL FIRE, 2024). Much of the burned area is federal national forest land that contains a variety of these ecotones.

Prior to Euro-American settlement, mean fire return interval ranged from 30-100 years in the vegetation types represented in the Line Fire burn area (USDA, 2018). The Line Fire footprint occupies some previously burned areas, including a large fire, the Old Fire (2003, 90,180 acres). Many other small to moderate-size fires also affected the area burned by the Line Fire, though most occurred more than 40 years ago (MTBS, 2024).

Much of the eastern half of the fire, particularly the Santa Ana River drainage, has not experienced wildfire activity in the last 40 years (MTBS, 2024). Areas with less recent fire activity or no recorded fire history might have a higher potential for postfire response due to higher fuel loading which might lead to more severely damaged soil. Also, since these areas have not been subjected to recent postfire erosional processes, they may have a more abundant supply of sediment that can be entrained by amplified postfire runoff.



The Figure 6. Fire history for the Line Fire. Note: Areas that haven't burned for many decades have a potentially higher erosional response than areas that have been subject to recent fire.

Mineral Hazards

Postfire effects reduce vegetative cover and increase the potential of airborne dust and runoff that can mobilize hazardous minerals associated with naturally occurring asbestos and heavy metals associated with mines. Bedrock potentially containing naturally occurring asbestos is located on the far western margin of the fire area near Highway 330 (see inset, Figure 7). Postfire hydrologic responses pose an increase in risk for water quality by mobilizing asbestos- and metal-rich surface deposits into streams within and downstream of the burned area. Since this geologic unit is relatively small in area, is far removed from sensitive receptors, and is not within a watershed of a known water source for the City of Highland, health effects stemming from this rock unit is considered negligible.

Moreover, a single Uranium prospecting site is believed to be the only mining feature located within the burned area. This site is located along Mile Creek near Pinezanita. This site shows no signs of recent use, structures, or human activity when assessing aerial images, so they were not assessed for postfire hazards. This mine operation may still contain mine tailings and mine waste that may contain potentially harmful concentrations of heavy metals. Potential adverse impacts to health and safety from this source is also considered negligible given its limited area and distance from sensitive receptors. For information on hazardous minerals, please refer to https://www.conservation.ca.gov/cgs/minerals/mineral-hazards, https://oehha.ca.gov/chemicals/ or https://pubs.usgs.gov/fs/2005/3014/.

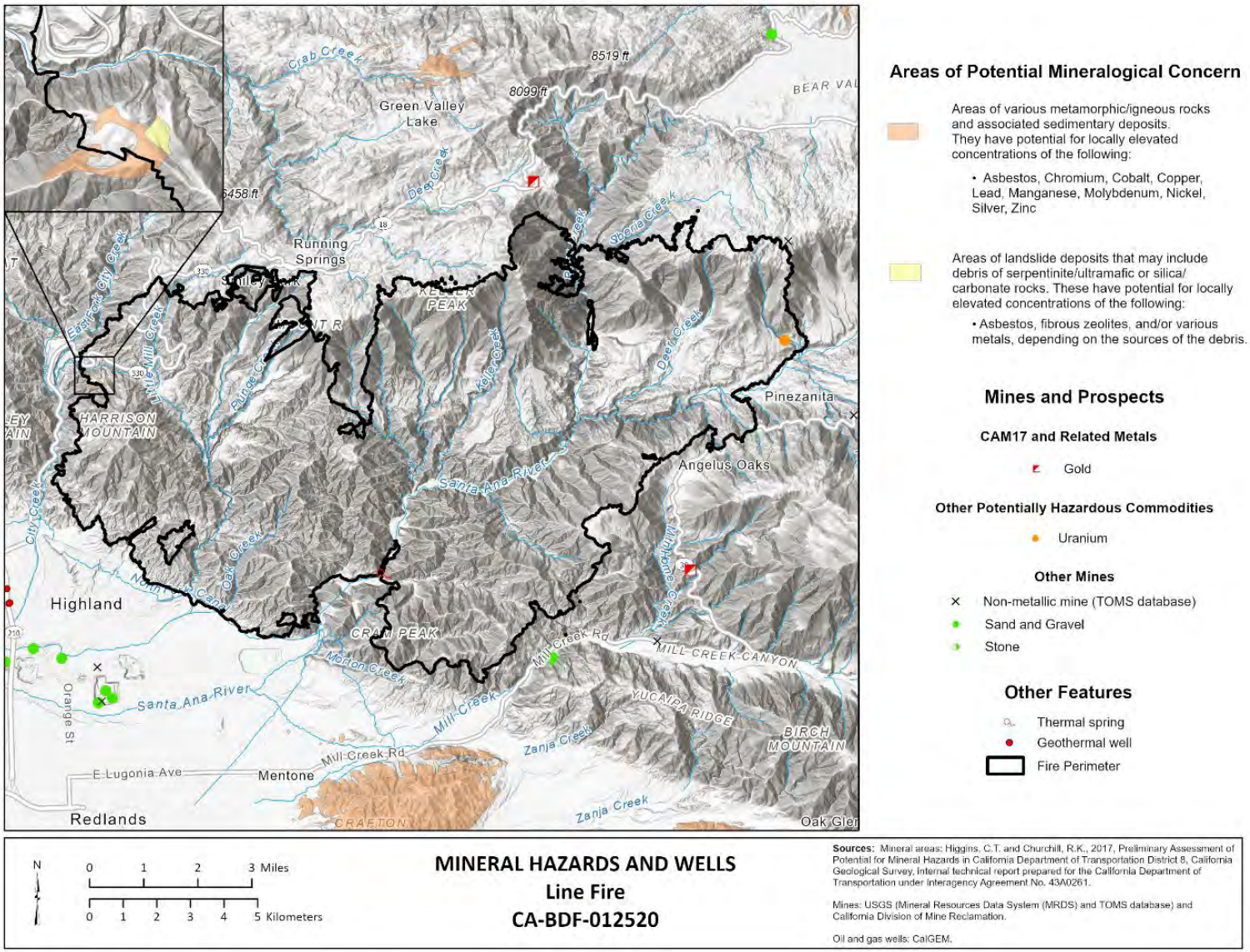


Figure 7. Mineral Hazards and Wells map for the Line Fire.

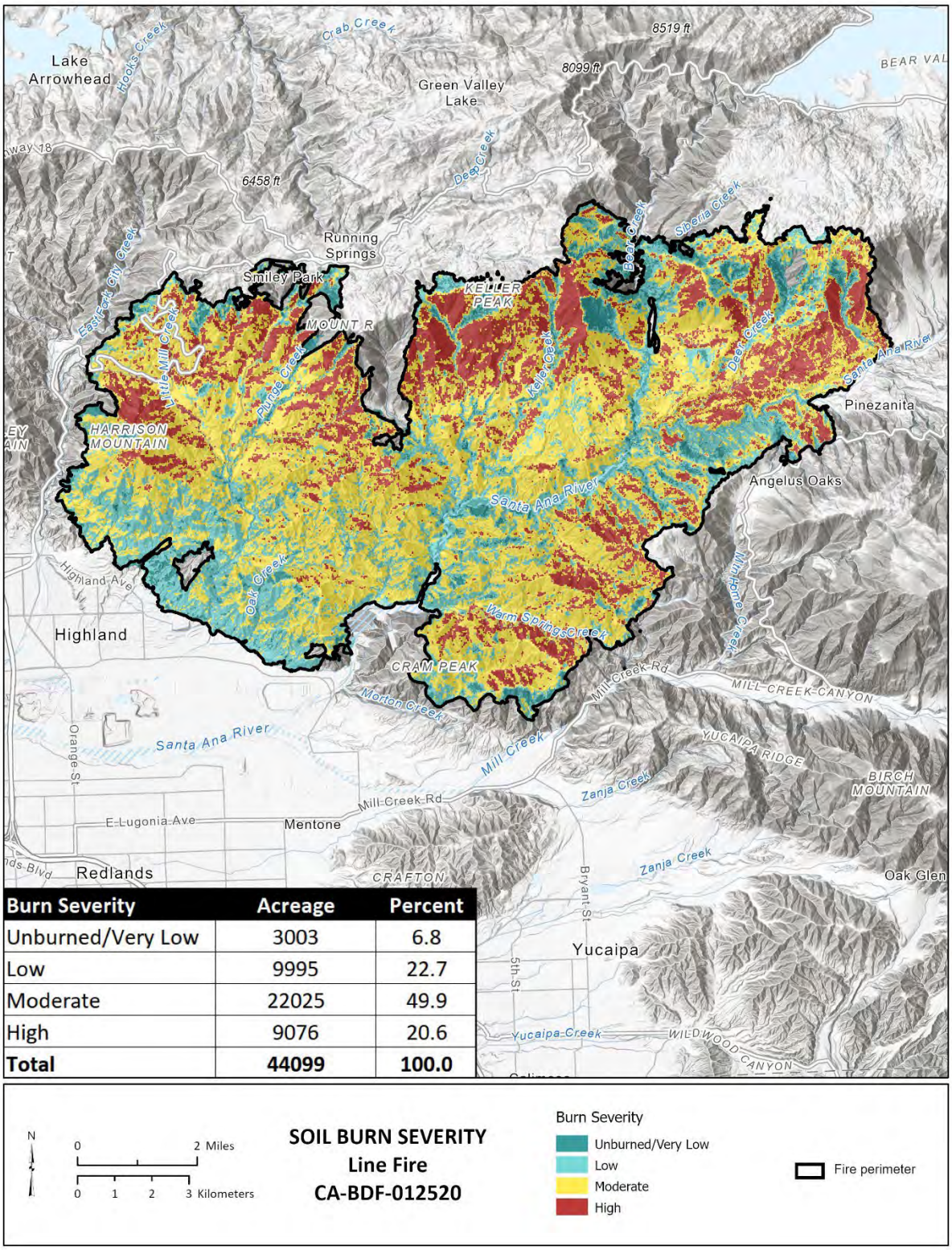
Modeling Postfire Response

Soil Burn Severity

A Soil Burn Severity (SBS) map of the burn area (Figure 8) was provided by the USFS BAER team assigned to the Line Fire. Within the Line Fire footprint, 23 percent of the area was burned at low, 50 percent at moderate, 20 percent at high and 7 precent as very low/unburned soil burn severity. Some of the highest proportions of moderate and high soil burn severity are located within steep mountainous terrain along the northern and eastern portions of the fire within the Santa Ana River, Plunge Creek, and City Creek drainages.

Postfire Debris Flow: Predicted Thresholds and Hazards

The USGS postfire debris flow hazard model (Staley et al., 2016) was run using the SBS map for the Line Fire to assist in the WERT's assessment of locations where hazards to life, property, and infrastructure may exist. The combined hazard model results reflect the potential likelihood of a debris flow occurring as well as the volumetric yield of the debris flow. These results are combined into an overall categorical ranking that range from low to high. Figure 9 shows the combined debris flow hazard for the 15-minute, 24 mm/hr (0.94 in/hr) intensity storm. Figure 9 indicates that the combined debris flow hazard is predominantly moderate and high throughout the burn scar, with some low hazard along the southern mountain front in lower elevation terrain. Figure 10 illustrates 15-minute rainfall intensities required to generate a 50 percent likelihood of debris flows for each basin across the burned area. The fire-wide basin average 15-minute rainfall intensity threshold is about 31.9 mm/hr (1.3 in/hr). Basins with high debris flow hazard rankings are typically in remote areas. These debris flows should have minimal immediate downstream impacts, but they may supply large quantities of sediment and debris to mainstream channels (e.g., Plunge Creek) that may be transported to downstream reaches and eventually impact infrastructure. Communities within the City of Highland contain the most densely populated and developed areas that may directly be impacted by post-fire debris floods / flows. Subdivisions that line the mountain front contain multiple homes that are located near basin outlets or are adjacent to historic channels with a combined hazard ranking of moderate and high. Damage to stream crossings along State Highway 330 is also possible.



Burn Severity	Acreage	Percent
Unburned/Very Low	3003	6.8
Low	9995	22.7
Moderate	22025	49.9
High	9076	20.6
Total	**44099**	**100.0**

Figure 8. Soil Burn Severity map for the Line Fire.

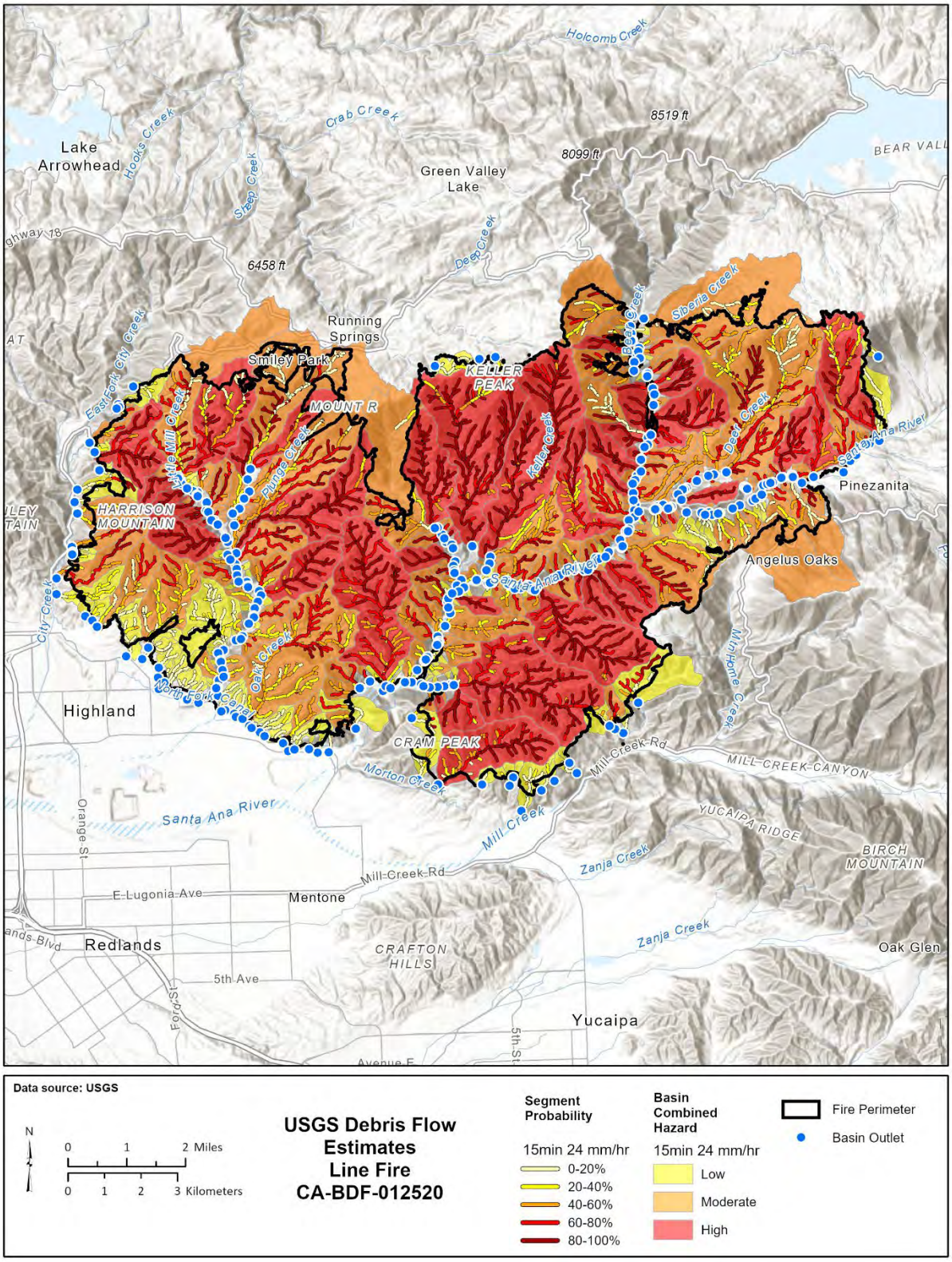


Figure 9. Combined debris flow hazard on the Line Fire for the 24 mm/hr (0.94 in/hr) 15-minute storm event.

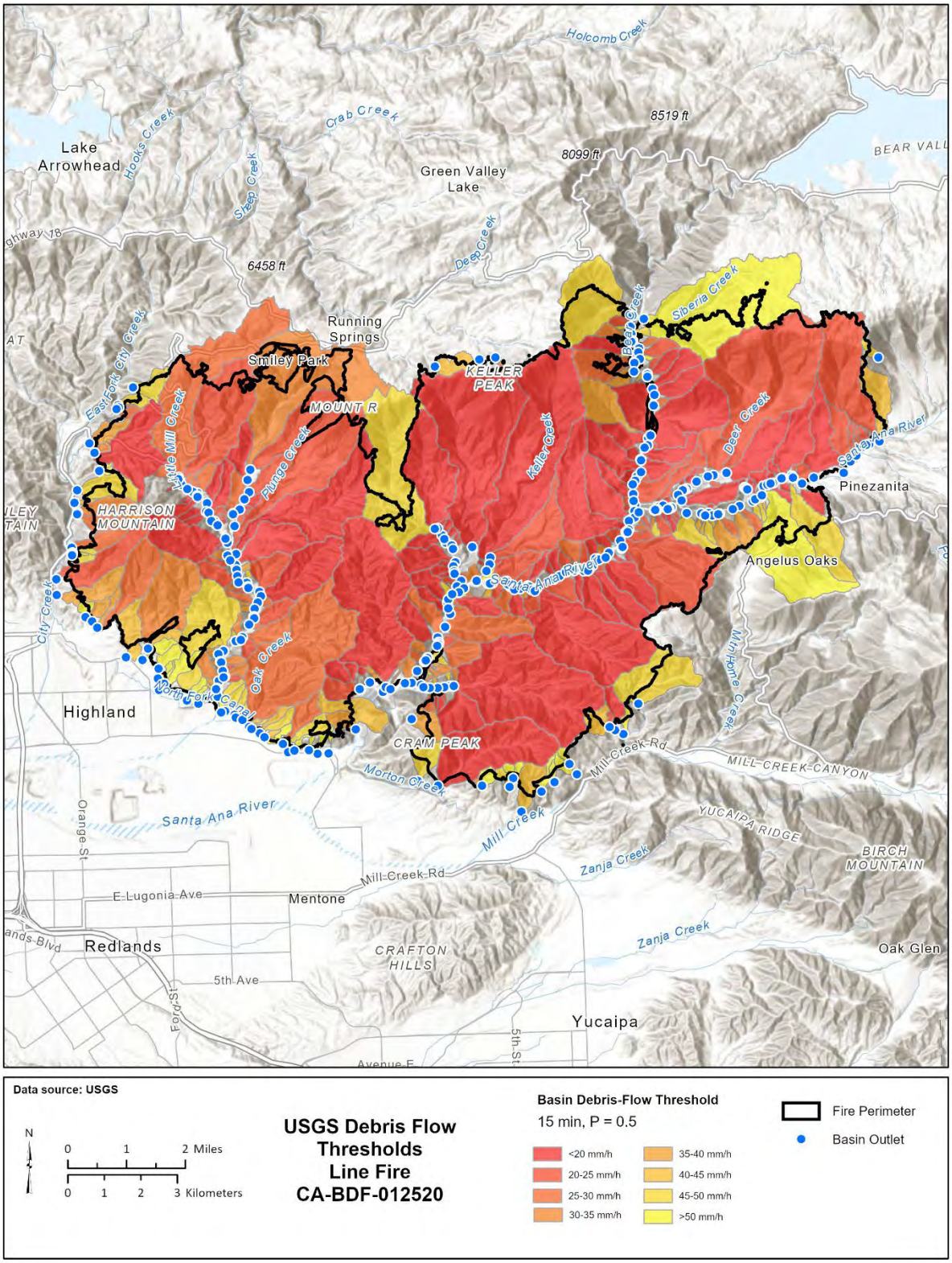


Figure 10. Predicted 15-minute rainfall intensity with a 50 percent likelihood of triggering a debris flow for the Line Fire.

Debris Flow Model Accuracy and Limitations

The results of the USGS debris flow model (Staley et al., 2016) used in the WERT post-fire assessment for the Line Fire give an indication of potential postfire watershed response but may not accurately predict debris-flow likelihood or volume for a given design storm.

The USGS model results do not constitute a site-specific analysis of debris-flow hazards. Additional on-the-ground evaluation should be conducted by qualified and licensed professionals where necessary and appropriate, rather than taking the model results at face value. The model results are also limited in that they do not show hazards for basins that are less than approximately 5 acres in area, and do not specifically identify hazards in areas where one or more tributaries may contribute flood and debris flows (drainage areas approximately greater than 2,000 acres). For areas not shown as having a debris flow hazard along a segment that is associated with a drainage network, a hazard may still be present yet undefined because the segment model results are limited based on the resolution of the input digital elevation model (DEM). Additionally, other hillslope processes such as rockfalls, debris slides, and deep-seated slides are not included in the model results.

It should also be noted that the debris-flow model does not predict runout and inundation areas beyond the modeled source basin and does not consider potential increased hazards from multiple storm events that may load channels with sediment that could be entrained in future debris flows.

Postfire Hydrology

Peak flows increase following wildfire as a result of reduced vegetation and surface cover and the formation of water repellent soils. The largest peaks occur during intense, short duration rainfall events on watersheds with steep slopes (Neary et al., 2005). Research conducted in southern California indicates that postfire peak flows can increase as much as 10- to 30-fold for low-magnitude storms and approximately 2- to 3-fold for larger magnitude storms (Rowe et al., 1949; Moody and Martin, 2001). Kinoshita et al. (2014) reported that commonly used flood flow prediction methods have lower confidence with larger recurrence interval events (25- and 50-year); therefore, we analyzed pre- and postfire flows assuming a 2-year storm event, equivalent to the 50% annual exceedance probability (AEP).

The WERT selected eight watersheds, or “pour points”, to estimate potential postfire increases in peak flow and associated impacts to Values-at-Risk from flooding and debris flood hazards. Seven of the pour points occur along the southwestern portion of the fire boundary along drainages that initiate within mountainous areas inside the burn area and flow to the south where they enter populated areas along valley bottoms. One of the pour points occurs within the northwestern portion of the burn area where a drainage intersects Highway 330. From west to east, the pour point watersheds include City Creek, Cook Creek, Bledsoe Gulch, Elder Gulch, Little Mill Creek, Plunge Creek, Oak Creek, and an unnamed creek. Figure 11 shows the location of the eight pour point watersheds. These watersheds represent elevated flood and debris flow hazards to private and public roads and residential structures and were selected based on elevated risks of flooding identified in the field or recognized by individuals familiar with the area as having past flooding problems, including representatives from the City of Highland and San Bernardino County. Pour points located close to the fire perimeter and burned at moderate and high soil burn severity (SBS) yield larger postfire flow increases than those far below the fire perimeter and those burned at lower severity. Note: Field observations

indicate that watersheds for PP #7a and #7b both outlet at PP#7a, though the model run was not able to capture this in the topography due to manipulation of the terrain associated with grading for Alder Creek Road.

Pre-fire peak flow estimates were first produced for the eight pour point watersheds using the South Coast, Region 5 USGS regional regression equations for a 2-year recurrence interval discharge (USGS StreamStats, 2024; Gotvald et al., 2012).

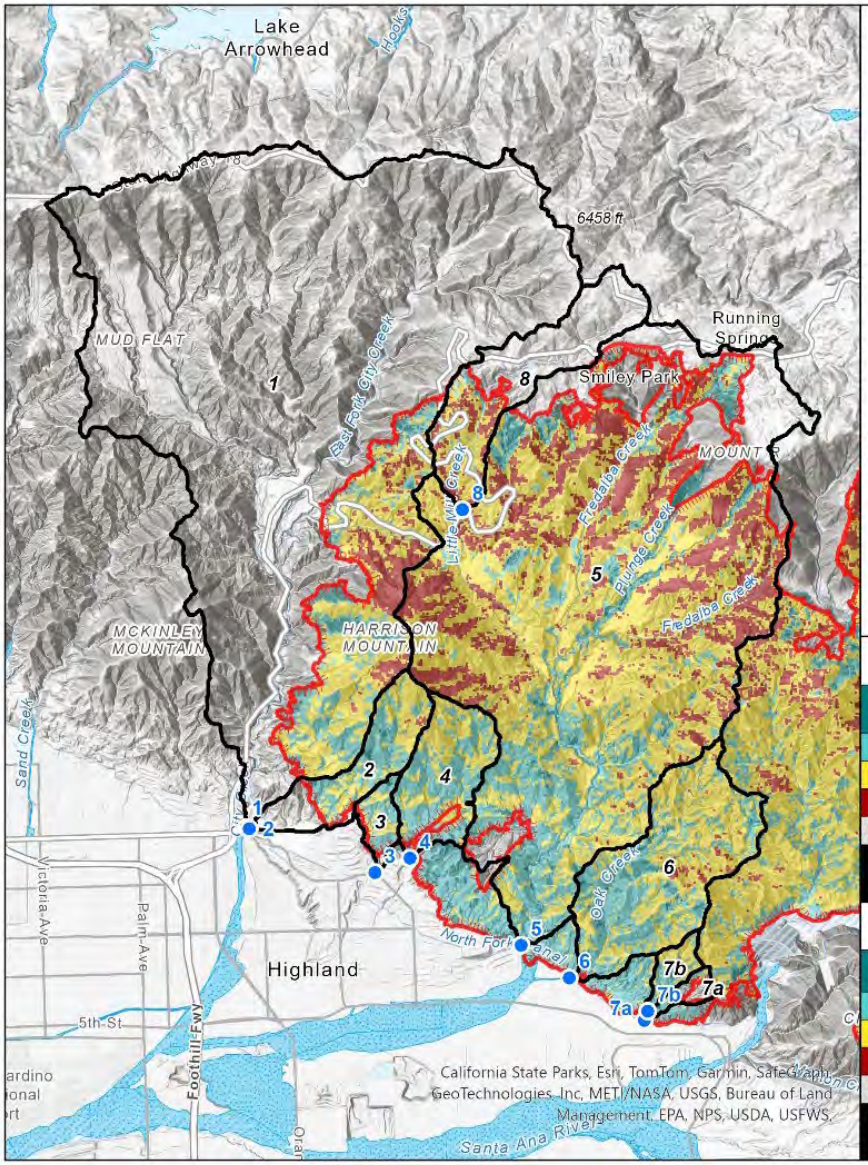
Changes in postfire peak flows were estimated based on the basin size and anticipated flow type at each pour point. Flow type was determined based on existing slope and channel morphology, as well as historic account of postfire runoff events, either reported in public documents reviewed as part of our assessment or through personnel accounts shared by local residences.

To estimate postfire peak discharge for flood and debris floods, we followed procedures outlined by USFS BAER teams (unpublished), referred to here as the BAER method. The BAER method uses the proportions of the watershed that are unburned and burned at low, moderate, and high SBS to account for postfire runoff increases. For this analysis, the postfire 2-year recurrence interval flow is estimated by assuming areas that are unburned or have very low SBS undergo no change in runoff (Q2); runoff from low SBS areas are assumed to respond similarly to a 5-year recurrence interval discharge (Q5); runoff from moderate SBS areas are assumed to respond similarly to a 10-year recurrence interval discharge (Q10); and runoff from high SBS areas are assumed to respond similarly to a 25-year recurrence interval discharge (Q25). Applicable USGS regression equations for the Q2, Q5, Q10, and Q25 flows are applied to each category (USGS StreamStats, 2024; Gotvald et al., 2012). The area-weighted flow estimates by soil burn severity class are then summed to derive the runoff response that would typically generate a 2-year peak flow.

The BAER method is intended to predict peak discharge for postfire floods and debris floods with sediment concentrations less than about 40%, however, it may underpredict peak discharge of debris flows that often form dilated surge fronts composed of segregated boulders and woody debris. Short-lived amplification in stage and instantaneous discharge caused by debris flow surge fronts can be 10 to 100 times larger than normal stream flow (Rickenmann, 2016; Kean et al., 2016) and can lead to flow avulsion (i.e., rapid shifting of the stream), property damage, and sometimes fatalities (Kean et al., 2016; 2019). Since the anticipated flow type at each pour point is debris flood with estimated sediment concentrations less than 40%, potential amplification resulting from dilated surge fronts was not considered.

Table 2 provides a summary of basin information as well as pre-fire and post-fire flood flow estimates based on a 2-year recurrence interval. Results indicate that postfire runoff events for a 2-year recurrence interval storm can result in floods and debris floods that are about 2 to 6 times larger than normal streamflow. The largest change occurs within the PP-5 basin above Highland where postfire debris flood hazard is high and the flow multiplier is estimated to be 6.

These flow estimates are intended for emergency response planning purposes only and are not to be used for design. Moreover, they are most appropriately applied to flows within the first year following the fire or until ground cover within the burned area is well established. As knowledge is obtained through monitoring the runoff response of stressing storms in the first wet season after fire or as the slopes in the watersheds become revegetated, these flow multipliers may be adjusted to decrease predicted postfire flows and reduce conservatism.



Pour Point Watersheds
Line Fire
CA-BDF-012520

Soil Burn Severity

- Unburned/Very Low
- Low
- Moderate
- High
- Fire Perimeter

- Pour Points
- Pour Point Watersheds
- FEMA Special Flood Hazard Areas
- DWR 100yr Awareness Floodplains

N

0 1 2 Miles

0 1.25 2.5 5 Kilometers

	PP #1	PP #2	PP #3	PP #4
Unburned/ Very Low	217 (1.6%)	15 (2.4%)	6 (3.8%)	27 (3.8%)
Low	678 (5.1%)	236 (37.0%)	99 (59.2%)	387 (54.6%)
Moderate	1,184 (9.0%)	226 (35.3%)	42 (25.3%)	291 (41.0%)
High	302 (2.3%)	8 (1.2%)	0 (0.0%)	2 (0.2%)
Outside Fire	10,782 (81.9%)	154 (24.2%)	20 (11.7%)	3 (0.4%)
Total Acres	13,163	639	167	709
Total km^2	53.3	2.6	0.7	2.9

	PP #5	PP #6	PP #7a	PP #7b	PP #8
Unburned/ Very Low	431 (4.0%)	85 (5.5%)	4 (4.4%)	4 (2.7%)	17 (1.6%)
Low	1,704 (15.7%)	577 (37.1%)	44 (46.8%)	63 (46.7%)	64 (5.9%)
Moderate	4,843 (44.5%)	855 (54.9%)	16 (16.5%)	68 (50.6%)	232 (21.5%)
High	2,003 (18.4%)	36 (2.3%)	0 (0.0%)	0 (0.0%)	119 (11.0%)
Outside Fire	1,892 (17.4%)	3 (0.2%)	30 (32.3%)	0 (0.0%)	647 (60.0%)
Total Acres	10,873	1,557	94	134	1,079
Total km^2	44.0	6.3	0.4	0.5	4.4

Figure 11. Pour Point locations within and downstream of the Line Fire.

Table 2. Basin metrics, pre- and postfire Q2 estimates, postfire Q2 flow recurrence intervals, and prefire Q2 flow multipliers used to estimate increased relative flood response for eight watersheds assessed for flood hazard (i.e., "pour points").

Pour Point #	Description	Anticipated flow type based on channel morphology and historic record	Basin Area (mi^2)	Relief (feet)	Mean Basin Elevation (feet)	% Unburned/ very low	% Low SBS	% Moderate SBS	% High SBS	Q2 prefire flow (CFS)[1]	Q2 post-fire flow (CFS) following BAER[2]	Q2 prefire to postfire flow multiplier (Postfire Q2/Q2) for Flood / Debris Flood	Interpreted Postfire Response[2, 3]
PP-1	City Creek at Highland Ave	Flood	20.6	4986	3850	84	5	9	2	359	735	2	Low
PP-2	Cook Creek	Debris Flood	1.0	3164	2663	27	37	35	1	35	109	3	Moderate
PP-3	Bledsoe Gulch	Flood	0.3	1504	2105	16	59	25	0	13	36	3	Moderate
PP-4	Elder Gulch	Flood	1.1	2606	2761	4	55	41	0	38	140	4	Moderate-High
PP-5	Plunge Creek	Debris Flood/Flow	17.0	4968	3971	21	16	45	18	297	1930	6	High
PP-6	Oak Creek	Debris Flood/Flow	2.43	2518	2725	6	37	55	2	66	289	4	Moderate-High
PP-7a	Orchard	Debris Flood/Flow	0.1	1226	2435	37	47	17	0	9	20	2	Low
PP-7b	Orchard	Debris Flood/Flow	0.2	1496	2593	3	47	51	0	12	38	3	Moderate
PP-8	Hwy 330	Debris Flood	1.7	2860	5225	62	6	21	11	74	229	3	Moderate

[1]2-yr Recurrence Interval (Q2) flow estimated using USGS regional regression equations (Gotvald, 2012).

[2]Postfire, 2-yr Recurrence Interval (Q2) flow (clearwater) following BAER protocol based on Soil Burn Severity: non&verylow = Q2; low = Q5; moderate = Q10; High =Q25. See report text for explanation.

[3]Locallized flooding in excess of the postfire reponses presented may occur immidiately downslope of basins burned at a high severity, at tributary confluence, and at crossing structures if high volumes of woody debris and large boulders are transported.

Postfire Hydrologic and Hydraulic Models

The peak flow estimates and flow multipliers summarized in Table 2 are best used to evaluate the relative magnitude of change from prefire to postfire runoff. However, because the methods applied only allow for peak flow to be estimated, they do not provide a complete runoff hydrograph needed to conduct unsteady 2D and 1D hydraulic modelling to inform flow conveyance and inundation extent within and downslope of burnt areas. Consequently, the WERT recognizes that City and Highland and San Bernardino County public works may wish to conduct detailed hydrologic and hydraulic modelling to better account for increased runoff and potential flow path uncertainty using available models such as the Hydrologic Engineering Center's Hydrologic Modeling System (HEC-HMS) and River Analysis System (HEC-RAS) (HEC, 2024). Upon request, the WERT can provide general guidance to help parameterize basic hydrologic and hydraulic models based on experience from burn scars in similar geoclimatic conditions with known postfire response.

VAR Observations and Discussion

This evaluation is not intended to be comprehensive and/or conclusive, and additional VARs may be identified through more detailed evaluation by responsible agencies. This includes more detailed site investigation for the development and design of appropriate mitigation measures. Several limitations are summarized below.

- FEMA, state, and local flood hazard mapping was not complete or non-existent in several areas.
- Not all roadway culverts and bridges in and adjacent to the burn area were evaluated.
- Some potential VARs were not evaluated, or evaluated from a distance, because of the lack of access.
- Hazards on alluvial fans could not be represented as single-points given the potential for avulsion (i.e., rapid channel shifting) and flow-path uncertainty. Alluvial fan VARs are generally presented as polygons or included in FEMA and DWR flood and awareness zones.
- VAR evaluation was not conducted within all mapped flood hazard areas that are downstream of the burn perimeter. Risk of flooding in these areas is preexisting and is anticipated to be increased by postfire runoff and/or blockage of drainage structures (e.g., culverts and bridges) by postfire debris. As such, local agencies should consider these previously mapped hazard areas in addition to the VARs identified in this report.

Specific Values-at-Risk (VARs) are contained within the geodatabase (VAR point and polygon feature classes) created by WERT, and these are the best product for use in response planning because they provide spatial location along with attribute data captured in the field. Detailed observations and potential mitigations are provided in the geodatabase (VAR point and polygon feature classes), VAR summary table (Appendix B) and VAR site information sheets (Appendix C and D). A summary of VARs by relative risk to life-safety and property are shown in Table 3.

Table 3. Values-at-Risk (VARs) classified by risk to life-safety and property.

		Risk to Life-Safety		
		Low	Moderate	High
Risk to Property	Low	LFV-07, LFV-08, LFV-09, LFV-11, LFV-12, LFV-17, LFV-18, LFV-20, LFV-22, LFV-26, LFV-27, LFV-29, LFV-30, LFV-31, LFV-39, LFV-42, LFV-52, LFV-53, KP-01, RS-01, SO-06		
	Moderate	LFV-01, LFV-02, LFV-06, LFV-13, LFV-15, LFV-16, LFV-19, LFV-21, LFV-24, LFV-25, LFV-28, LFV-32, LFV-33, LFV-34, LFV-37, LFV-38, LFV-43, LFV-44, LFV-45, LFV-47, LFV-48, LFV-49, LFV-50, LFV-51, LFV-54, LFV-55, LFV-56, SO-01, SO-03, SO-04, SO-05	LFV-36, LFV-40, LFV-46, SO-02	
	High	HWY-01, LFV-03, LFV-04, LFV-14, LFV-23, LFV-41	LFV-05, LFV-35, HWY-02	LFV-10

Exigent Values-at-Risk

Exigent VARs are those that should receive priority attention for pre-planning and emergency protection measure implementation. The 14 exigent VARs on the Line Fire are VARs with high risk to either life-safety or property, or moderate risk to both life-safety and property (Table 3). These VARs are discussed below, along with associated VARs that include many residential structures that face potential flood risks in areas of known flood hazard and key road crossings that present a moderate hazard to either life-safety or property.

Floodplains (LFV-05, LFV-10): Multiple active alluvial floodplains mapped on regional geologic maps (for example Bedrossian and others, 2010) may be impacted by flood flows emanating from the San Bernardino Mountain front along the southern fire perimeter. **LFV-05** is downstream of a basin with a low combined hazard rating and estimated mean flow volume of about 20,000 cubic yards (24mm/hr (0.94in/hr) intensity; 15-minute duration). A single large culvert delivers flows to **LFV-05** at Highland Avenue. Historical flows have damaged past culverts along this upper reach of the VAR. Sufficient debris and material that can be mobilized is currently available upstream of the VAR to cause similar damage and plugging of various culverts within the VAR. Failure of the earthen dam at **LFV-03** may also magnify these impacts. The culverts may act as choke points when plugged with debris and divert flows to overflow and redivert along various roadways in the built environment. It is beyond the scope of the WERT analysis to predict flow paths diverted into the built environment.

LFV-10 is an active alluvial fan (Bedrossian and others, 2010) downstream of a large basin with a moderate combined hazard rating and estimated mean flow volume of about 100,000 cubic yards at 24mm/hr (0.94in/hr) intensity; 15-minute duration. These drainages also discharge into Elder Gulch which has been developed into a concrete walkway. The walkway crosses many major city streets (for example Baseline Street, Water Street, and Greenspot Road) that contain culverted crossings. The culverts may act as choke points when plugged with debris and divert flows to overflow and redivert along various roadways in the built environment. It is beyond the scope of the WERT analysis to predict flow paths diverted into the built environment. Of particular concern is Arroyo Verde Elementary School at the base and downslope of the concrete walkway. Flows may then spread out and inundate the school property (Arroyo Verde Elementary School) and downstream structures and ingress and egress roadways such as Greenspot Road.

LFV-05 and **LFV-10** may experience similar effects to past flood events. Culverts should be monitored and maintained, and responsible agencies should consult with a licensed engineer to install flow deflection structures.

Mountain Front Communities (LFV-35, LFV-36, LFV-40): Numerous homes that abut the mountain front along the fire's southwestern boundary may be subject to debris floods. **LFV-35** is situated directly in front of a small drainage that experienced a flow event on 9/20/2024. The flow deposited sediment and fully filled the v-ditch immediately behind **LFV-35**. It is believed that a more intense rain event could trigger a larger magnitude response and mobilize in-stream boulders immediately upstream of the ditch. Larger flows may overtop the ditch and impact the rear block wall of these residences. Damage to the wall and nearby residential structures is possible.

Alder Creek Road, a dirt road that has multiple channel crossings upstream of **LFV-35**, is believed to contribute sediment to future flows. It is also believed that the USGS stream path indicated in the USGS postfire debris flow model is inaccurate for **LFV-35**. Instead of a sharp 90-degree northward bend in the channel above Alder Creek Road, we believe flows impacting the road would continue downstream along the road towards **LFV-35**. Responsible agencies should monitor and maintain the v-ditch to ensure unobstructed flood conveyance. These agencies should consider consulting with a licensed engineer to install flow deflection structures between **LFV-35** and the v-ditch.

LFV-36 is a v-ditch drainage structure located behind residential structures along La Cresta Street. We observed amble sediment deposition throughout the ditch following the 9/20/2024 storm event. Trash racks appeared to have effectively prevented sediment from entering other drainage structures such as culverts. However, these structures also elevated the mud deposited within the ditch. A larger storm event will likely increase deposition within the ditch and increase the amount of debris caught by trash racks, thereby elevating the sediment deposited within the ditch. If larger flow events overwhelm and overtop the ditch, flows will likely be bound by the rear block walls of residential structures. These walls may fail if flows are large enough or if the ditch experiences subsequent avulsions. Flows may then inundate homes and backyards along the ditch. If the walls do not fail, flows will be conveyed north towards Oak Creek or south towards a small detention basin adjacent to Greenspot Road. If flows are large enough, the vented culvert within this detention basin may plug and induce overtopping flows onto Greenspot Road. It is believed Alder Creek Road upslope from **LFV-36** will contribute

sediment delivered to the ditch. The responsible agency should monitor and maintain the ditch to ensure maximum flow conveyance.

A debris flood will potentially impact **LFV-40**. This VAR experienced a flow event on 9/20/2024. Prior to exiting the mountain front, the channel crosses a dirt road along the northern boundary of the citrus orchards. Here the flow inundated the road and split into 2 main segments. One segment flowed west towards **LFV-39** while the other flowed south towards the eastern boundary of **LFV-40**. It is believed the main and historical channel is the south-draining channel. Most of the flow progressed down the main channel and narrowly missed several homes at the end of the Capri Way cul-de-sac. Several minor branches of the flow also flowed through the orchard between the two channel segments and deposited sediment along Capri Way. It is believed that larger flows would directly impact homes at the end of the cul-de-sac, overwhelm v-ditch drainage structures, and severely inundate Capri Way. Future flows may also mobilize loose cobbles and boulders in-channel and on a rock revetment along the dirt road stream crossing. This elevates the risk of downstream damage. The USGS postfire debris flow model shows a low combined hazard for the basin with an estimated mean flow volume of 3,000 cubic yards (24mm/hr (0.94in/hr) intensity; 15-minute duration). This is unlikely though smaller volume flows are expected to exceed damages observed on 9/20/2024. Responsible agencies should monitor and maintain the drainage system and consult with a licensed engineer to install flow deflection structures.

Seven Oaks (SO-02): The Seven Oaks community includes several residences that are situated along the Santa Ana River floodplain with multiple culverted crossings of roads that provide ingress and egress. The upstream watershed is relatively large and mostly unburned, and the potential increase in hazard to life-safety and property in Seven Oaks due to postfire conditions is generally low. However, the Mile Creek drainage, which is a tributary to the Santa Ana River, burned at moderate severity and the USGS postfire debris flow model estimates a mean flow volume of 170,000 cubic yards (24mm/hr (0.94in/hr) intensity; 15-minute duration) that can be delivered to the Santa Ana River. The confluence of this tributary is immediately upstream of multiple residences in Seven Oaks, including **SO-02**. This area was previously impacted by debris flood / flows during Tropical Storm Hilary on 8/20/2023 which resulted in significant bank scour, particularly adjacent to **SO-02**. Postfire increase in flood flows emanating from Mile Creek may contribute to additional bank scour at this location, with the potential to further undercut the bank and compromise the residence. The occupants of the home should be notified of this hazard and bank conditions should be monitored during and after stressing storm events.

Bledsoe Detention Basins (LFV-03, LFV-04): Debris basins downstream of burned slopes may be subject to substantial sediment deposition. **LFV-03** acts as a detention basin and is dammed by a fill crossing with no culvert observed. The dam is slightly dipped in the middle and armored with sandbags that may not withstand debris floods or flows. This basin appears roughly 25% full and may be subject to overtopping flows. If the dam fails, it could induce very damaging downstream flows containing sediment and debris derived from the fill dam. **LFV-04** is located downstream of **LFV-03**. This basin has a roughly 30-foot standpipe that may be subject to damage or plugging from debris. If substantial sediment is delivered, flows may fill the basin and overtop Highland Avenue before proceeding towards LFV-05 or rediverting along Highland Avenue. The USGS postfire debris flow model estimates a mean flow volume of 20,000 cubic yards (24mm/hr (0.94in/hr) intensity; 15-minute duration) to be delivered to **LFV-**

04. Responsible agencies should monitor and maintain the basins. The agency responsible for the fill crossing should consider improvements to prevent failure.

Greenspot Road Crossings (LFV-46): Two crossings along Greenspot Road may be subject to floods and debris floods. The culvert crossing at **LFV-46** drains two moderately sized drainages with both moderate and low combined hazard ratings. An engineered channel conveys flows from these drainages towards **LFV-46**. The culvert crossing was plugged and overtopped on 9/20/2024. The channel was fully filled with sediment and flows inundated Greenspot Road. It was then rediverted along the road towards **LFV-45**, which was also inundated. Large flows are likely to increase the damage and effects observed during 9/20/2024. Greenspot Road serves as the only eastern ingress and egress route for the City of Highland and **LFV-46** may potentially impact this road. Responsible agencies should monitor and maintain these crossings and provide traffic signage to alert motorists.

Citrus Orchard (LFV-41): Multiple small and moderately sized drainages upstream of **LFV-41** may be subject to debris flows or floods. Flows emanating from these drainages would directly impact and likely flow through the orchard, as experienced on 9/20/2024. The highest hazard and largest basin drains adjacent to the farm house into an engineered channel roughly 20 feet wide. This was the largest flow observed at **LFV-41** on 9/20/2024 that deposited two to three feet diameter boulders along with a substantial volume of sediment within the orchard. A portion of the flow also escaped the engineered channel and impacted trees within the orchard. Future flows will likely inundate the orchard and damage trees within or adjacent to water courses. An irrigation water line was being installed when WERT assessed the property. This water line is located within the channel of a small drainage that experienced a flow on 9/20/2024. Additional water infrastructure such as pumps and tanks are located at the outlet of this drainage. Subsequent flow events will likely damage the pipeline and adjacent irrigation equipment. There are two roads that access the property, a southern road adjacent to **LFV-46** and a western road at the end of Capri Way adjacent to **LFV-40**. Both roads experienced flows on 9/20/2024. If larger flows impact these roads in the future, the property including the farmhouse may become inaccessible. Alder Creek Road above the property may fail or contribute sediment to future flows. It is very likely the property will experience flows similar to those on 9/20/2024. The property owner should consider monitoring and maintaining the engineered channel to facilitate water conveyance and consult a licensed engineer to install deflection structures.

Utilities (LFV-14, LFV-23): Some utility infrastructure may be subject to debris floods. **LFV-14** contains a water tank and associated equipment located within a potential flow path of a moderately sized drainage. Flows may impact existing K-rails. Larger flows may damage these and directly impact equipment and infrastructure before flowing down the access road towards **LFV-13**. The USGS postfire debris flow model predicts a mean flow volume of 1,300 cubic yards (24mm/hr (0.94in/hr) intensity; 15-minute duration) from this drainage. **LFV-23** is a water pipeline (North Fork Canal) crossing over Plunge Creek that may be impacted by debris floods. Since it is downstream of a large basin that was completely burned, the channel may experience large magnitude flows that may transport boulders and woody debris. A flow may damage the pipeline or the bents supporting the pipeline, thereby compromising it. The water district should consider monitoring and maintaining the pipeline.

Multiple quarry pits **(LFV-56)** lie in the floodplain downstream of the burned area, adjacent to Plunge Creek on the north side and the Santa Ana River on the south side. It is our understanding that some of these quarries are not operational and are currently being used as

groundwater recharge basins. Due to postfire conditions in the upstream watersheds, there is increased potential for high flow events and risk of flood impacts to operational quarries and associated mining infrastructure.

Key Infrastructure

Road and highway infrastructure allowing access into and through the burned area are discussed below. Additional information regarding signage and other geohazards are also discussed.

The county road network potentially affected by the Line Fire was not completely evaluated during the WERT investigation. All roads, stream crossings, and drainage structures downstream and downslope of hillslopes and drainages burned at moderate to high SBS are at risk to storm damage. For example, road crossings along low-volume mountain roads such as **LFV-48** are at risk of plugging and overtopping that can lead to the crossings being compromised and access restricted. These roadways experienced substantial sediment deposition as a result of the 9/20/2024 convective storm event. Monitoring, maintenance, and repair costs are expected to be high until the Line Fire burn area revegetates and recovers: a period that typically can take 2 to 5 years but may occur faster in some areas where the soil burn severity was low. Crossings and drainage along all county roads within and downstream of the burned area should be evaluated and maintained as soon as possible and monitored and cleaned out after significant storm events. In addition, crossings that pose a high risk of failure and sediment delivery may be reconstructed with properly sized culverts, lower fill-slope heights, and rock armor. **We recommend receiving regional alerts (for example, the National Weather Service) and watching storm forecasts so problematic roads can be avoided during storms.** Some specific areas of concern are discussed below.

State Highway 330 (HWY-01, HWY-02) in the upper City Creek and Plunge Creek watersheds may be impacted by debris floods or debris flows. Much of the watersheds burned upgradient of this section of highway are steep (greater than 30 degrees) and were burned at moderate and high severity. Therefore, the USGS postfire debris flow model predicts at least a 40% likelihood for debris flows (24mm/hr precipitation intensity; 15-minute duration) along this section of Highway 330 (**HWY-02**). Combined hazard ratings for watersheds along **HWY-02** range from moderate to high. Multiple watercourse crossings, such as **HWY-01**, are at risk of damage and plugging from flows. Culverts appear undersized and do not capture the full width of the existing channel. At these crossings, the roadway appears well-elevated above stream channels. It is believed that the road fills will act as an impoundment feature for flows emanating from upstream areas. Road fills that sustained fire damage may also experience surficial erosion in the form of rilling or gullying. Smaller drainages with no road crossings will likely experience sediment deposition and sustain damage to the road surface. Clearing and repairing culverts will assist in stormwater conveyance and minimize affects to the roadway. These preparatory actions will likely be insufficient if large debris flood or debris flow events occur.

Rockfall Hazards exist along portions of Highway 330. Increased rock exposure and root damage from the fire will increase the likelihood of rockfall. Loose rocks were observed perched along road cuts. In high risk rockfall areas during significant storm events we suggest having local agencies patrol these areas for hazards, staging proper heavy equipment for response and provide signage to adequately warn drivers. Highway 38 was not assessed as no upstream threats were observed as a result of fire, including at **LFV-53**.

Flood and Water Supply Infrastructure

The Seven Oaks Dam, which is an earth and rock-fill dam located along the San Ana River approximately at the southern boundary of the burned area, was completed in 1999 and resulted in the formation of a 145,600 acre-ft capacity reservoir. The reservoir was constructed to control outflow along the river and provide flood protection to downstream communities. Approximately 20 percent of the 209-square mile catchment upstream of the reservoir burned as a result of the Line Fire, suggesting that the reservoir will receive higher than normal flows and sediment loads, potentially increasing sedimentation rates and impacting storage capacity.

Critical water supply infrastructure, including water lines (i.e., North Fork Canal), intakes, wells, storage tanks, and treatment plants for developed areas in the vicinity of the Line Fire are located within and downstream of burned drainages in the Highland area. Much of the infrastructure is located within the active channels, along low-lying alluvial terraces, or in the mouths of potential debris flood canyons, suggesting that the infrastructure is susceptible to inundation by flood flows, hyperconcentrated flows, and debris floods during large rain events.

General Hazards to Water Quality

One building was destroyed and 4 others were partially damaged as a result of the Line Fire. Destroyed structures adjacent to watercourses have the potential to transfer contaminated soils, large and small debris, and hazardous materials into waterways which can impact water quality downstream. Based on current understanding of impacts on burned residential homes and structures from wildfires, the resulting ash and debris can contain concentrated and toxic amounts of polycyclic aromatic hydrocarbons and heavy metals such as antimony, arsenic, cadmium, copper, lead, and zinc. The characterization of hazardous materials and their impacts on the environment and water resources is outside the purview of the WERT and is generally under the review of other State and Federal Agencies, such as State Water Quality Control Board, Department of Toxic Substances Control, California Department of Office of Emergency Services (Cal OES), and the Federal Environmental Protections Agency. To protect water quality and human health, local agencies may request assistance from the Cal OES Watershed Mitigation, Coordination, and Outreach unit to deploy emergency protective measures (EPMs) in areas with high potential for hazardous material runoff and increased sedimentation within the watershed.

General Recommendations

Implement an Early Warning System

An effective early warning system requires the implementation of different components (Figure 11) for hazard risk reduction, as well as linkages between these components so that the goals of protecting life, safety, and property are accomplished. In previous sections, this report characterizes the spatial distribution of hazard and risk within and downstream of the burned area, greatly increasing knowledge about potential risk from postfire hazards. This report also contains a fire-specific rainfall threshold to be used as a trigger point for forecast-based watches and warnings. Each VAR is characterized by the potential postfire hazard, relative risk from the hazard, and the potential emergency protective measures that can be implemented for risk reduction. The granular nature of VAR characterization allows for more targeted communication and response planning by emergency responders, public works/flood control agencies, and other entities tasked with implementing risk reduction activities (e.g., NRCS).

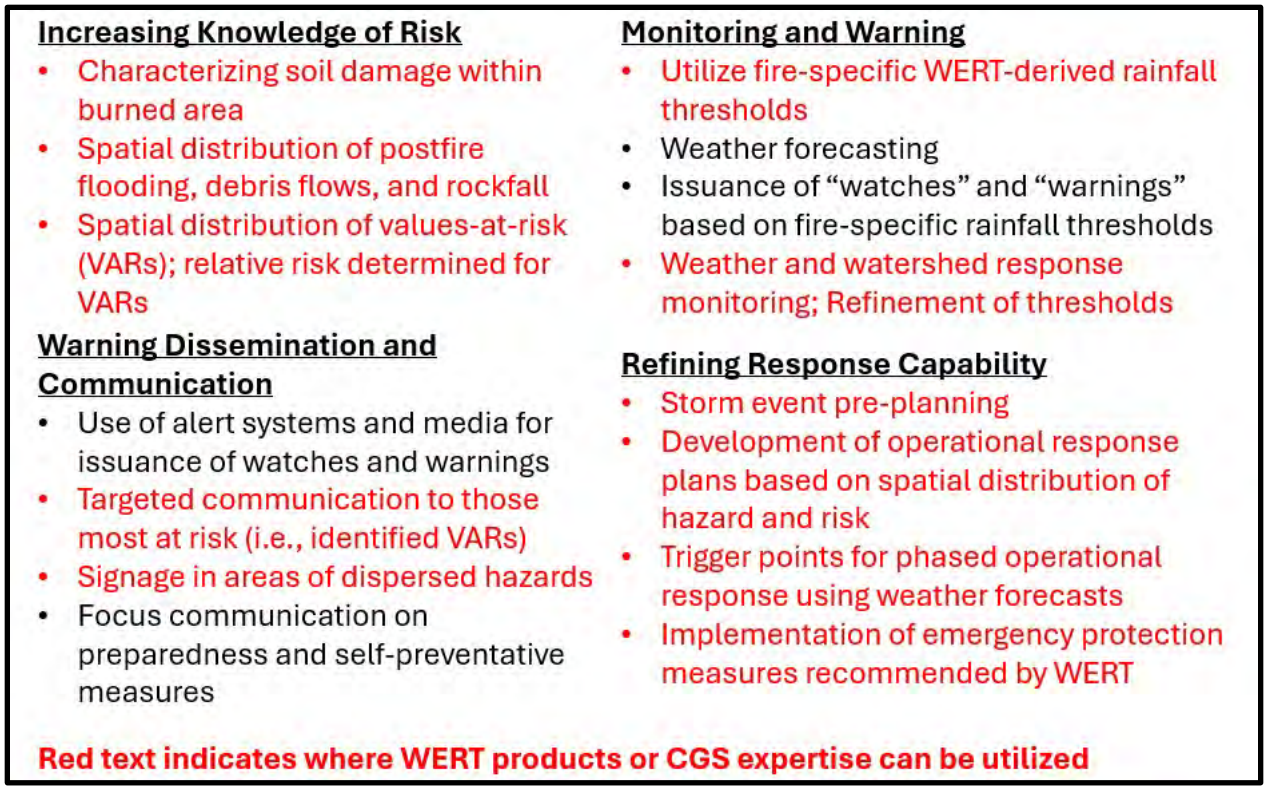


Figure 11. The four components of "people-centered" early warning systems (adapted from Garcia and Fearnley, 2012), along with steps necessary to implement each component specific to minimizing risks from postfire watershed hazards. This WERT report provides knowledge to implement each of these components in a manner specific to the fire.

Prescribed Rainfall Thresholds

The initial year rainfall thresholds are determined by WERT for the Line Fire by considering data such as the USGS modeled rainfall thresholds, regional debris-flow thresholds, previous flood and rainfall history, geologic/geomorphic conditions of the burned area, and the hazard and relative risk associated with each VAR. Consideration was also given to 60-minute rainfall data and associated watershed response from a convective storm that impacted the burn scar on 20 September 2024. The following thresholds have been developed by the WERT and approved by the National Weather Service (NWS) and the USGS (Table 4).

Table 4. Year 1 rainfall thresholds for the Line Fire.

Duration	***Year 1 Threshold Intensity mm/hr (in/hr)***	***Year 1 Threshold Depth mm (in)***	***Recurrence Interval***
15 minutes	20 (0.8)	5 (0.2)	1-year
30 minutes	16 (0.6)	8 (0.3)	1-year
60 minutes	15 (0.6)	15 (0.6)	1-year

The WERT strongly recommends that San Bernardino County Public Works, San Bernardino County Office of Emergency Services, San Bernardino County Fire Department, City of Highland, and San Bernardino County Sheriff's Office work with the NWS and the California Geological Survey to monitor forecasts and rainfall intensity during storms, as well as observe postfire response following storm events. If the initial rainfall threshold is too conservative, and little response occurs during storm events, data and observations will be necessary to adjust the threshold upward in a defensible manner. Alternatively, rainfall thresholds can also be lowered based on gage data and observations.

Existing early warning systems should be used and iteratively improved such that residents can be alerted to incoming storms, allowing enough time to safely vacate hazard areas. In areas where cellular reception is poor or non-existent, methods should be developed to effectively contact residents. For example, installation of temporary mobile cellular towers should be considered. Early warning systems for the Line Fire should take advantage of the services described below.

Utilize National Weather Service Forecasting

Flash flood and debris flow warnings with practical lead times of several hours must come from a combination of weather forecasts, rainfall measurements of approaching storms, and knowledge of triggering thresholds. The following information is from the National Weather Service (NWS); they provide flash flood and postfire debris flow "watch" and "warning" notifications in burn areas.

> **Watches** are issued when the likelihood of hazardous weather or a hydrologic event has increased significantly, but it's occurrence, location, and/or timing is still uncertain. Watches provide lead time for pre-storm planning and response.
>
> **Warnings** are issued when hazardous weather or hydrologic events are occurring, are imminent, or have a very high probability of occurring.

For additional information, see the NWS Los Angeles/Oxnard Forecast Office webpage (https://www.weather.gov/lox/).

Residents Potentially Affected by Postfire Hazards Should Sign Up for Alerts

This report identifies areas in San Bernardino County within and downstream of the Line Fire burn area with the highest potential for postfire flooding, debris flows, and rockfall. Each county has its own emergency notification system to warn residents of potential hazards. These emergency notification systems enable the counties to provide essential information quickly in a variety of situations, including in the event of fire-induced flooding and debris flows.

San Bernardino County Sheriff and Fire Departments use the Telephone Emergency Notification System (TENS) to send emergency notification via telephone and text message. TENS alerts are intended to target affected areas during an emergency. The San Bernardino Ready App (SB Ready) is also available to help residents stay prepared and receive emergency alerts. Residents can register to receive the TENS text message alerts and find more information on SB Ready at https://sbcfire.org/alertwarning.

Wireless Emergency Alerts (WEA)

Residents should be aware of what to do when receiving an alert through WEA. WEA is an alert system originated by the NWS that can inform residents, visitors, and businesses of flash flood warnings and other potential hazards. WEA alerts are emergency messages sent by authorized government alerting authorities through mobile carriers. Government partners include local and state public safety agencies, FEMA, the FCC, the Department of Homeland Security, and the National Weather Service. **No signup is required**, and alerts are automatically sent to WEA-capable phones during an emergency. Since WEA alerts can be disabled by phone users, residents and businesses potentially subject to hazards associated with the Line Fire are urged not to opt out of WEA. You can find more information at the following link: https://www.weather.gov/crp/wea.

Communicating Hazard and Risk Associated with Line Fire

Increasing awareness is the key to minimizing risk on the Line Fire. The potential for debris flows and flooding exists near and within portions of the City of Highland, East Highland and Seven Oaks. The potential for flooding exists along all waterways that drain the area impacted by the Line Fire, particularly Elder Gulch, Plunge Creek, and Oak Creek. These hazards constitute a potential threat to life-safety and property. Residents and property owners downstream of burned areas should be aware that floods severity and frequency may increase. Soil burn severity was higher in the upper, forested areas of larger watersheds along the northern portion of the fire. These drainages (e.g., Plunge Creek, Santa Ana River) will likely experience the highest increases in postfire discharge at basin outlets. Smaller drainages whose upper reaches are less impacted by higher soil burn severity will likely experience smaller increases in runoff. Public outreach should focus on communicating hazards to affected residents and property owners.

Hazards exist to transportation corridors that allow ingress and egress to parts of the City of Highland along the mountain front and to some residences in the community of Seven Oaks. If these transportation corridors are affected by postfire hazards, they may leave residents stranded after storm events, and prevent the delivery of emergency services to these residents. This constitutes a potential life-safety threat if emergency medical care is needed for residents stranded by storm events. Signage has been used effectively in similar situations on previous fires to inform the public traveling key corridors. Signage placed along portions of the county road network, specifically Base Line Street, Highland Avenue, Greenspot Road, and Seven Oaks Road, as well as State Highway 330, can help alert drivers of potential debris flow, flooding, and/or rockfall hazards during periods of rainfall. Owners of non-public road networks should be aware of the potential hazards along roadways following fire and should implement signage accordingly.

For those interested, links to additional information about postfire geohazards are listed below.

- CGS Burned Watershed Geohazards website: https://www.conservation.ca.gov/cgs/bwg/program
- CAL FIRE post wildfire safety website: https://readyforwildfire.org/post-wildfire/
- Cal OES postfire geohazards article: https://news.caloes.ca.gov/flood-after-fire-preparing-for-the-post-disaster-danger
- FEMA postfire factsheet: https://www.fema.gov/sites/default/files/documents/fema_flood-after-fire_factsheet_nov20.pdf

Response Planning for the Line Fire

An objective of the WERT process is to provide operational intelligence to those tasked with implementing risk reduction activities (e.g., emergency planners, fire departments, flood control agencies). WERT information should be used to narrow the decision-space for operational planning, strategy, and tactics. Key information provided by the WERT includes the following:

- VAR location (map and spatial data)
- Whether the VAR is a discrete structure (point) or a grouping of structures (polygon)
- The types of hazards posing risk to the VAR
    - The report discusses whether hazards are debris flows, debris flood/flooding, or rock fall
- What is the relative risk to life-safety and/or property?
    - Relative risk is characterized as low, moderate, and high
    - Response efforts should prioritize VARs with moderate to high life-safety and/or property risk
    - Low risk is associate with a nuisance level of hazard
- Emergency protective measures are recommended to reduce risk
    - WERT does not design direct protection measures (e.g., deflection structures)
    - Some measures need more intensive evaluation and design to reduce risk

Informing and empowering the public is a key step in risk reduction. San Bernardino County has resources that can help reduce risk from postfire flooding and debris flows. San Bernardino County's Storm and Flood webpage includes sandbag information, a homeowner's guide to flood, debris and erosion control, flood after fire safety tips, and links for additional resources (https://burnareainfo.sbcounty.gov/).

The WERT recommends that local governments conduct public outreach so that residents and property owners can make informed decisions that reduce their risk exposure to postfire hazards.

Increased Flood Flows, Erosion, Sedimentation, and Water Quality Impacts

First responders and Emergency Planning personnel should work in conjunction with San Bernardino County Public Works and Caltrans to coordinate response planning for increased flood flows and resultant sedimentation in the area of the Line Fire. Postfire flood inundation mapping should be performed for areas downstream of the burn area and should be used as the basis for response planning and potential evacuations. All areas downstream/downslope of the burned areas will potentially be subject to nuisance flooding and sedimentation at the minimum.

Debris Flow Runout

Potential debris flow hazards were identified that could impact State Highway 330 and homes and structures within various communities in Highland. Models used to predict postfire debris-flow runout are currently under development. Thus, WERT geologists rely partially on geomorphic and geologic mapping evidence to estimate the downstream extent of potential debris-flow inundation. Some of the at-risk sites are within built environments where geomorphic

evidence may have been altered or destroyed through grading and/or construction. Also, geomorphic evidence may not be sufficient to predict the downstream extent of debris flows under postfire conditions. In areas below larger, severely burned drainages, the areal extent of debris-flow inundation is highly uncertain. It is recommended property owners are made aware of the potential hazards, get connected to receive advanced forecast and information through NWS and County Alert systems, and obey local evacuation notices issued by the County Sheriff or other Government Authority.

Increased Rockfall Hazards

Existing rockfall hazards were identified during field evaluations along portions of Highway 330. However, due to the rapid nature of the evaluation, a fully comprehensive evaluation of rockfall hazard was not possible. DeGraff and Gallegos (2012) provide an overview of rockfall hazard following wildfire, along with suggested approaches for identifying these hazards. The WERT strongly recommends more detailed analysis to further refine the identification of rockfall hazard areas.

General Recommendations for Mine Sites

No large mine sites are present within the burned area; therefore, significant postfire impacts related to mines are not anticipated from the Line Fire.

Road Drainage Systems, Storm Monitoring, and Storm Maintenance

Due to the presence of areas burned at moderate and high soil burn severities, increased flows on slopes and onto the road and storm drain systems can be expected. Increased erosion can inundate roads and plug these drainage systems. Flows could be diverted down roads and cause erosion and possible blockage, and/or loss of portions of the road infrastructure and structures along roads. The WERT did not evaluate the potential for rockfall, sedimentation, flooding, or debris-flow hazards at all roads or watercourse crossings along federal, state, county, or municipal road corridors. Existing road drainage systems should be inspected by the appropriate controlling agency to evaluate potential impacts from floods, debris floods, debris torrents, debris flows, and sedimentation resulting from storm events. Equipment should be staged in areas where risk is high and access is necessary. Spatial data generated by the USGS and the WERT (e.g., USGS debris-flow model and flood flow predictions) can be used to screen potential at-risk areas for increased monitoring and maintenance presence.

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Appendix A – Line Fire WERT Contact List

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Name	Affiliation	Position	Email	Phone Number
Don Lindsay	California Geological Survey	BWG Program Manager	don.lindsay@conservation.ca.gov	530-360-6948
David Longstreth	California Geological Survey	WERT Lead	david.longstreth@conservation.ca.gov	707-738-4118
Jonathan Woessner	CAL FIRE	WERT Liaison	jonathan.woessner@fire.ca.gov	530-227-8160
Shane Littlefield	CAL FIRE	BDU Unit Chief	Shane.Littlefield@fire.ca.gov	951-314-0402
David Haas	CAL FIRE	BDU Unit Forester	david.haas@fire.ca.gov	909-253-6632
Liz Brown	CAL FIRE	Batallion Chief	liz.brown@fire.ca.gov	
Jim Topoleski	San Bernardino County Fire	Division Chief	jtopoleski@sbcfire.org	909-557-0096
Kelly Anderson	San Bernardino County Fire		kanderson@sbcfire.org	
Jeffrey Birchfield	San Bernardino County Fire		jbirchfield@sbcfire.org	
Dan Munsey	San Bernardino County Fire		dmunsey@sbcfire.org	
Crisanta Gonzalez	San Bernardino County OEM	Director	crisanta.gonzalez@oes.sbcounty.gov	
Robert Gonzales	San Bernardino County OEM	Emergency Services Officer	robert.gonzales@oes.sbcounty.gov	909-356-3939
Marc Rodabaugh	San Bernardino County Public Works		Marc.Rodabaugh@dpw.sbcounty.gov	
Michael Fam	San Bernardino County Public Works	Engineering Manager - Flood Control	mfam@@dpw.sbcounty.gov	909-991-5537
Ibram Gayed	San Bernardino County Public Works		ibram.gayed@dpw.sbcounty.gov	
Ocatavio Duran Jr.	City of Highland	Public Works Director/City Engineer	oduran@cityofhighland.org	909-864-6861
Matt Bennett	City of Highland		mbennett@cityofhighland.org	
Jim Richardson	City of Highland		jrichardson@cityofhighland.org	
Jason Sadler	Caltrans		jason.sadler@dot.ca.gov	909-520-5526
Jason Wolf	East Valley Water District		jwolf@eastvalley.org	909-772-5149
Liz Colby	NRCS		Liz.Colby@usda.gov	
Emma Chow	NRCS	Assistant State Conservationist	Emma.Chow@usda.gov	805-345-8612
Ilima Segoviano	NRCS	Area Engineer	Ilima.Segoviano@usda.gov	760-347-3675 x3459
Narcizo Guerrero	NRCS	Area Resource Conservationist	Narcizo.Guerrero@usda.gov	951-684-3722 x7893
Dominic Mezzatesta	CalOES	Watershed Program Manager	dominic.mezzatesta@caloes.ca.gov	
Derek Bays	CalOES	Engineering Geologist	derek.bays@caloes.ca.gov	
Curtis Kvamme	USFS	BAER Soil Scientist	curtis.kvamme@usda.gov	
Todd Ellsworth	USFS	BAER Team Lead	todd.ellsworth@usda.gov	760-920-5648
Alex Tardy	NOAA	NWS - San Diego	alexander.tardy@noaa.gov	
Jayme Laber	NOAA	NWS - LA/Oxnard	jayme.laber@noaa.gov	

Appendix A. Line Fire WERT Contact List

Name	Affiliation	Position	Email	Phone Number
John Dumas	NOAA	NWS - LA/Oxnard	john.dumas@noaa.gov	
Michelle Lenertz	Arroyo Verde Middle School	Principal		909-307-5590
David Jarcaz	Mill Creek Farms			909-557-3262

Appendix B – Values-at-Risk Summary Table

Line Fire
Values-at-Risk Table

Site Number	Community / Local Area	Address	Latitude	Longitude	Potential hazard / Field observation	Potential risk	Remarks	Hazard Category	Specific at-risk feature	Feature Category	Potential hazard to life?	Potential hazard to property?	EPM	EPM2	EPM3	EPM4	EPM Text
HWY-01	Hwy 330		34.18202	-117.14989	Culverted road crossing. Potential hazard is debris flow/flood and plugged culvert.	Possible probability of occurrence with moderate consequence = Intermediate risk.	8' CMP culvert from basin burned at mostly moderate and high. Burned trash rack with debris plugging potential. 50' high culvert crossing creates a large-sized detention basin.	debris flow / flood	Culverted road crossing	drainage structure	low	high	Early Warning	Clear and maintain culvert			
HWY-02	Hwy 330				Potential hazard is debris flow/flood, rockfalls, and flooding of roadway, and plugging of culverts along stretch of highway intersecting burned drainages.	Very likely probability of occurrence with moderate consequence = High risk.	High potential for flows to impact roadway throughout highway. Rockfalls likely in steep areas with loose rocks. Multiple small drainages with active channels that empty onto roadway.	debris flow / flood	Highway 330 within burn perimeter	multiple	moderate	high	Early Warning	Signage	Monitor and maintain	Deflection structure	Traffic control
KP-01	Keller Peak				Access roadway to communications towers. Potential hazard is debris flow/flood impacting roadway and vehicle access.	Likely probability of occurrence with minor consequence = Low risk.	Severely burned slope with large granitic boulders and daylighted bedrock throughout. Rain may mobilize sand (grus) and deposit along roadway.	debris flow / flood	Keller Peak Road	other	low	low	Early Warning	Monitor and maintain	Signage		
LFV-01	Highland / Cook Creek	Highland Avenue and Summertrail Place	34.1363051	-117.189397	Bridge over Cook Creek for access road to Water Plant. Potential hazard is plugging of bridge arch culvert in large debris flow event; debris could divert to Highland Ave.	Possible probability of occurrence with moderate consequence = Intermediate risk.		debris flow	Bridge culvert	drainage structure	low	moderate	Early Warning	Clear and maintain culvert	Debris barrier		
LFV-02	Highland	28409 Highland Ave	34.1352739	-117.18662	American Legion Post 421 in path of possible avulsion flow from Cook Creek.	Possible probability of occurrence with moderate consequence = Intermediate risk.		debris flow / flood	Building, community hall	recreational	low	moderate	Early Warning	Deflection structure			
LFV-03	Highland	Cloverhill Drive and Marcus Lane, Water Plant 149	34.1347195	-117.167935	Large fill crossing has no observed structure (for example no culvert), water is draining out of base of fill, fill is about 60' thick on downstream side, 25' on upstream.	The fill crossing is acting as a basin that appears to be trapping debris and filling up. Overtopping and or dam failure possible. Possible probability of occurrence with moderate consequence = Intermediate risk.	Basin may need clearing. Need approximate volume of existing sediment in basin. Appears ~25% full. Significant elevation difference between upstream and downstream side: ~40 ft.	debris flow / flood	Fill dam and downstream crossings	utilities	low	high	Early Warning	Monitor and maintain			
LFV-04	Highland / Bledsoe Gulch	Highland Avenue crossing of Bledsoe Gulch	34.1294029	-117.167466	Debris basin with standpipe. Potential hazard is debris flow plugging standpipe and filling basin, with potential to overtop and impact downstream watercourse.	Possible probability of occurrence with major consequence = High risk.		debris flow / flood	Watercourse crossing	drainage structure	low	high	Clear and maintain basin	Monitor and maintain			
LFV-05	Highland	Bledsoe Gulch			Possible zone of debris flow and flood inundation through the built environment.	Possible probability of occurrence with major consequence = High risk.		debris flow / flood	Homes, drainage channels, culverts	multiple	moderate	high	Early Warning	Monitor and maintain	Signage		
LFV-06	Highland	6718 Randall Lane	34.1316798	-117.16236	Residence located at the outlet of a small drainage. The potential hazard is debris flood that could avulse from concrete drainage ditch and impact rear yard, swimming pool, and residence.	Possible probability of occurrence with moderate consequence = Intermediate risk.	Drainage outlets into v-ditch that runs adjacent to north side yard. Rear yard fencing includes block wall and wrought iron. Upslope basin is relatively small, with the upper portion burned at low severity.	debris flow / flood	Home	home	low	moderate	Early Warning	Monitor and maintain	Deflection structure		
LFV-07	Highland	Access road off Van Leuven Lane	34.1328698	-117.159852	Culverted road crossing providing access to water tank. Potential hazard is plugging of culvert with debris, leading to overtopping and nuisance flooding along paved access road.	Possible probability of occurrence with low consequence = Low risk.	Upstream basin relatively small and burned at low severity with some moderate. Evidence of past overtopping was observed that included minor scour on downstream slope of crossing. Culvert is 48-inch CMP with top of pipe about 2 ft below road surface.	flood	Culvert road crossing	drainage structure	low	low	Early Warning	Clear and maintain culvert			
LFV-08	Highland	6747 Van Leuven Lane	34.1310566	-117.160294	Residence located at the outlet of a small drainage. Potential hazard is debris flow / flood that could mobilize burnt debris and sediment and impact property fence wall and rear yard of residence.	Possible probability of occurrence with low consequence = Low risk.	Upstream basin is small and burned at low severity. No notable incision in drainage channel. Unknown if rear yard fence wall was designed / constructed as an impact / diversion wall.	debris flow / flood	Home	home	low	low	Early Warning	Monitor and maintain			
LFV-09	Highland	Pleasant View Lane	34.1276076	-117.161856	Culverted road crossing. Potential hazard is plugging of culvert with debris, leading to overtopping, impacting road surface with overland flow being directed easterly along Pleasant View Lane.	Possible probability of occurrence with minor consequence = Low risk.	Crossing consists of 36"" CMP drop structure to pipe that extends below paved roadway. Debris has accumulated around inlet from recent rains. Upstream basin is small and burned at low severity. Concrete v-ditch leading to inlet is about 8' wide at crest by 3' deep.	flood	Drainage crossing structure	drainage structure	low	low	Early Warning	Clear and maintain culvert			
LFV-10	East Highlands Ranch	Elder Gulch Road			Inundation area along former Elder Gulch drainage that is converted to a walkway.	Possible probability of occurrence with major consequence = High risk.		flood	Homes and Arroyo Verde elementary school	multiple	high	high	Early Warning	Signage	Debris barrier		
LFV-11	Highland	6971 Pleasant View Lane	34.1272913	-117.160929	Residence located at the outlet of a small drainage, with drainage (concrete v-ditch) extending below rear yard fence wall and through residence yard. Potential hazard is for flood / debris flood to impact residence and rear yard.	Low probability of occurrence with minor consequence = Low risk.	Small basin burned at low severity drains to small v-ditch directed toward rear yard of home. V-ditch extends below block wall, running through rear / side yard to street.	flood	Residence, drainage structure	multiple	low	low	Early Warning	Monitor and maintain			
LFV-12	Highland	Pleasant View Lane	34.1264157	-117.16007	Pleasant View Lane adjacent to drainage inlet structure and water tank access road. Potential hazard is nuisance, sediment-laden flood flows down the water tank access road and across and down Pleasant View Lane.	Potential for inlet to plug up, leading to backwater effects that will contribute to runoff down access road toward public street.	Flow path is perceived to be unrestrained down water tank access road, with much of the runoff not being directed into adjacent drainage ditch. The inlet structure includes a 48-inch RCP drop structure with 6 ft freeboard so backwater effects are more likely than overtopping.	flood	Roadway	multiple	low	low	Early Warning	Monitor and maintain	Deflection structure		
LFV-13	Highland	Pleasant View Lane			Multiple residences located adjacent to potential flow path. Potential hazard is avulsion of sediment laden flow from water tank access road toward homes, resulting in impacts to rear fence wall and inundation of rear yards and residences.	Possible probability of occurrence with moderate consequence = Intermediate risk.	Upslope drainage burned at moderate severity. Some k-rail has been placed to impede / maintain flow down access road, with some k-rail retaining 1-2 ft of sediment.	flood	Homes	home	low	moderate	Early Warning	Monitor and maintain	Deflection structure		
LFV-14	Highland	Access off Pleasant View Lane	34.1266407	-117.158155	Water tank and associated equipment obstructing canyon drainage and within potential flow path. The potential hazard is for debris flood to impact water tank and equipment.	Possible probability of occurrence with high consequence = High risk.	Moderately sized basin burned at low severity. Tank is situated on a fill pad that has essentially plugged the canyon. Drainage broadens just upstream of tank, but limited area for flow around improvements. K rail has been installed to help protect structures and direct flow around tank and along / down access road toward Pleasant View Lane.	debris flow / flood	Water tank and equipment	utilities	low	high	Early Warning	Monitor and maintain	Deflection structure		
LFV-15	Highland	7123 Hidden Court	34.1243441	-117.156648	Residence located at the outlet of a small drainage. Potential hazard is for flood that could mobilize burnt debris and available sediment and impact fence wall, rear yard, and residence.	Possible probability of occurrence with moderate consequence = Intermediate risk.	Basin burned at low severity. No incised channel but drainage has U-shape feature with abundant sediment.	debris flow / flood	Home	home	low	moderate	Early Warning	Monitor and maintain	Deflection structure		
LFV-16	Highland	Crest View Lane			Multiple residences located adjacent to potential flow path. Potential hazard is flood flows avulsing from constructed drainage channels, impacting rear yard fence walls and inundating property.	Possible probability of occurrence with moderate consequence = Intermediate risk.	The basin is moderately sized and burned at low severity. There is a small upstream debris basin that could be overwhelmed during a significant storm event, and overtopping flows would follow down along access roads and directed toward the rear yard of homes.	flood	Multiple homes	home	low	moderate	Early Warning	Monitor and maintain	Deflection structure		
LFV-17	Highland	Baseline Street	34.1210167	-117.1563	Potential for nuisance flood flows across Baseline Road emanating from recreational trail and adjacent v-ditch. Upstream debris basin has evidence of past overtopping. Flows would be directed down this trail and onto Baseline.	Possible probability of occurrence with minor consequence = Low risk.		flood	Roadway	other	low	low	Monitor and maintain	Sandbags			
LFV-18	Highland	Baseline Road	34.1212077	-117.155006	Small debris basin with 48-inch CMP drop structure. Potential hazard is plugging of inlet, leading to overtopping of basin and nuisance flood flow diverted to spillway and onto Baseline Road.	Possible probability of occurence and minor consequence = Low risk.		flood	Storm drain inlet	drainage structure	low	low	Clear and maintain culvert	Sandbags			

Line Fire
Values-at-Risk Table

Site Number	Community / Local Area	Address	Latitude	Longitude	Potential hazard / Field observation	Potential risk	Remarks	Hazard Category	Specific at-risk feature	Feature Category	Potential hazard to life?	Potential hazard to property?	EPM	EPM2	EPM3	EPM4	EPM Text
LFV-19	Highland Area	Baseline Road and Brookwood Lane	34.1209369	-117.151311	48" diameter culvert that contains trash rack. Potential hazard is plugging of culvert resulting in flood flows that would be diverted onto Baseline Road.	Possible probability of occurrence with moderate consequence = Intermediate risk.	Not able to determine where culvert flows to, did not find outlet.	debris flow / flood	Culvert, avulsion to residential area	multiple	low	moderate	Clear and maintain basin	Monitor and maintain	Early Warning		
LFV-20	Highland	Baseline Road			Portion of Baseline Road along slope toe with upslope burned drainages. Potential hazard is nuisance flood and sediment-laden flows over road surface as a result of multiple drainages that exit mountain front and direct runoff toward roadway.	Likely probability of occurrence and minor consequence = Low risk.	Flow path is unknown across manipulated terrain between road and drainage outlets.	flood	Roadway	other	low	low	Early Warning	Monitor and maintain			
LFV-21	Highland Area	Baseline Street and Muir Ct.	34.1199916	-117.147769	36" diameter culvert that contains trash rack. Potential hazard is plugging of culvert resulting in flood flows that would be diverted onto Baseline Road.	Possible probability of occurrence with moderate consequence = Intermediate risk.		debris flow / flood	Culvert	drainage structure	low	moderate	Monitor and maintain	Clear and maintain basin	Early Warning		
LFV-22	Highland / Plunge Creek	Vista Rio Road			Multiple residences located adjacent to watercourse. Potential hazard is debris flood / flow avulsing from channel and impacting residences.	Possible probability of occurrence and moderate consequence = Intermediate risk.	Spoke to homeowner at 7539 Vista Rio	debris flow / flood	Homes	home	low	low	Early Warning	Monitor and maintain	Sandbags		
LFV-23	Highland / Plunge Creek		34.1182624	-117.142065	North Fork Canal crossing over Plunge Creek supported on bents located adjacent to active channel. Potential hazard is debris flood / flow impacting canal (36" steel pipe supported on concrete bents).	Likely probability with moderate consequence = High risk.	Upstream basin burned at low mod and high. Significant burnt woody debris and boulders that could become entrained.	debris flow / flood	Water line	utilities	low	high	Monitor and maintain				
LFV-24	Highland / Plunge Creek		34.1184408	-117.141179	Water utility structure (siphon?) adjacent to watercourse. Potential hazard is debris flood / flow impacting structure.	Possible probability of occurrence with major consequence = High risk.	Upstream basin burned at low mod and high. Significant burnt woody debris and boulders that could become entrained.	debris flow / flood	Water siphon	utilities	low	moderate	Monitor and maintain	Early Warning			
LFV-25	East Highland	Plunge Creek and Greenspot Road	34.1100112	-117.149793	Potential impact to bridge crossing of Plunge Creek via Greenspot Rd from flooding and debris flows	Possible probability of occurrence with moderate consequence = Intermediate risk.		debris flow / flood	Bridge	drainage structure	low	moderate	Early Warning	Signage			
LFV-26	Highland	Cochrane Street			Storage / junk yard situated within a drainage and at the outlet. Potential hazard is flood flow mobilizing debris and materials and impacting on site storage containers.	Probable probability of occurrence with minor consequence = Low risk.	Potential to impact downstream residential street and property line wall.	debris flow / flood	Storage containers	other	low	low	Early Warning	Monitor and maintain			
LFV-27	Highland	Cochrane Street	34.115627	-117.138619	Storm drain inlet adjacent to Cochrane Street. Potential hazard is clogging of inlet, resulting in overtopping flows spilling onto Cochrane Street.	Probable probability of occurrence with minor consequence = Low risk.	36" RCP with flared wing walls at base of rock-lined v-ditch.	flood	Storm drain inlet	drainage structure	low	low	Monitor and maintain	Sandbags			
LFV-28	Highland	Kent St. / Cochrane St.			Kent Street and Cochrane Street located in potential flood flow path. Potential hazard is sediment-laden flows emanating from adjacent slopes onto Cochrane Street, with overland nuisance flow down Cochrane and Kent Street.	Likely probability of occurrence with moderate consequence = Intermediate risk.	Upstream drainages are relatively small, steep, and burned at low severity. Runoff is conveyed from drainage outlet to concrete brow ditches and rock-lined down drains that direct flows onto Cochrane.	flood	Roadways, front yards of residences	multiple	low	moderate	Monitor and maintain	Sandbags			
LFV-29	Highland	Cochrane Street	34.1142319	-117.135373	Storm drain inlet adjacent to Cochrane Street. Potential hazard is clogging of inlet, resulting in overtopping flows spilling onto Cochrane Street.	Probable probability of occurrence with minor consequence = Low risk.	36" RCP with flared wing walls at base of rock-lined v-ditch. Upslope contains a small debris basin and additional runoff routing devices.	flood	Storm drain inlet	drainage structure	low	low	Monitor and maintain	Sandbags			
LFV-30	Highland	San Benito Street at McLean Street	34.1138999	-117.133343	Community park located near outlet of steep drainage. Potential hazard is flood and mobilized burnt debris and sediment impacting park site.	Probable probability of occurrence with minor consequence = Low risk.		debris flow / flood	Park site	recreational	low	low	Monitor and maintain				
LFV-31	Highland	Santa Angela St	34.1126859	-117.139538	Water storage tanks adjacent to Oak Creek controlled drainage channel. Potential hazard is debris flood / flow overtopping channel and inundating water tank site.	Possible probability of occurrence with major consequence = High risk.	Upstream basin is moderately-sized and steep, and was burned at low and moderate severity. There is a debris basin upstream with debris racks on both ends. This basin could reach capacity during significant storm events or following back-to-back events.	debris flow / flood	Water tanks and associated equipment	utilities	low	low	Early Warning	Monitor and maintain	Debris barrier		
LFV-32	Highland	McLean Street, La Cresta Street, Calle Carissa Street, and Via Alicia St			Multiple single-family residences adjacent to Oak Creek controlled drainage channel. Potential hazard is debris flood / flow overtopping banks and impacting rear block walls, inundating backyards and residences.	Possible probability of occurrence with moderate consequence = Intermediate risk.	Upstream basin is moderately-sized and steep, and was burned at low and moderate severity. There is a debris basin upstream with debris racks on both ends. This basin could reach capacity during significant storm events or following back-to-back events.	debris flow / flood	Homes	home	low	moderate	Early Warning	Monitor and maintain	Debris barrier		K-rails may be used to help protect impacts to block walls.
LFV-33	East Highlands	San Benito Street	34.1130686	-117.133926	San Benito Street crossing over channelized portion of Oak Creek. Potential hazard is plugging of culvert crossing from debris flood / flow with overtopping flows and backwater effects impacting roads and structures.	Possible probability of occurrence with moderate consequence = Intermediate risk.	Downstream of detention basin. Experienced very minor (inches) of flow during 9/20. Past flows reached channelized bankfull and plugged bridge. Post fire effects may elevate risk of overtopping roadway. Overtopping flows may divert into park to the north or into community south of the bridge.	flood	Double-barrel box culvert	drainage structure	low	moderate	Early Warning	Clear and maintain culvert			
LFV-34	Oak Creek	Access off San Benito Street	34.1144462	-117.129243	Debris basin with standpipe. Potential hazard is debris flow/flood filling and overtopping basin, resulting in increased flows downstream.	Likely possibility of occurrence with moderate consequence = High risk.	Debris basin experienced 12ft of deposition on 9/20. 5000+ cubic yards deposited. Trash racks above and downstream of basin. Future deposition and overtopping flows likely.	debris flow / flood	Debris basin	drainage structure	low	moderate	Clear and maintain basin	Early Warning			
LFV-35	East Highlands	7817 La Cresta Street			Residence located at outlet of small drainage. Potential hazard is debris flow/flood overwhelming drainage ditch and impacting multiple residences.	Likely chance of occurrence with moderate consequence = High risk	Small drainage burnt mostly at low. Highly altered upper drainage with multiple road crossings, fills, and small detention basins. Ditch is roughly 80% full. No debris basin observed at ditch. Loaded channel with boulders up to 2' diameter. Subsequent flows may mobilize boulders that may impact brick walls of residential yard. K-rails in place.	debris flow / flood	Ditch and homes	multiple	moderate	high	Early Warning	Monitor and maintain	Deflection structure		Clear ditch
LFV-36	East Highlands	Behind residences along La Cresta Street			Drainage ditch located along service road and adjacent to residential back yards. Potential hazard is debris flow/flood avulsing from ditch and impacting homes and road surfaces.	Very likely probability of occurrence with minor consequences = Low risk	Multiple mud deposits observed within and adjacent to the channel. Trash racks observed to effectively hold back debris. Service road adjacent ditch seems to also serve as secondary conveyance if ditch capacity is exceeded. Detention basin along south end of ditch system seems to have a vented culvert with a few feet of sediment deposition within CMP. Large flow event may exceed deposition capacity of this detention basin. Excess flow will likely deposit onto Greenspot Rd. which is the only eastern ingress/egress for the entire City of Highlands. V-ditch north of Marbella Way and down-slope of Alder Creek Rd will likely contribute flows into this v-ditch line. Dirt road (Alder Creek Rd.) upslope from ditch may serve as source area for debris. Home at 7855 La Cresta St, Highland, CA 92346 may benefit from deflection structure.	debris flow / flood	V-ditch behind homes on La Cresta St.	drainage structure	moderate	moderate	Early Warning	Monitor and maintain	Deflection structure		
LFV-37	East Highlands	Alder Creek Road (unpaved access portion)	34.1103471	-117.127637	Storm drain inlet adjacent to roadway. Potential hazard is plugging of the inlet with debris and overtopping road. Impacts to downstream storm drain also expected.	Very likely probability of occurrence with moderate consequence = High risk.	Storm drain inlet that crosses beneath Alder Creek Road and presumed to enter storm drain system in downslope development. Debris flood / flow appears to have occurred here on 9/20/24, resulting in clogging of storm drain downstream, and debris flowing out of manhole riser onto access road and neighborhood street. Inlet is 48" CMP.	debris flow / flood	Storm drain inlet.	drainage structure	low	moderate	Early Warning	Clear and maintain culvert			Add debris guard
LFV-38	East Highland	7894 Ravello Court	34.1094542	-117.127597	Residence located adjacent to potential flow path. Potential hazard is debris flood/flow impacting residence and Ravello Court.	Likely probability of occurrence with moderate consequence = High risk.	Sediment-laden flow occurred during 9/20 storm event that spilled out of a storm drain manhole, down an access driveway and onto roadway and front yard at north end of cul-de-sac. Flow then progressed south along Ravello Ct. towards future development and Alder Creek Rd. Manhole likely delivered flow from LFV-37 that drains towards Marbella Way. Culvert at LFV-37 is believed to be tied-in to this manhole. Neighbor described flow as a "river," therefore flow was significant for an upwelling manhole. Possible compromised stormwater piping. Underground blockage likely. If this is repaired, larger flows may be diverted towards Marbella Way from LFV-37.	debris flow / flood	Home	home	low	moderate	Early Warning	Monitor and maintain			

Line Fire
Values-at-Risk Table

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LFV-39	East Highland	31010 Avenida Ramblas			Concrete drainage ditch collecting flow from small upstream basins located along an access road behind several residences. Potential hazard is filling and overtopping of ditch, and debris floods impacting block walls and homes.	Likely probability of occurrence with minor consequence = Low risk.	Ditch likely to become plugged and overtop. Flow may then progress northwest towards block wall of backyards. Flows may then progress towards and deposit on Ravello Ct as it travels along the v-ditch service road. Discharge from upstream drainage splits into 3 segments. This VAR is a recipient of a majority of that discharge.	debris flow / flood	Drainage ditch, block walls, yards, road	multiple	low	low	Early Warning	Clear and maintain culvert	Deflection structure		
LFV-40	Mediterra	31063 Capri Way			Two homes located adjacent to v-ditch and service road. Potential hazard is cobbles and debris may mobilize and proceed downgradient toward homes. If v-ditch conveyance capacity is exceeded, flows will deposit along roadway and impact homes.	Likely probability of occurrence with moderate consequence = High risk.	Small drainage burnt at mostly low. Mountain front immediately upstream of VAR has been altered. Human activity diverted flows into 3 directions: southeast towards homes, south through orchard and down to road, and west toward LFV-39 and Alder Creek Rd. Man made rock revetments with loose cobbles observed at channel fork upstream of VAR. Capri Way serves as the only ingress/egress route for the cul-de-sac community.	debris flow / flood	Two homes at end of cul-de-sac and road	multiple	moderate	moderate	Early Warning	Monitor and maintain	Deflection structure		Suggest changing rod iron fence to something less penetrative.
LFV-41	East Highland				Orchards, agricultural equipment and damaged water infrastructure in / adjacent to potential flow paths of a minor drainage. Potential hazard is debris flow/flood impacting these features.	Likely probability of occurrence with minor consequence = Low risk.	Water tanks and pumps are placed adjacent channel and will likely be impacted by flows. Orchards may experience debris and sediment from slopes. Slopes appear to be susceptible to rilling and gullying.	debris flow / flood	Orchards and agricultural equipment	business	low	high	Early Warning	Monitor and maintain			
LFV-42	East Highland		34.1068276	-117.122033	Debris flow/flood of storage area and orchards	Possible probability of occurrence with minor consequence = Low risk.	Alluvial fan located upstream and partially within orchard. Flows may impact a portion of orchard downstream of the fan. Equipment stored on fan may be impacted by flows. Flows more likely to progress towards LFV-43 as evidenced by 9/20 event.	debris flow / flood	Storage area and orchard	multiple	low	low	Early Warning	Monitor and maintain	Deflection structure		Remove equipment from alluvial fan.
LFV-43	East Highland		34.107185	-117.12021	Debris flow/flood of private road and home	Possible probability of damage with moderate consequence = Intermediate risk.	Basin burned at mostly low. Farm home placed between drainages but 9/20 flows almost reached backyard after losing confinement. Future flows may lap against property, but unlikely due to rock revetment adjacent structure. Water tanks placed on what appears to be an upstream berm that protects the structure and diverts flows. Channel adjacent house is concrete and armored. Engineered channel walls act as berms to focus flow along northern boundary of property away from the home and orchards. Evidence of overbanking observed following 9/20 flows, particularly at the sharp 90-degree bend. Pipeline upstream and spanning channel.	debris flow / flood	Home and private access road	multiple	low	moderate	Early Warning	Deflection structure			
LFV-44	East Highland	Greenspot Road			Debris flow/flood of roadways, culverts, and utilities	Likely chance of occurrence with moderate consequence = High risk	Flow likely to escape channel upstream of Greenspot Road. Flows likely to then re-enter channel after impacting culvert, inundating road, and flooding water facility south of the road. Flows may then impact gate and weir adjacent to East Valley Water District facility.	debris flow / flood	Culvert, road, multiple water facilities	utilities	low	moderate	Early Warning	Deflection structure	Monitor and maintain		
LFV-45	East Highland	Greenspot Road	34.1045197	-117.122009	Flooding of water facility	Likely probability of occurrence with moderate consequence = High risk.	Santa Ana low turnout fully buried in sediment. Plugged culvert downstream from farm diverted flows west along Greenspot Road into water facility. Basin was mostly low severity. Larger flow would likely deposit downstream of this facility and enter the adjacent channel.	flood	San Bernardino MWD Santa Ana Turnout	utilities	low	moderate	Early Warning	Deflection structure			
LFV-46	East Highland	Greenspot Road	34.1046292	-117.11996	Plugging of culvert and inundate roadway	Likely probability of occurrence with moderate consequence = High risk.	Moderately trafficked, 2-lane road acts as the only source of eastern ingress/egress for the community of Highlands. Paved culvert crossing with concrete head wall. 4' culvert width and 2' head wall length. Culvert fully plugged and buried. Evidence of overtopping during 9/20. Culvert crossing likely to experience similar flows.	debris flow / flood	Culvert crossing	drainage structure	moderate	moderate	Early Warning	Clear and maintain culvert			
LFV-47	East Highland	Access off Greenspot Road	34.1051301	-117.111982	Debris flow/flood of San Bernardino water turnout facility	Possible probability of occurrence with moderate consequence = Intermediate risk.	Small drainage upstream burned at low. Deposits from 9/20 storm contacted edge of facility but no impacts observed. Plentiful debris on alluvial fan upstream of facility. Facility situated mid-fan. Larger flow may inundate the facility. 2 rock check dams that have been filled-in, where one has a plugged 12' boiler pipe culvert.	debris flow / flood	Water turnout facility	utilities	low	moderate	Early Warning	Monitor and maintain	Deflection structure		
LFV-48	Seven Oaks Dam		34.1153714	-117.105819	Debris flow/flood of dirt roadway	Likely probability of occurrence with minor consequence = Low risk.	Basin largely burned at moderate severity. Basin upslope of large, triple-benched fill with 5' deep vented culverts on downstream side. Fully clogged upstream culvert with very small 30'x30' basin. Sediment deposition along roadway. Entire road observed to have similar characteristics from a distance. High diversion potential throughout road. This was communicated to us as a CalFire road that is maintained by the county.	debris flow / flood	County maintained road	other	low	moderate	Clear and maintain culvert	Early Warning	Monitor and maintain	Signage	
LFV-49	Seven Oaks Dam		34.114947	-117.101277	Debris flow/flood of roadway	Likely probability of occurrence with minor consequence = Low risk.	Basin burned at roughly half moderate. Culvert crossing at road crossing likely blew out. Flow deposited cobble sized debris downstream and along roadway on 9/20. Flows tracked along roadway all the way to the bottom of the dam.	debris flow / flood	Roadway	other	low	moderate	Early Warning	Monitor and maintain			
LFV-50	Seven Oaks Dam		34.1131106	-117.101809	Debris flow/flood of roadway	Likely probability of occurrence with moderate consequence = High risk	Small basin burned at largely low severity. Half of basin unburned. 9/20 storm caused minor sediment laden flood onto roadway. 36" steel culvert with concrete headwalls. A portion of flow missed the culvert. The flow progressed down along the road, and due south off the road and down the engineered slope.	debris flow / flood	Roadway and ditch	multiple	low	moderate	Early Warning	Clear and maintain culvert	Monitor and maintain		
LFV-51	Santa Ana River	Santa Ana Trail	34.1454738	-117.058936	Hydro-electric station adjacent to the Santa Ana River. Potential hazard is debris flood / flow impacting structures.	Likely probability of occurrence with moderate consequence = High risk.	Assessed remotely. This site was inaccessible during the WERT field work. It is unknown if this facility is currently operating. Upslope basins burned at low, mod and high severity.	debris flow / flood	Hydro-electric intake	utilities	low	moderate	Early Warning				Communicate hazard risk to So Cal Edison.
LFV-52	Mentone	34200 Fish Hatchery Road			Ranch, house, livestock located adjacent to watercourse and/or within potential flood path. Potential hazard is debris flood overtopping or avulsing from channel and impacting home and structures.	Possible probability of occurrence with moderate consequence = Intermediate risk.	Upper 25% of basin burned at low severity, while the rest was unburned.	debris flow / flood	Ranch	home	low	low	Early Warning	Signage	Deflection structure		
LFV-53	Mill Creek Road		34.1028299	-117.019479	Culverted crossing below Mill Creek Road. Potential hazard is debris flow/flood impacting the crossing.	Unlikely probability of occurrence with minor consequence = Very low risk.	Small upper tributaries burned at low and moderate. Substantial live vegetation in channel. Any flow would likely get attenuated. Large basin to retain debris due to culvert crossing acting as a dam. Road grade is roughly 50' above debris basin bottom. Unable to access culvert.	debris flow / flood	Culvert crossing	drainage structure	low	low	Early Warning	Monitor and maintain			
LFV-54	San Bernardino	Alabama Street	34.1024923	-117.208825	City Creek culvert at Alabama St., just downstream of confluence with Plunge Creek. Potential hazard is flood flow with entrained debris plugging all / portions of culverts, leading to backwater effects and inundation of adjacent areas.	Possible probability of occurrence with moderate consequence = Intermediate risk.	Crossing is a single structure with three components, including a double-barrel box culvert and two arch culverts. Source area burned predominantly at low severity, with some mod and high in the upper elevations.	debris flow / flood	Culvert road crossing	drainage structure	low	moderate	Early Warning	Monitor and maintain			
LFV-55	East Highland	Orange Street crossing of Plunge Creek	34.1027445	-117.182408	Orange Street bridge over Plunge Creek. Potential hazard is debris flow / flood impacts to bridge.	Possible probability of occurrence with moderate consequence = Intermediate risk.		debris flow / flood	bridge	drainage structure	low	moderate	Early Warning	Signage			
LFV-56	Elder Gulch, Plunge Creek, Santa Ana River confluence	Alabama St., Foothill FWY, Orange St. and Abbey Way.			Quarries located within the Plunge Creek / Santa Ana wash. Potential hazard is flooding impacting the quarry pits.	Possible probability of occurrence with moderate consequence = Intermediate risk.		debris flow / flood	Existing quarry pits	business	low	moderate	Early Warning				
RS-01	Running Springs	31929 Pine Cone Dr, Running Springs, CA 92382			Progressive erosion (rilling and gullying) downstream and adjacent structure.	Possible probability of occurrence with low consequence = low risk.	Burnt slope immediately downstream of burnt structure. Low burn severity down gradient of home with loosened surface material. Loss of ground cover may intensify erosion immediately down gradient and adjacent of structure that may possibly cause subsequent failure. Evidence of soil creep along private dirt road below structure. High burn severity further down gradient. Moderately steep slopes (~25deg) below structure. Rilling and gullying likely adjacent and near structure.	debris flow / flood	Home and private road	home	low	low	Early Warning				
SO-01	Seven Oaks	Seven Oaks Rd, west of Middle Control Rd			Barn structure and water well located adjacent to watercourse. Potential hazard is flood flows mobilizing debris and overtopping banks, resulting in inundation and impact to structures.	Possible probability of occurrence with moderate consequence = Intermediate risk.	The barn sustained minor damage from a debris flood that occurred during TS Hilary in August 2023. Since then, grading has been performed to infill the north side bank, which was significantly scoured out immediately adjacent to the barn. A porch has recently been added to the barn, with footings located where the scour occurred. A small portion of the upstream watershed burned at moderate and low severity within Mile Canyon, which may result in elevated flood hazard immediately downstream along the Santa Ana River. The residence at this location is more removed and elevated above watercourse (above high water from TS Hilary response).	debris flow / flood	Barn, water well	multiple	low	moderate	Early Warning				If the barn is a habitable structure, evacuation prior to stressing storm events should be considered.

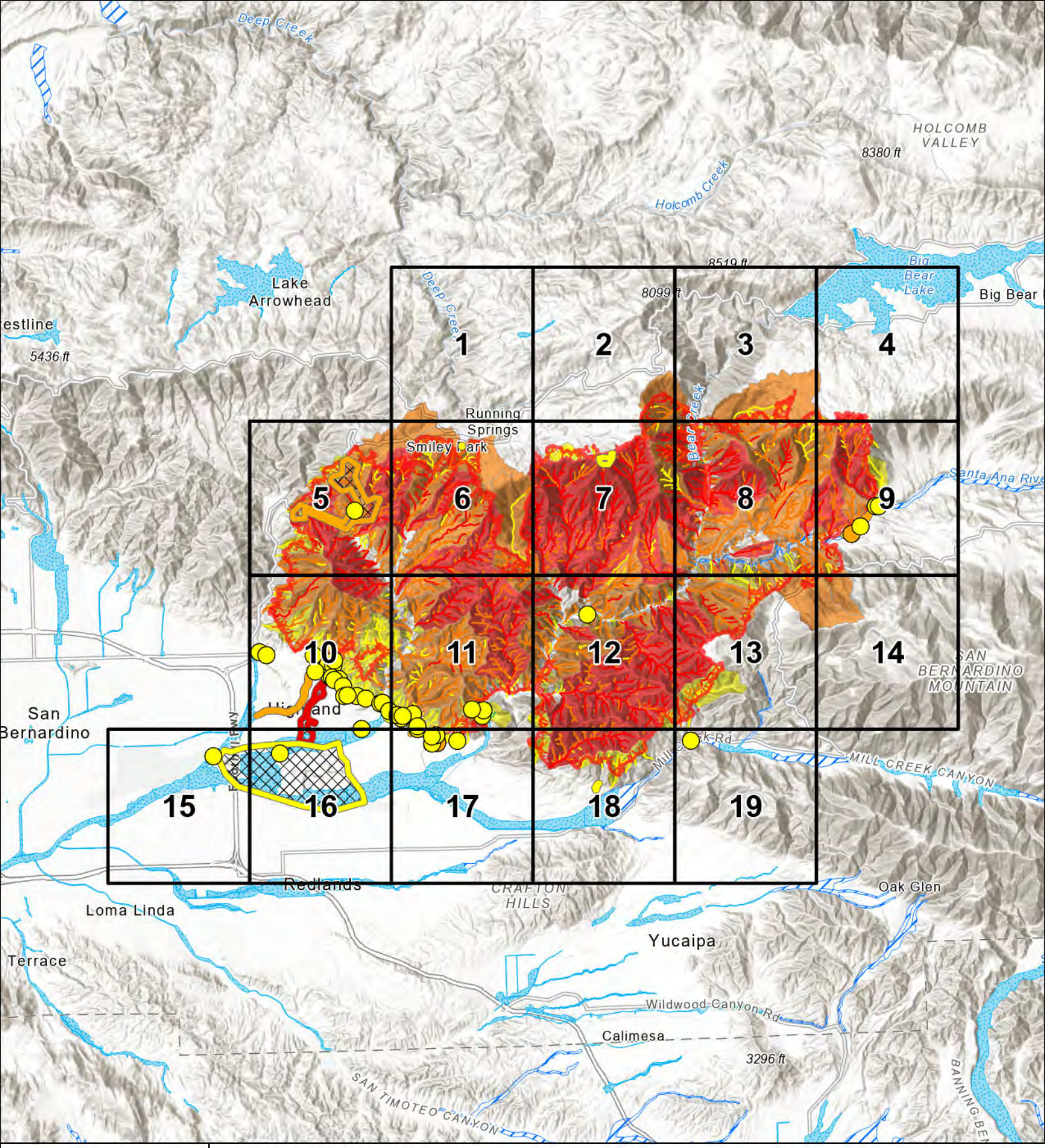
Line Fire
Values-at-Risk Table

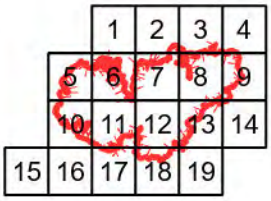
Site Number	Community / Local Area	Address	Latitude	Longitude	Potential hazard / Field observation	Potential risk	Remarks	Hazard Category	Specific at-risk feature	Feature Category	Potential hazard to life?	Potential hazard to property?	EPM	EPM2	EPM3	EPM4	EPM Text
SO-02	Seven Oaks	Seven Oaks Drive	34.1692754	-116.953224	Residence located adjacent to watercourse. Potential hazard is debris flood/flow overtopping bank and inundating residence.	Possible probability of occurrence with moderate consequence = Intermediate risk.	Bank was scoured out during TS Hilary response resulting in near vertical adjacent to southeast corner of structure. Structure is elevated above watercourse though additional scour could compromise foundation support.	debris flow / flood	Home	home	moderate	moderate	Early Warning				
SO-03	Seven Oaks	Middle Control Road	34.1716549	-116.949551	Bridge crossing over Santa Ana River drainage. Potential hazard is flood flows mobilizing debris and boulders, plugging bridge culvert and overtopping. Potential for stranding residences along east bank.	Possible probability of occurrence with major consequence = High risk.	Bridge spans 27' with 6-7' from thalweg to bottom of bridge deck. Concrete deck supported on steel I beams. Bridge is downstream of Mile Creek tributary to Santa Ana that contains steep hill slopes burned at mod and low severity. Area impacted by debris flow from TS Hilary on 8/20/23.	debris flow / flood	Bridge, road	drainage structure	low	moderate	Early Warning	Monitor and maintain	Signage		
SO-04	Seven Oaks	Weesha Road, Seven Oaks Road			Multiple residences located adjacent to Santa Ana River watercourse. Potential hazard is debris flood overtopping channel banks and inundating homes.	Possible probability of occurrence with moderate consequence = Intermediate risk.	Upstream watershed is largely outside of the burn perimeter; however, the Mile Creek tributary just upstream contains steep slopes with moderate and low burn severity. Flooding from this drainage could mobilize burned debris in Mile Canyon and downed woody debris and boulders scattered along the Santa Ana River drainage from the TS Hilary event	debris flow / flood	Homes	home	low	moderate	Early Warning				
SO-05	Seven Oaks	Seven Oaks Road	34.1781448	-116.943241	Seven Oaks Road culverted crossing over Mile Creek. Potential hazard is flood flow mobilizing woody debris, leading to plugging of culvert and overtopping of road. road inundation may impact ingress/egress to residences.	Likely probability of occurrence with moderate consequence = High risk.	4' x 10' box culvert with approx. 1.5 ft of freeboard. overland flow along road surface in both directions. Crossing is at road high point. Boulders and mature tress present just upstream of crossing. Mile Creek drainage burned mostly at moderate severity.	debris flow / flood	Culvert crossing	drainage structure	low	moderate	Early Warning	Clear and maintain culvert	Signage		
SO-06	Seven Oaks	Seven Oaks Road	34.1781166	-116.942067	Seven Oaks Road culverted crossing over Sand Creek. Potential hazard is flood flow mobilizing woody debris, leading to plugging of culvert and overtopping of road. Road inundation may impact ingress/egress to residences.	Possible probability of occurrence with moderate consequence = Intermediate risk.	30-inch diameter RCP with 48-inch head wall. Small drainage burned at low severity.	debris flow / flood	Road crossing culvert	drainage structure	low	low	Early Warning	Clear and maintain culvert	Signage		

Summary of General Recommendations and Findings

- Utilize early warning systems available to homeowners, particularly those located in flood-prone areas. The WERT recommends using the National Weather Service early warning system and forecasts.
- Increase the situational awareness of affected residents and the communities regarding the hazards and risks associated with living downstream/downslope of burned areas.
- The WERT strongly recommends that San Bernardino County Public Works, San Bernardino County OEM, San Bernardino County Fire, and San Bernardino County Sheriff's Office work with the NWS and the California Geological Survey to monitor forecasts and rainfall intensity during storms, as well as observe postfire response following storm events. The initial rainfall thresholds can be adjusted accordingly after assessing hydrological response to storms.
- Monitor and/or remove accumulated debris from culverts and channels that are upstream of culverts in areas that are subject to postfire flooding where there is an elevated risk to life and/or property.
- While the potential for debris flows exists within and downstream of the Line Fire, the primary hazard of concern is flooding and debris flooding impacting residential neighborhoods along the mountain front in Highland. These hazards constitute a potential threat to life-safety and property.
- Debris flood / flow hazards exist through the built environment along Elder Gulch drainage to Boulder Ave and Bledsoe Gulch drainage to south of Greenspot Road.
- The WERT recommends that local government conduct public outreach so that residents and property owners can make informed decisions that reduce their risk exposure to postfire hazards.
- Close coordination between San Bernardino County Office of Emergency Management, the National Weather Service, and local first responders will be necessary to effectively implement a response plan that will minimize risk.

Appendix C – Values-at-Risk Map Book





Incident: Line Fire CA-BDF-012520

Values at Risk (Polygon)
Potential hazard to life
- Low
- Moderate
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Value at Risk (Point)
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Basin Combined Hazard
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0 5,000 10,000 ft

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- Fire Perimeter
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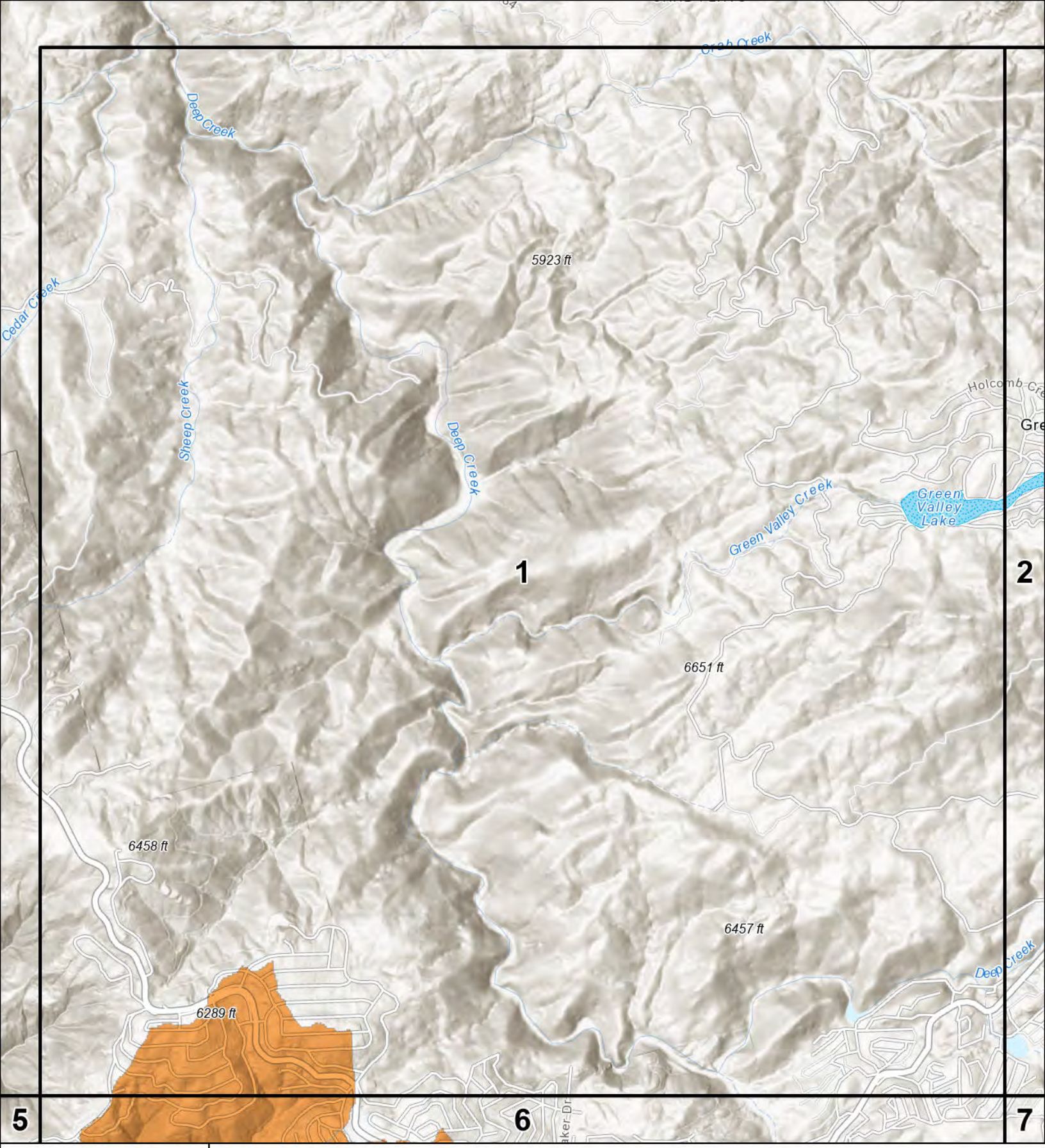

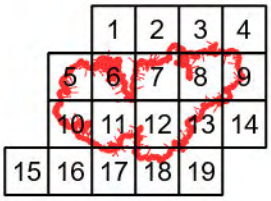

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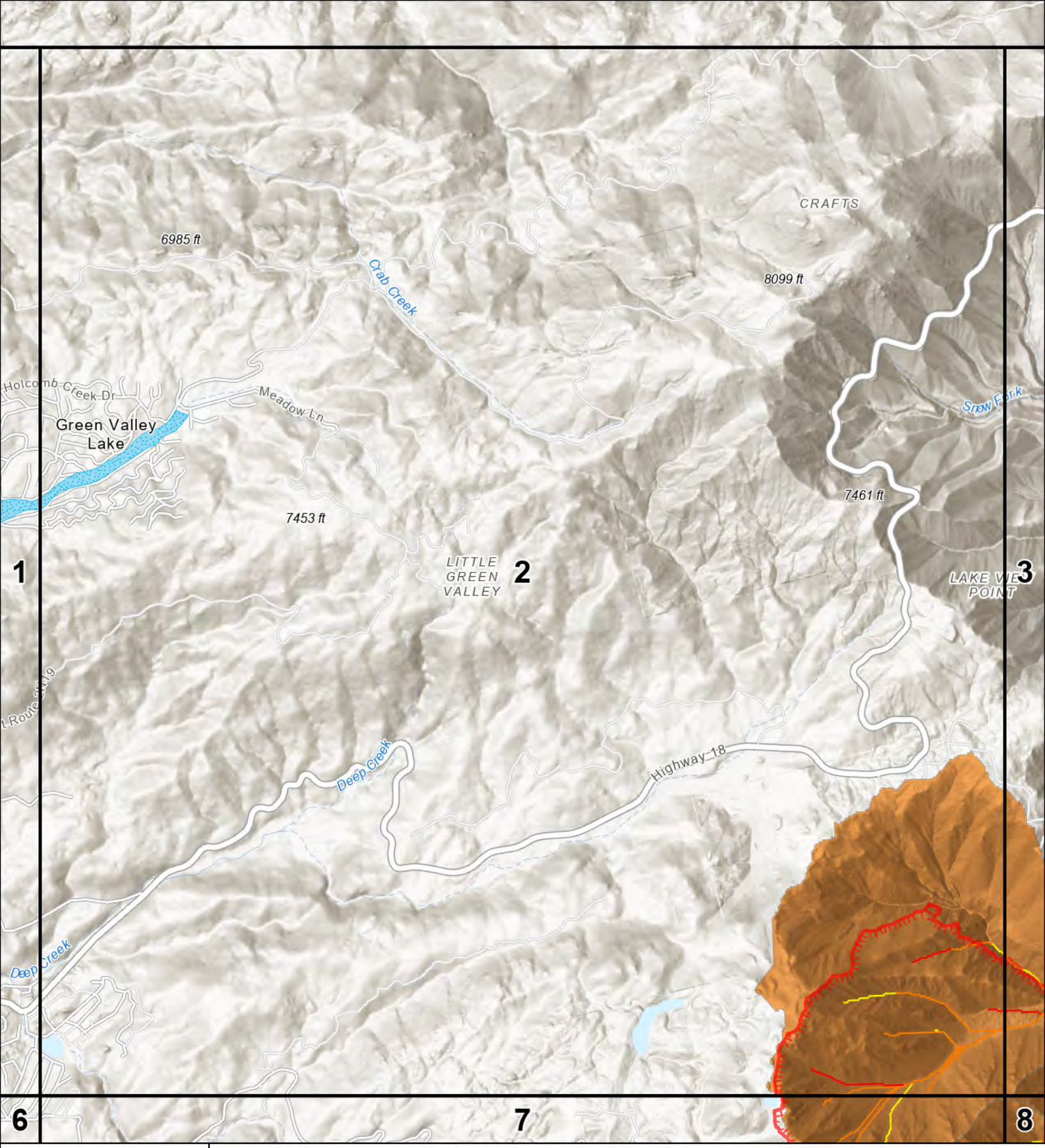

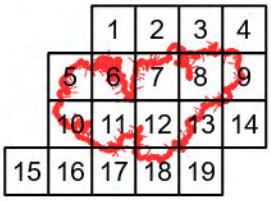

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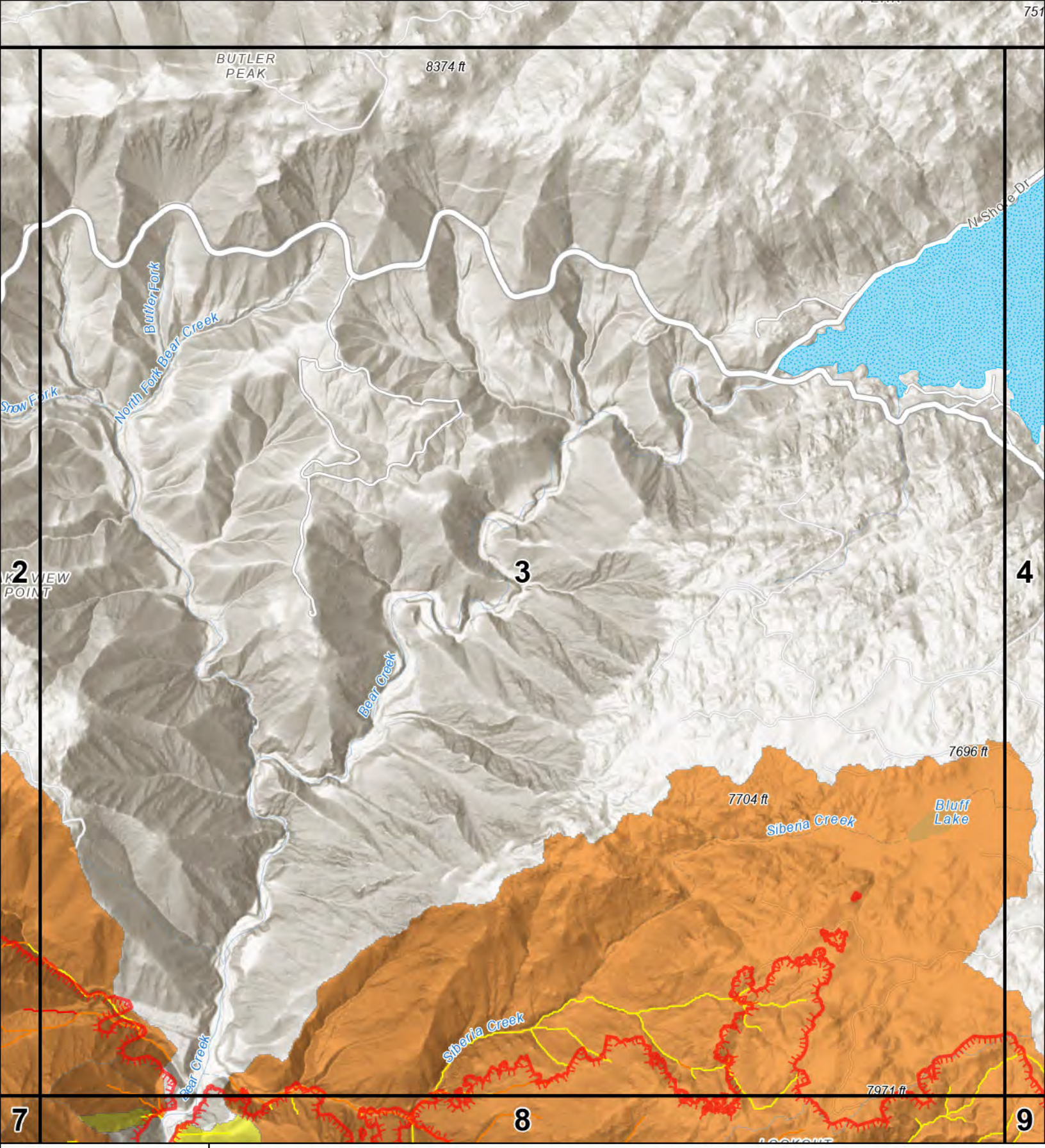

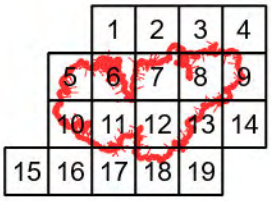

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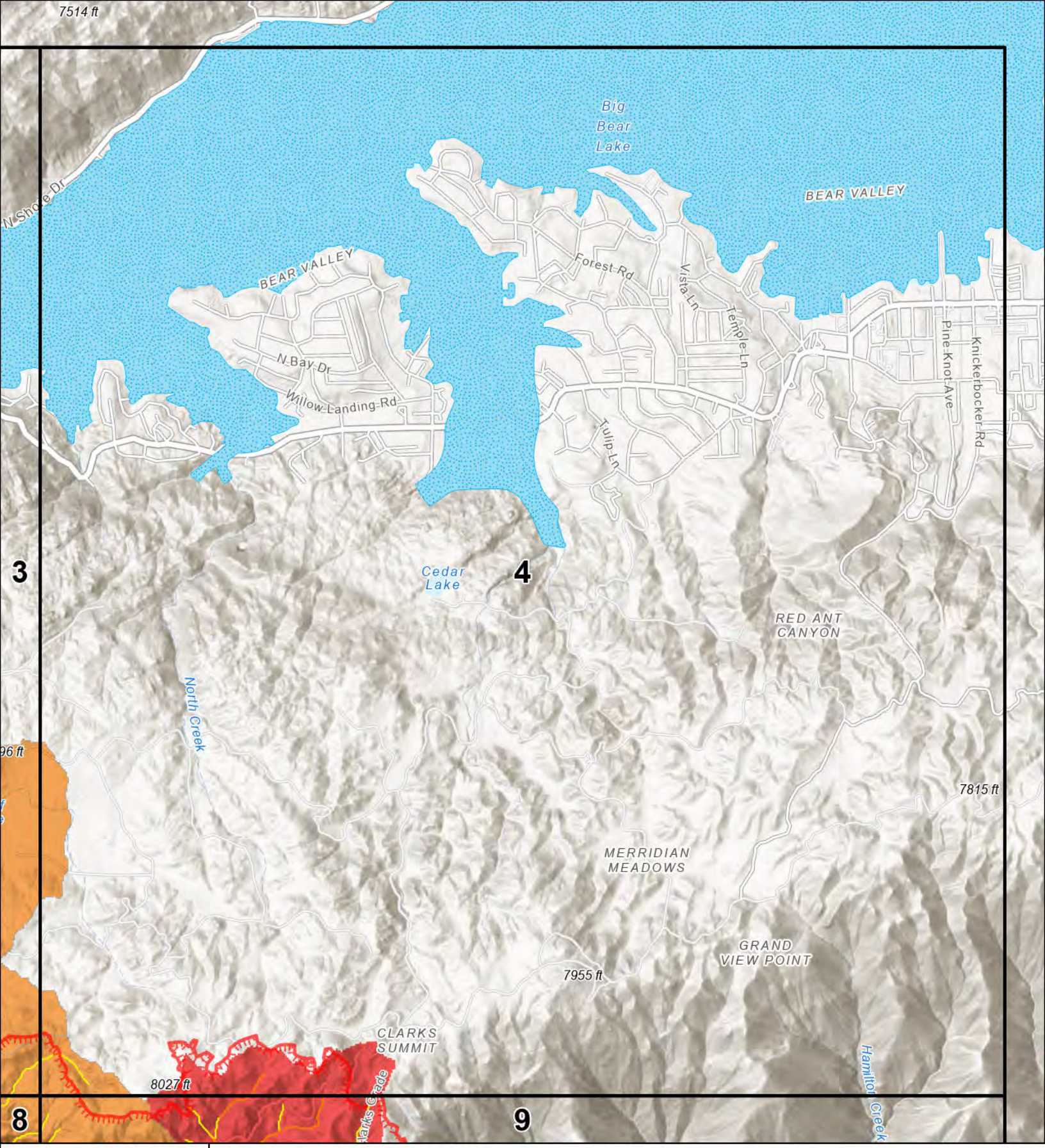

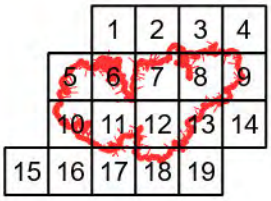

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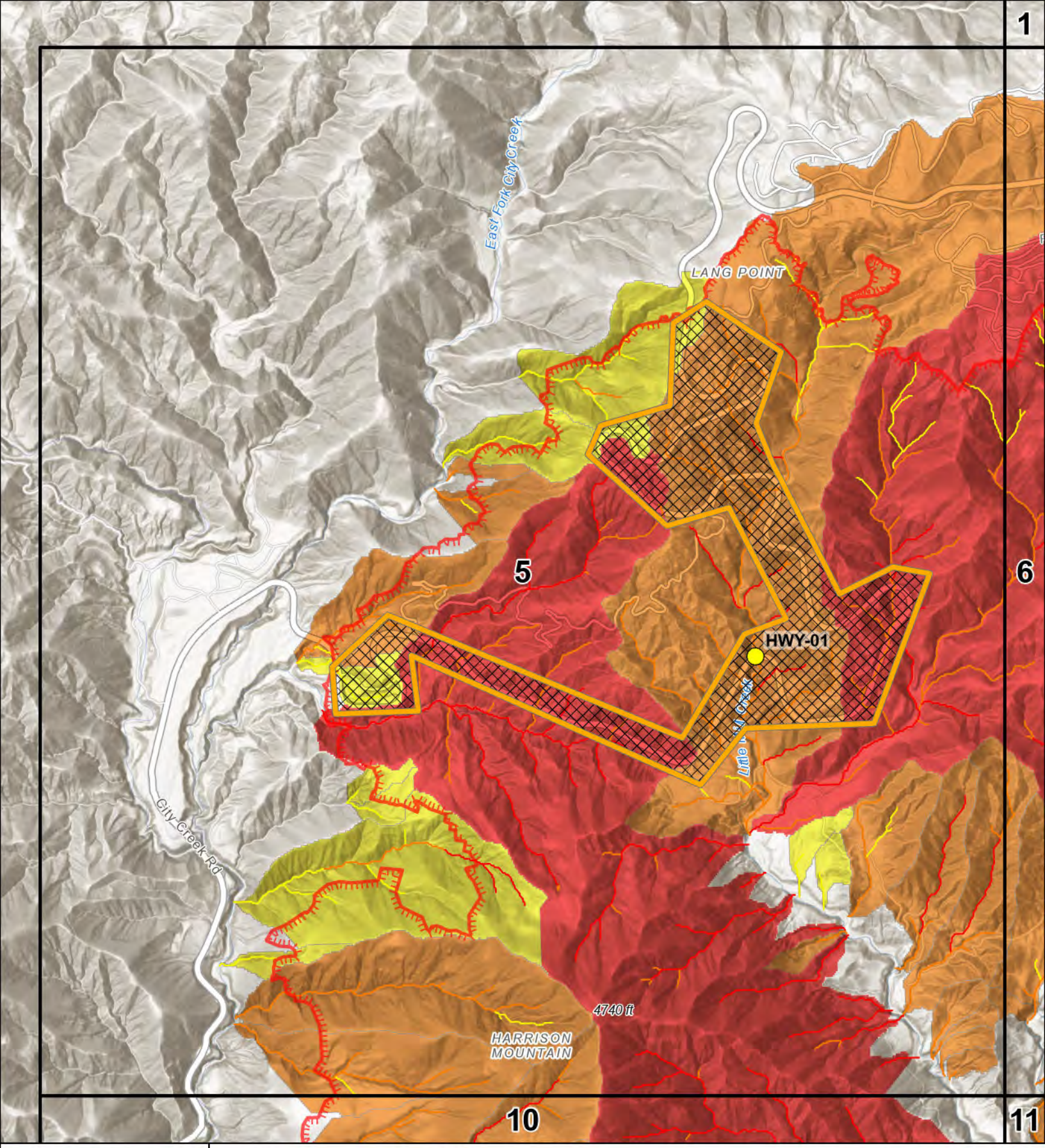

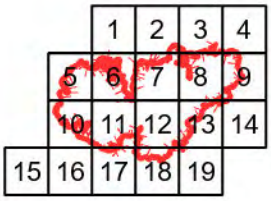

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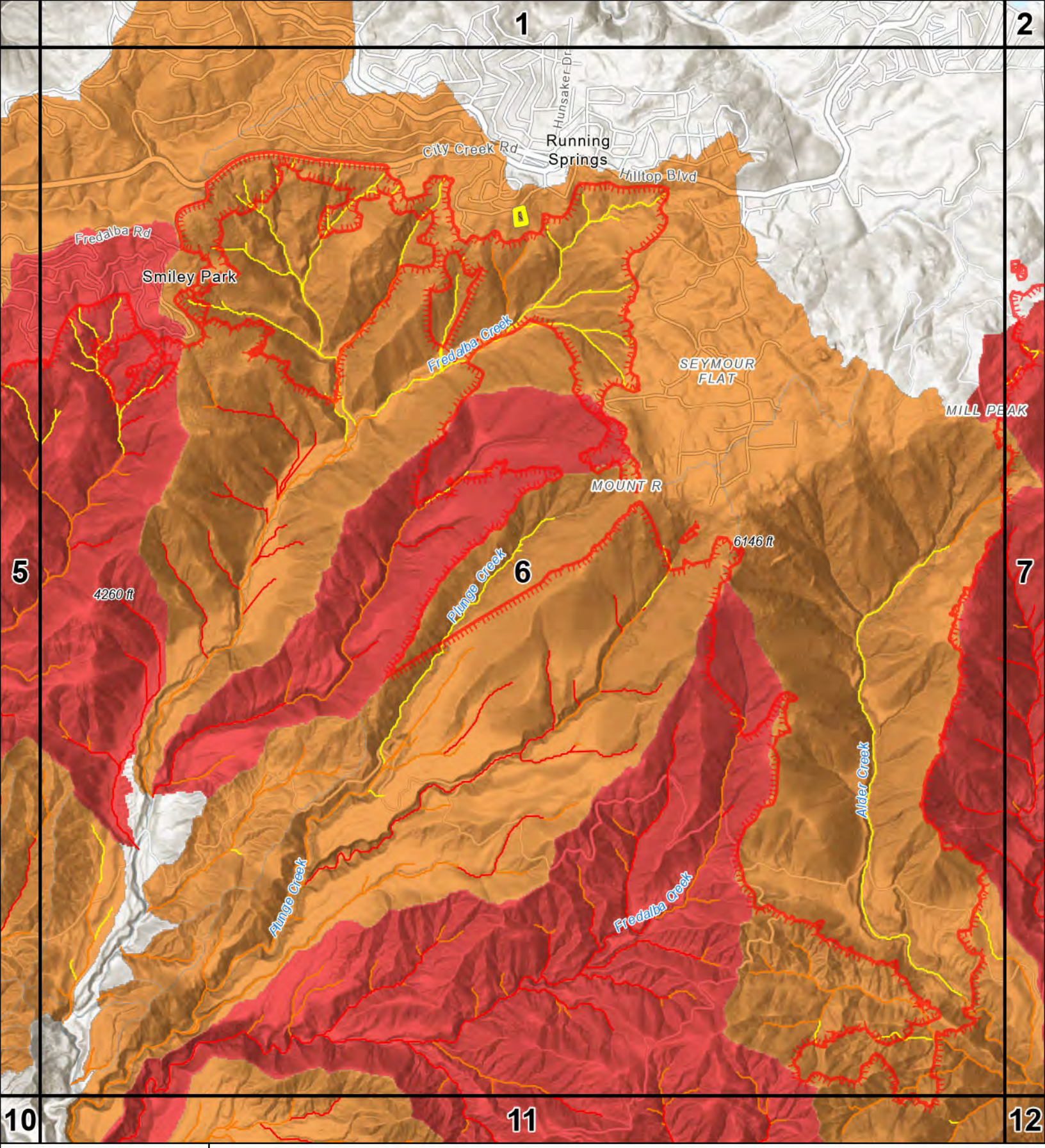

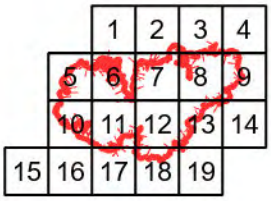

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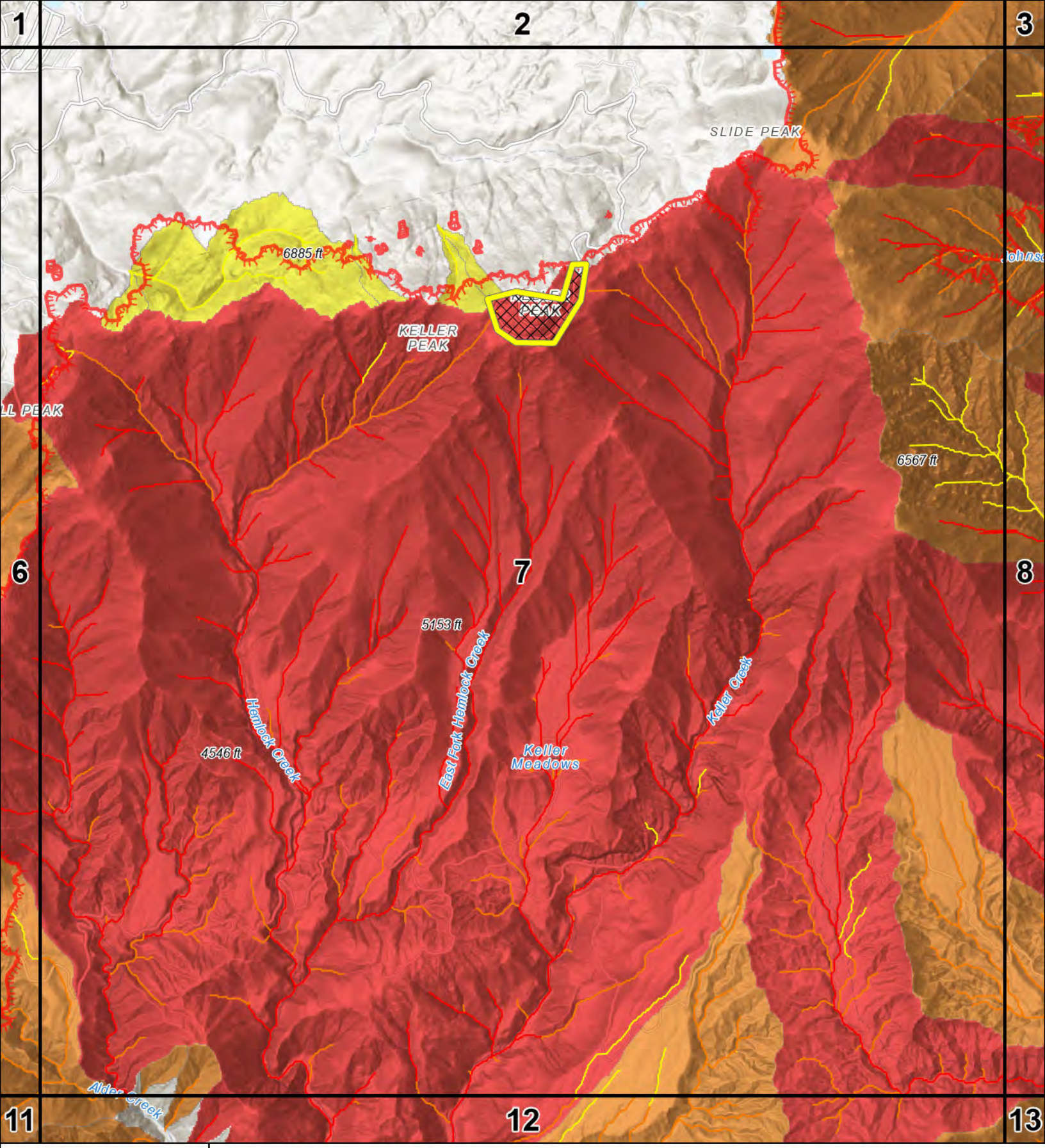

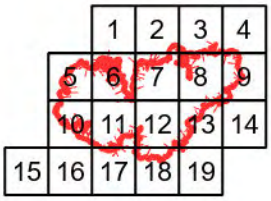

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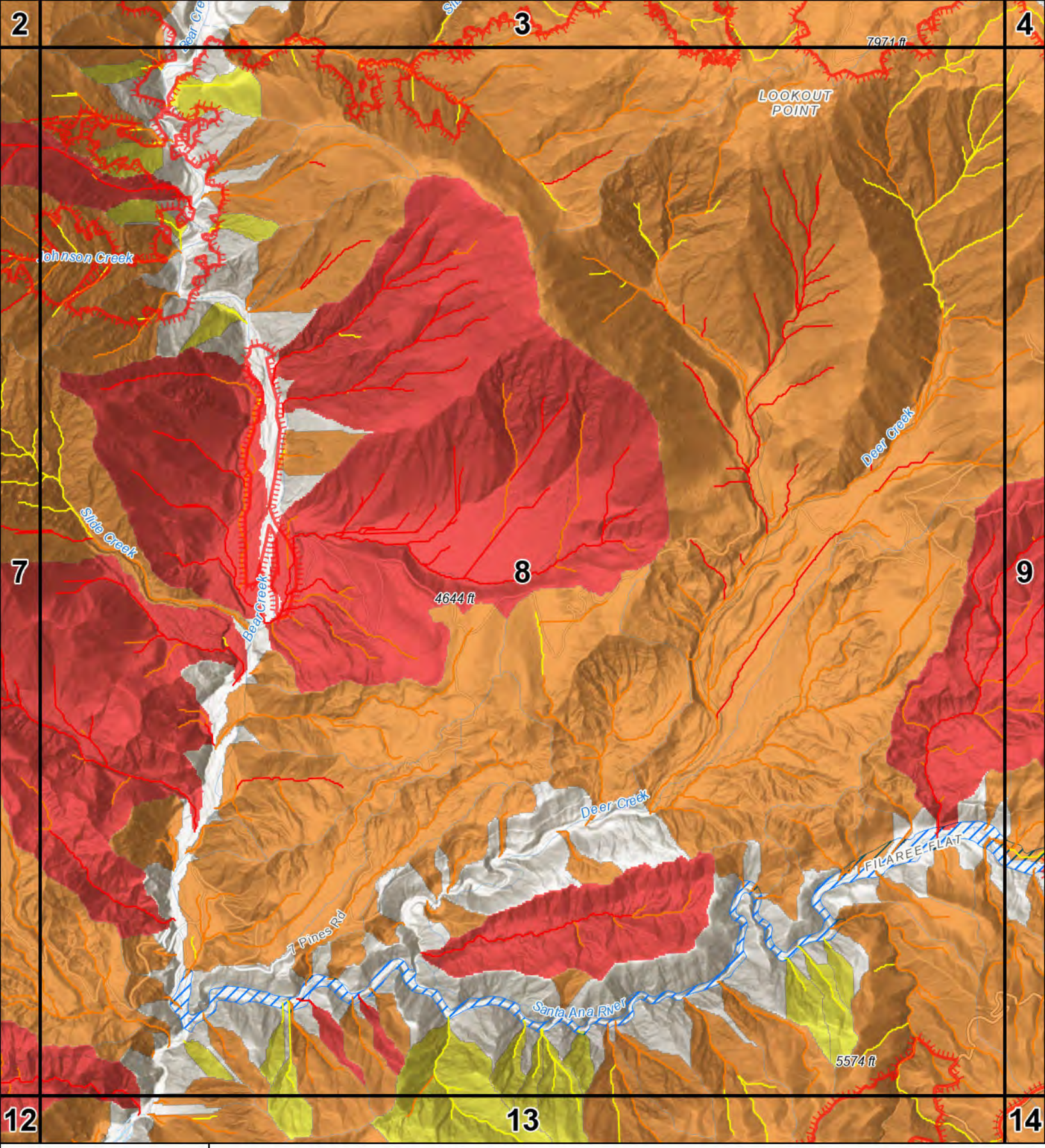

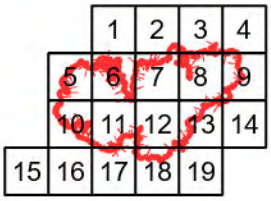

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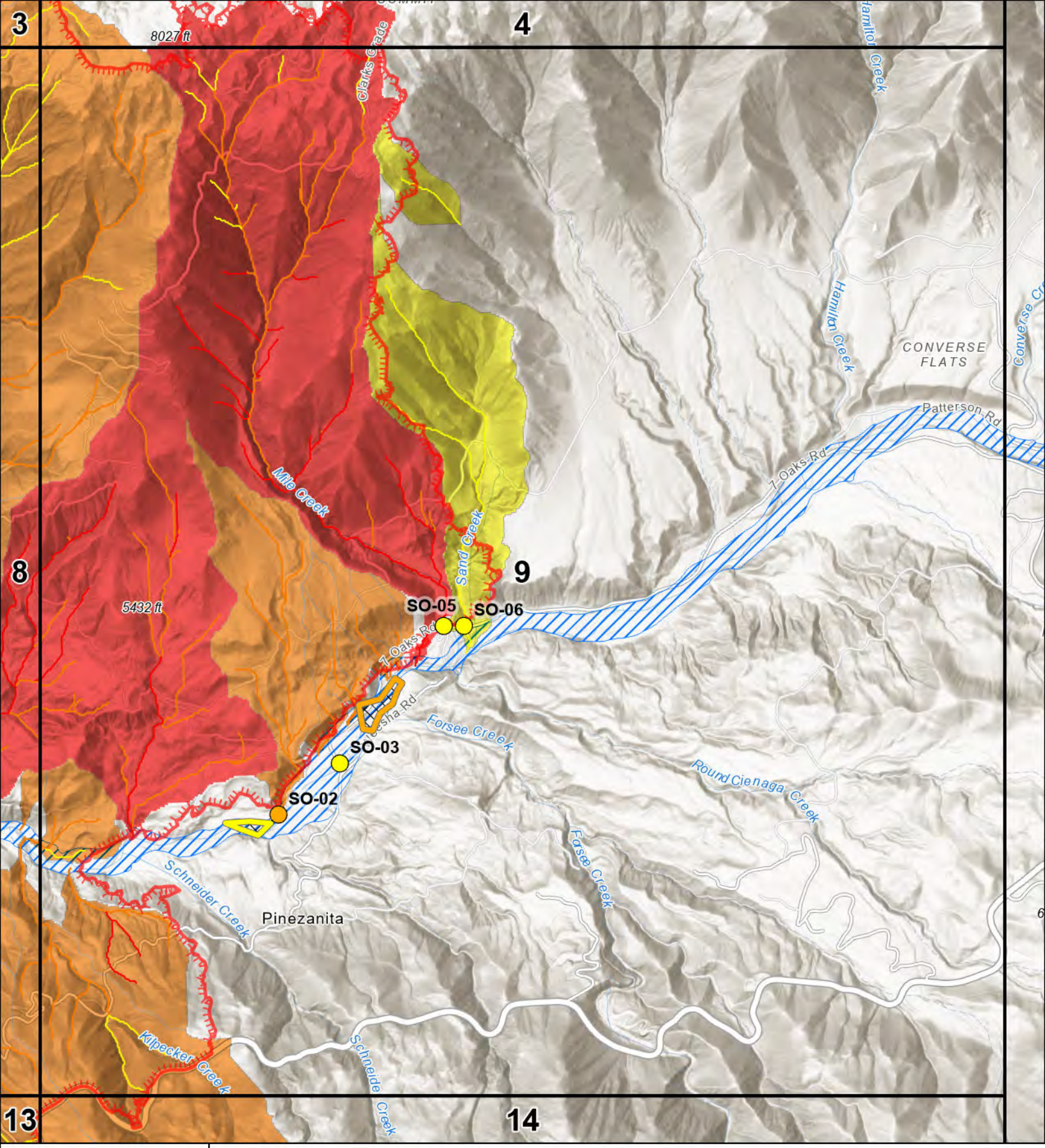

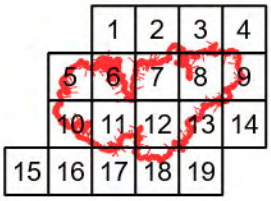

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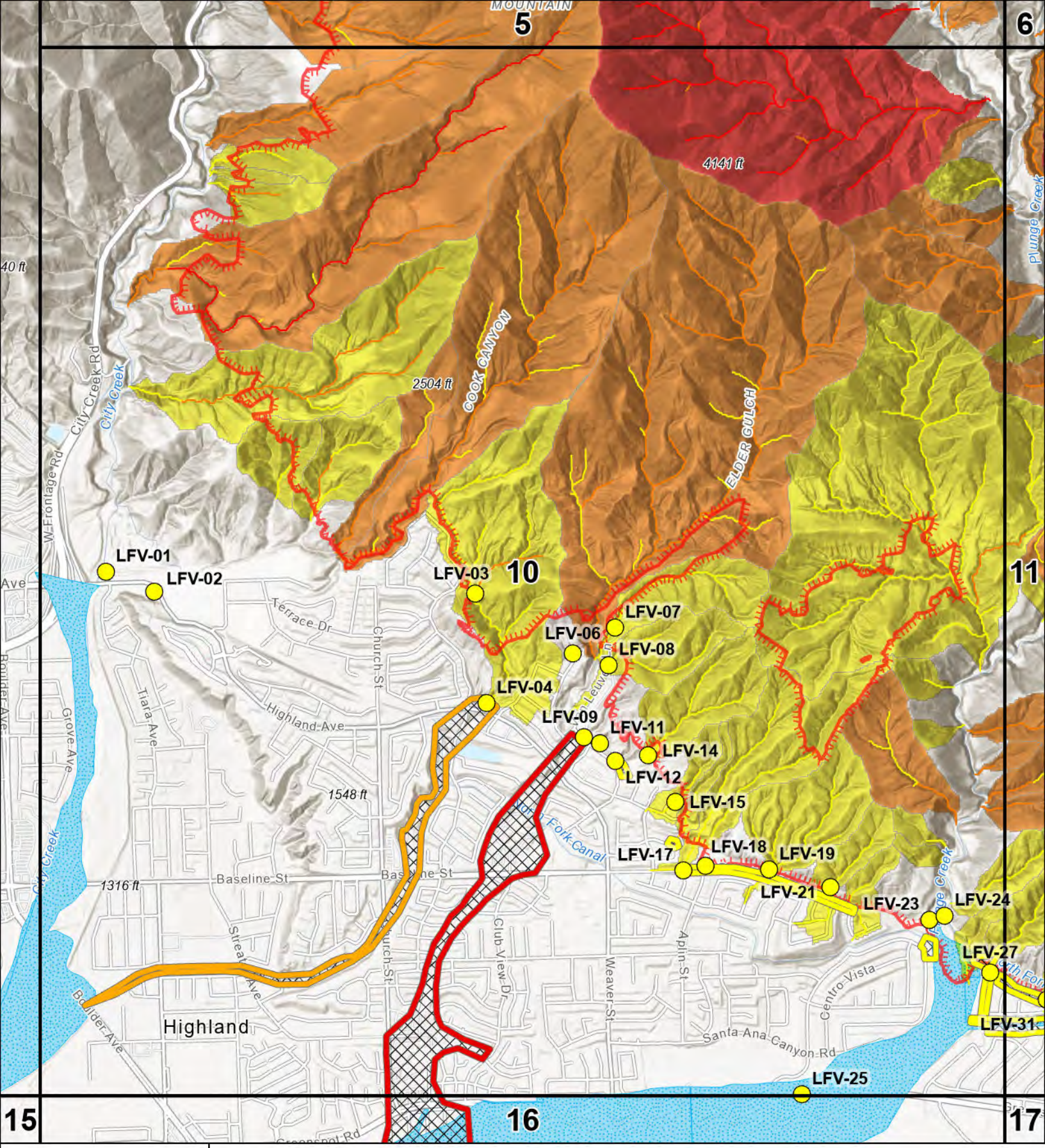

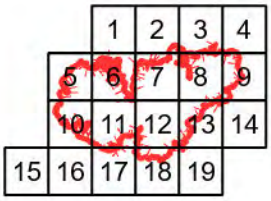

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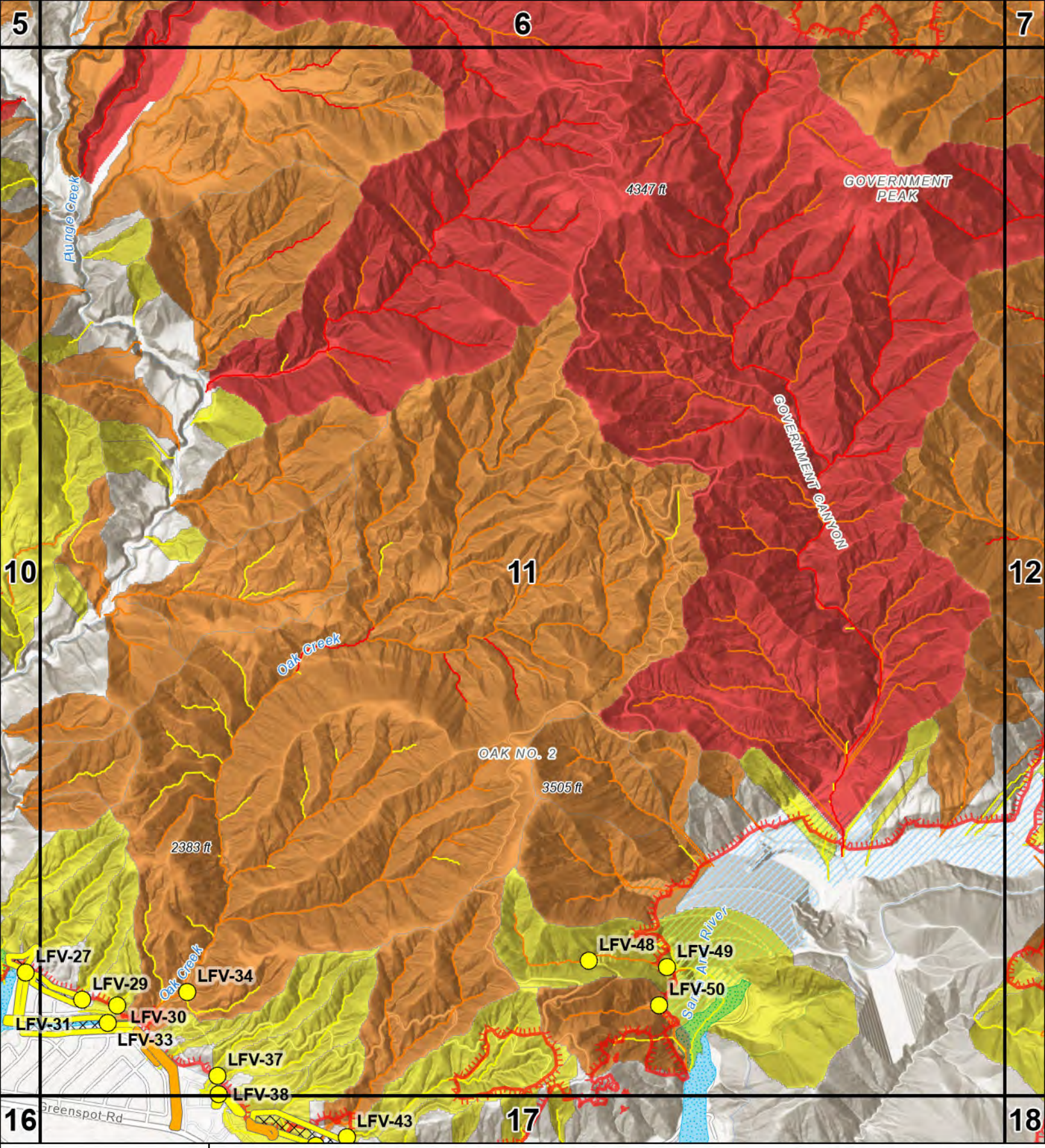

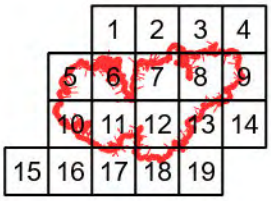

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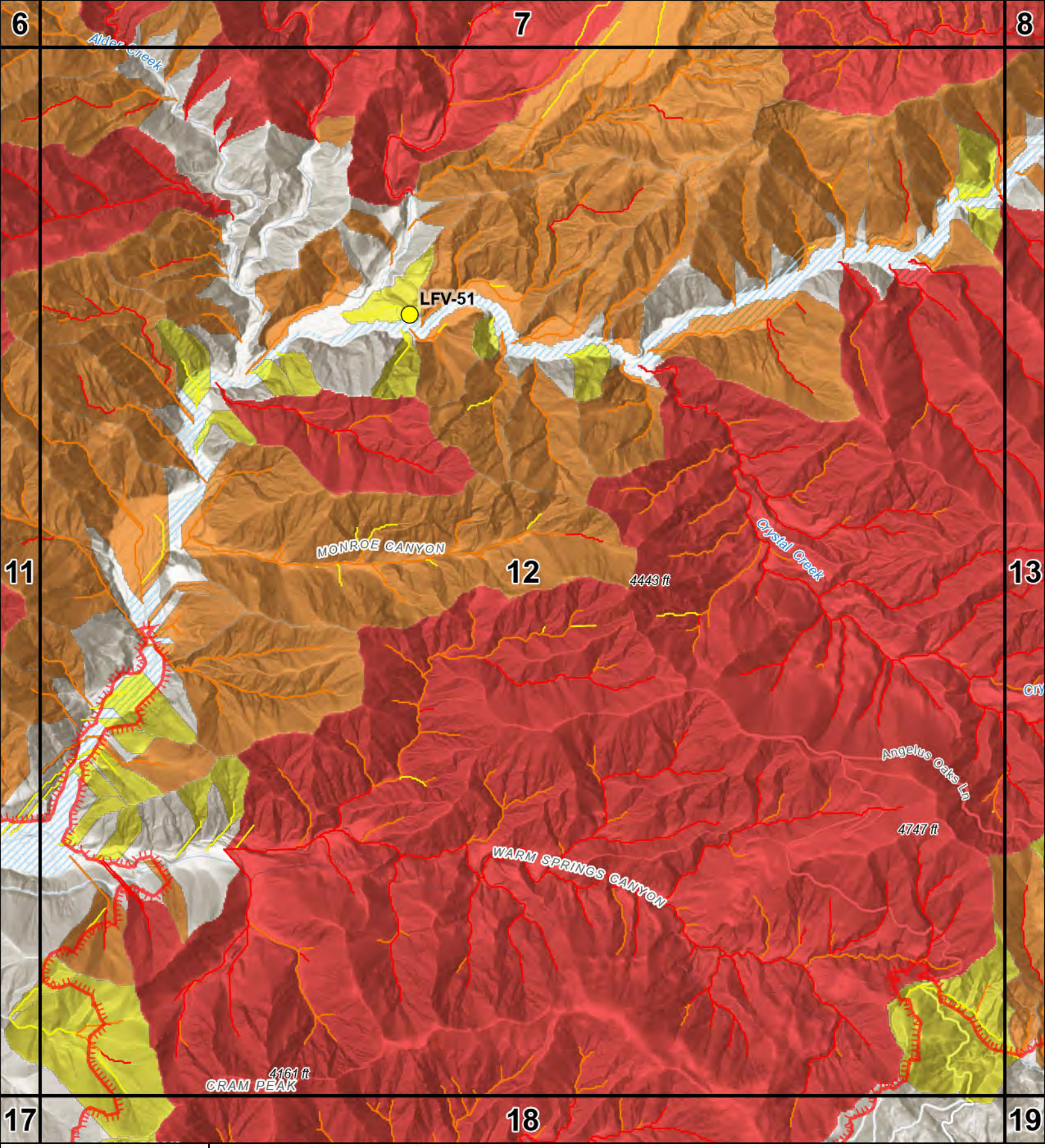
- Low
- Moderate
- High

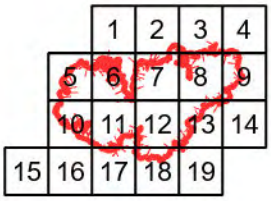
N

0 1,000 2,000 ft

0 300 600 m

- Fire Perimeter
- FEMA Special Flood Hazard Areas
- DWR 100yr Awareness Floodplains





Incident: Line Fire CA-BDF-012520

Values at Risk (Polygon)
Potential hazard to life
- Low
- Moderate
- High

Value at Risk (Point)
Potential hazard to life
- Low
- Moderate
- High

Basin Combined Hazard
15 min 24 mm/h
- Low
- Moderate
- High

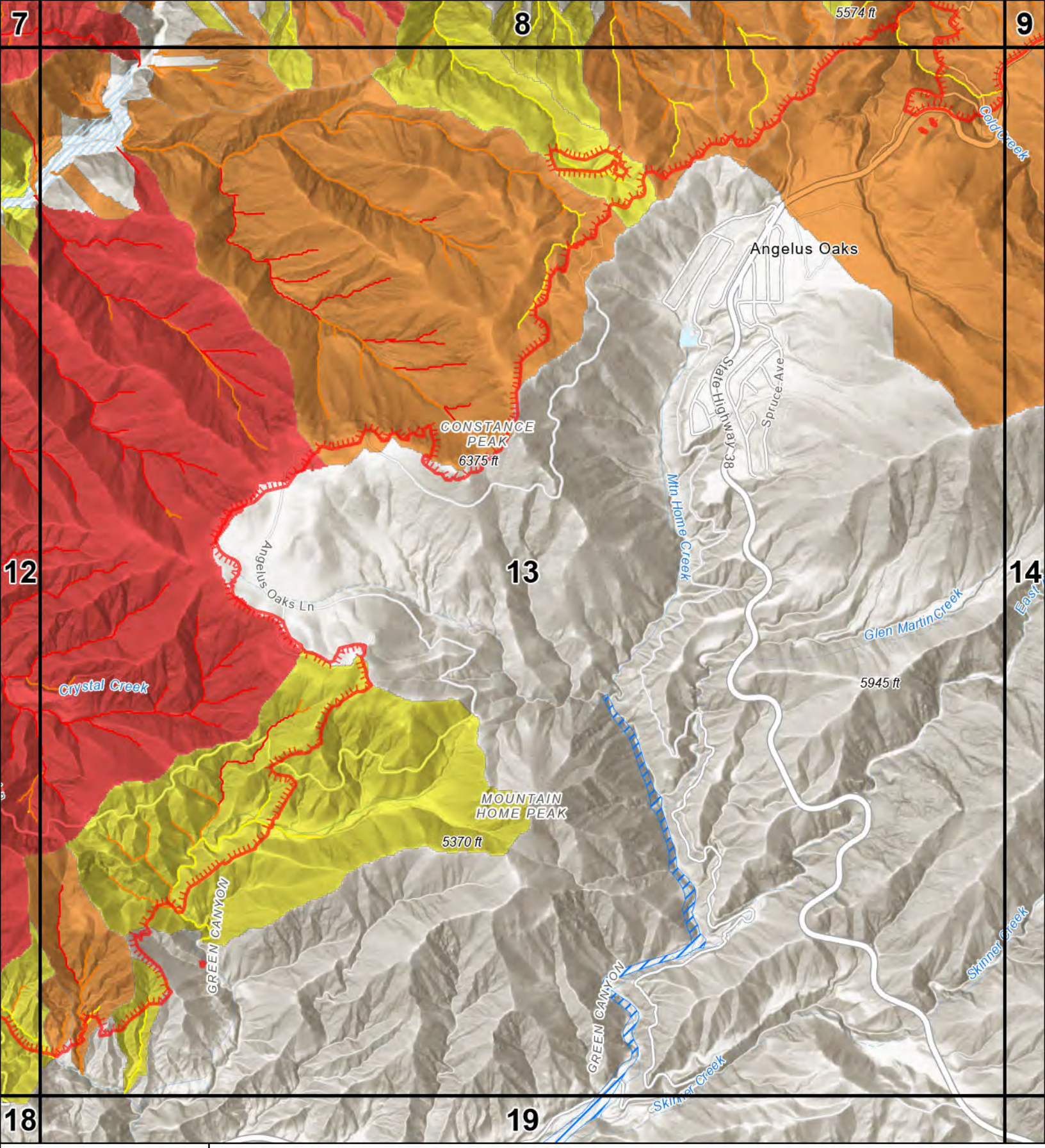
Segment Combined Hazard
15 min 24 mm/h
- Low
- Moderate
- High

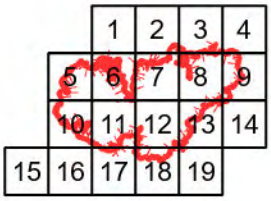
N

0 1,000 2,000 ft

0 300 600 m

- Fire Perimeter
- FEMA Special Flood Hazard Areas
- DWR 100yr Awareness Floodplains





Incident: Line Fire CA-BDF-012520

Values at Risk (Polygon)
Potential hazard to life
- Low
- Moderate
- High

Value at Risk (Point)
Potential hazard to life
- Low
- Moderate
- High

Basin Combined Hazard
15 min 24 mm/h
- Low
- Moderate
- High

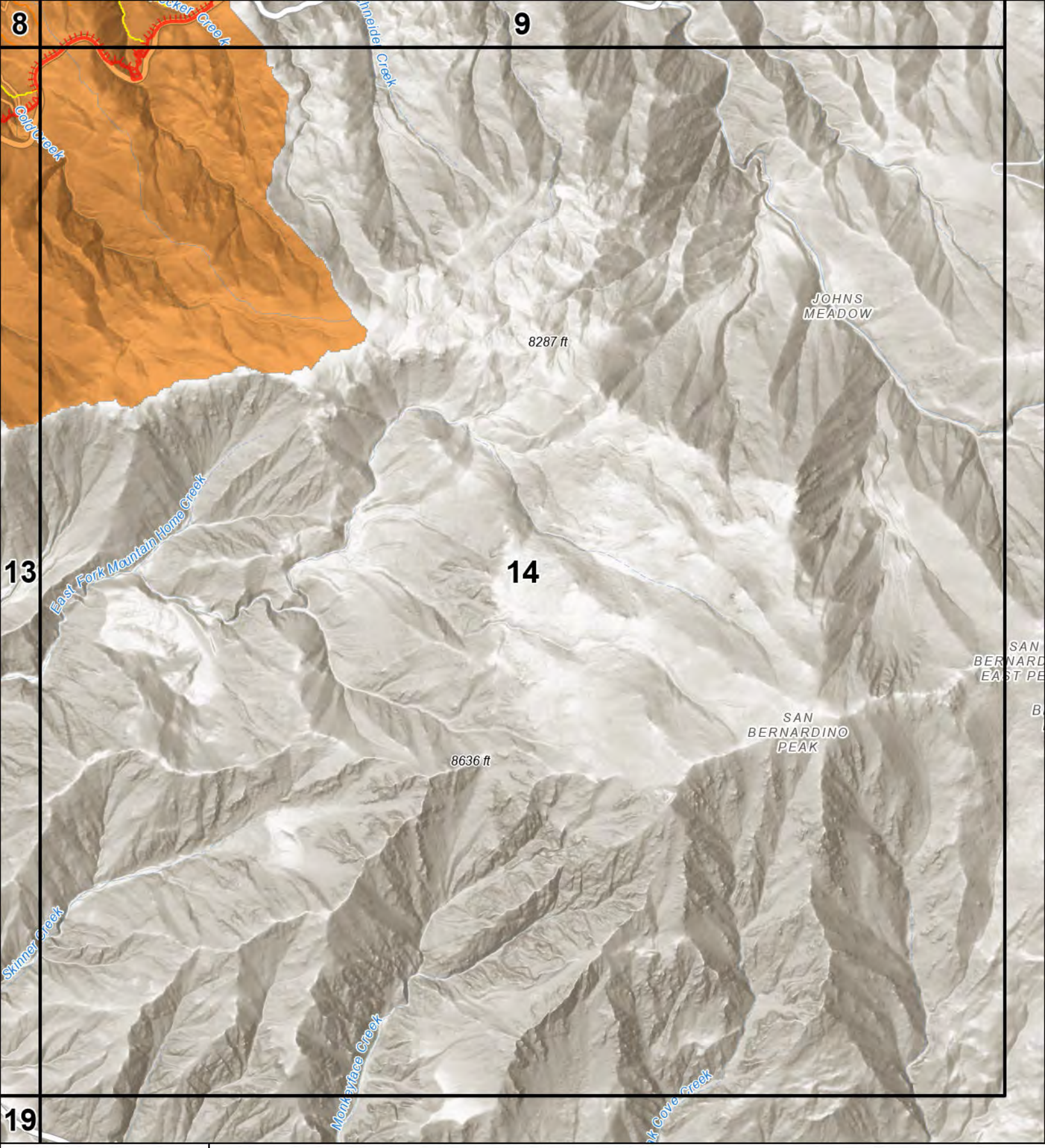
Segment Combined Hazard
15 min 24 mm/h
- Low
- Moderate
- High

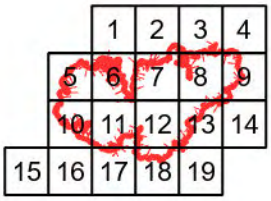
N

0 1,000 2,000 ft

0 300 600 m

- Fire Perimeter
- FEMA Special Flood Hazard Areas
- DWR 100yr Awareness Floodplains





Incident: Line Fire CA-BDF-012520

Values at Risk (Polygon)
Potential hazard to life
- Low
- Moderate
- High

Value at Risk (Point)
Potential hazard to life
- Low
- Moderate
- High

Basin Combined Hazard
15 min 24 mm/h
- Low
- Moderate
- High

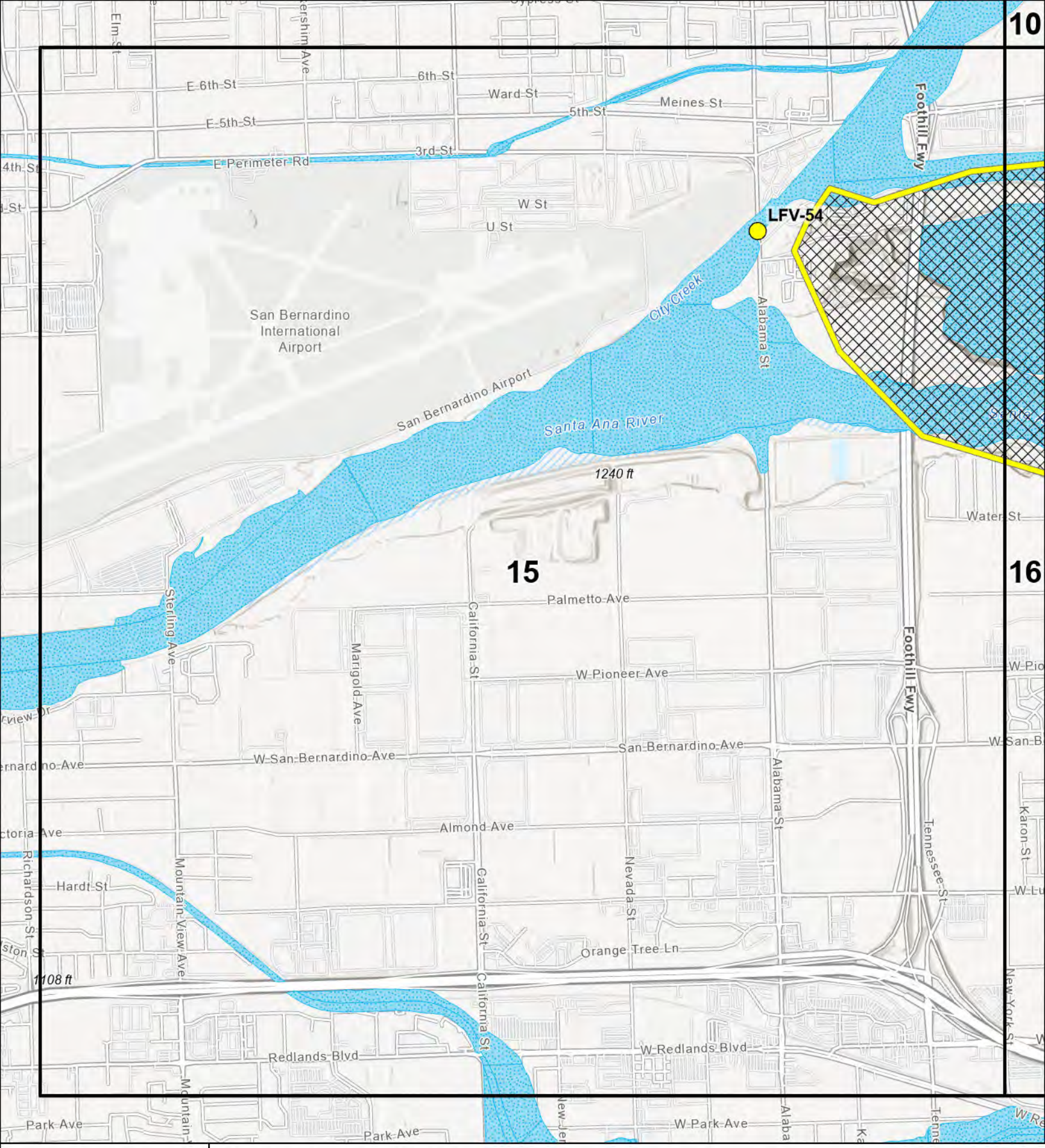
Segment Combined Hazard
15 min 24 mm/h
- Low
- Moderate
- High

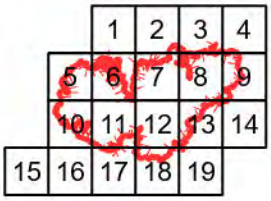
N

0 1,000 2,000 ft

0 300 600 m

- Fire Perimeter
- FEMA Special Flood Hazard Areas
- DWR 100yr Awareness Floodplains





Incident: Line Fire CA-BDF-012520

Values at Risk (Polygon)
Potential hazard to life
- Low
- Moderate
- High

Value at Risk (Point)
Potential hazard to life
- Low
- Moderate
- High

Basin Combined Hazard
15 min 24 mm/h
- Low
- Moderate
- High

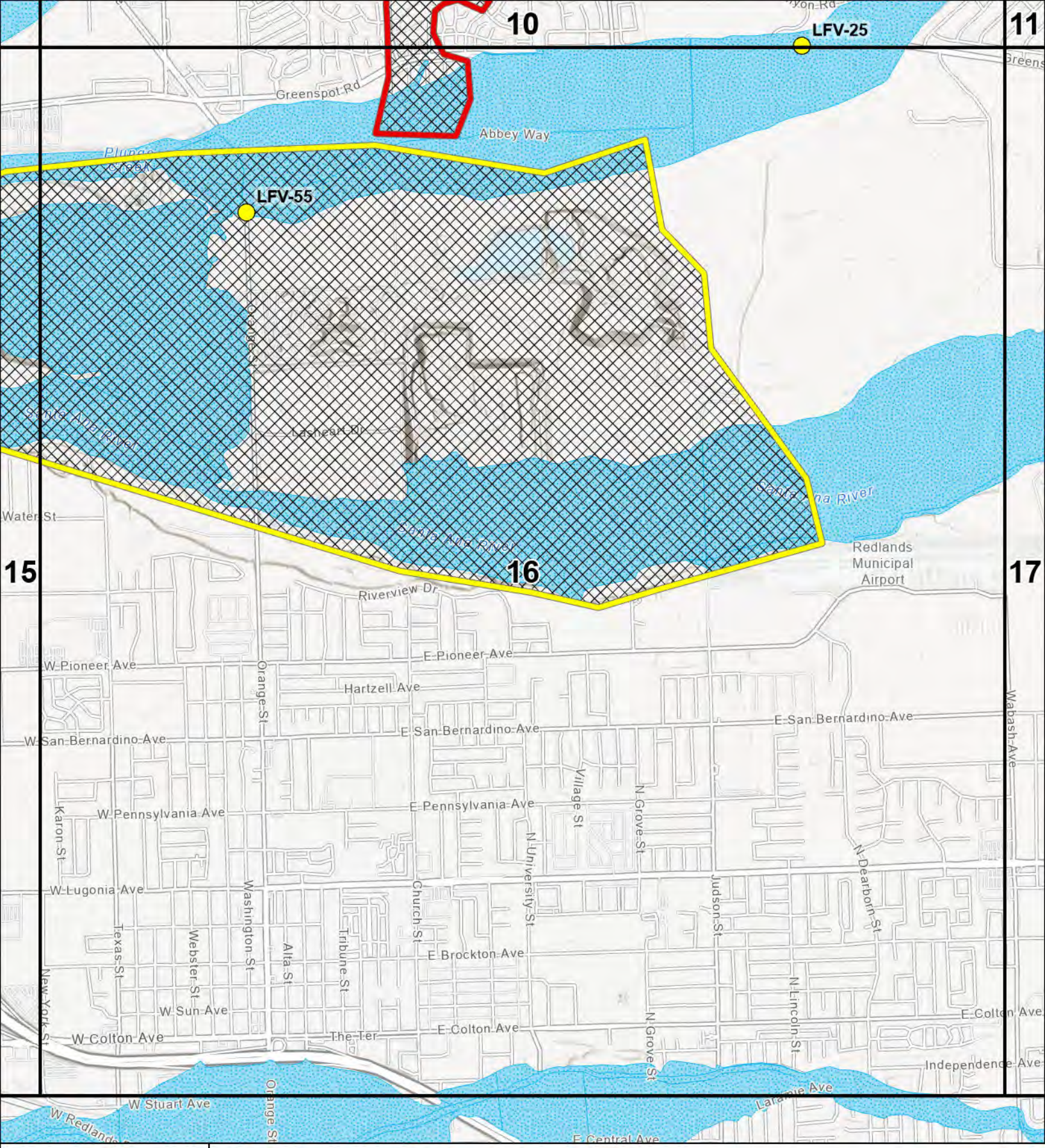
Segment Combined Hazard
15 min 24 mm/h
- Low
- Moderate
- High

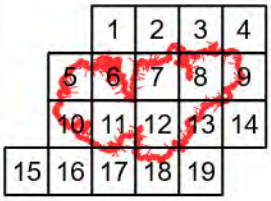
N

0 1,000 2,000 ft

0 300 600 m

- Fire Perimeter
- FEMA Special Flood Hazard Areas
- DWR 100yr Awareness Floodplains





Incident: Line Fire CA-BDF-012520

Values at Risk (Polygon)
Potential hazard to life
- Low
- Moderate
- High

Value at Risk (Point)
Potential hazard to life
- Low
- Moderate
- High

Basin Combined Hazard
15 min 24 mm/h
- Low
- Moderate
- High

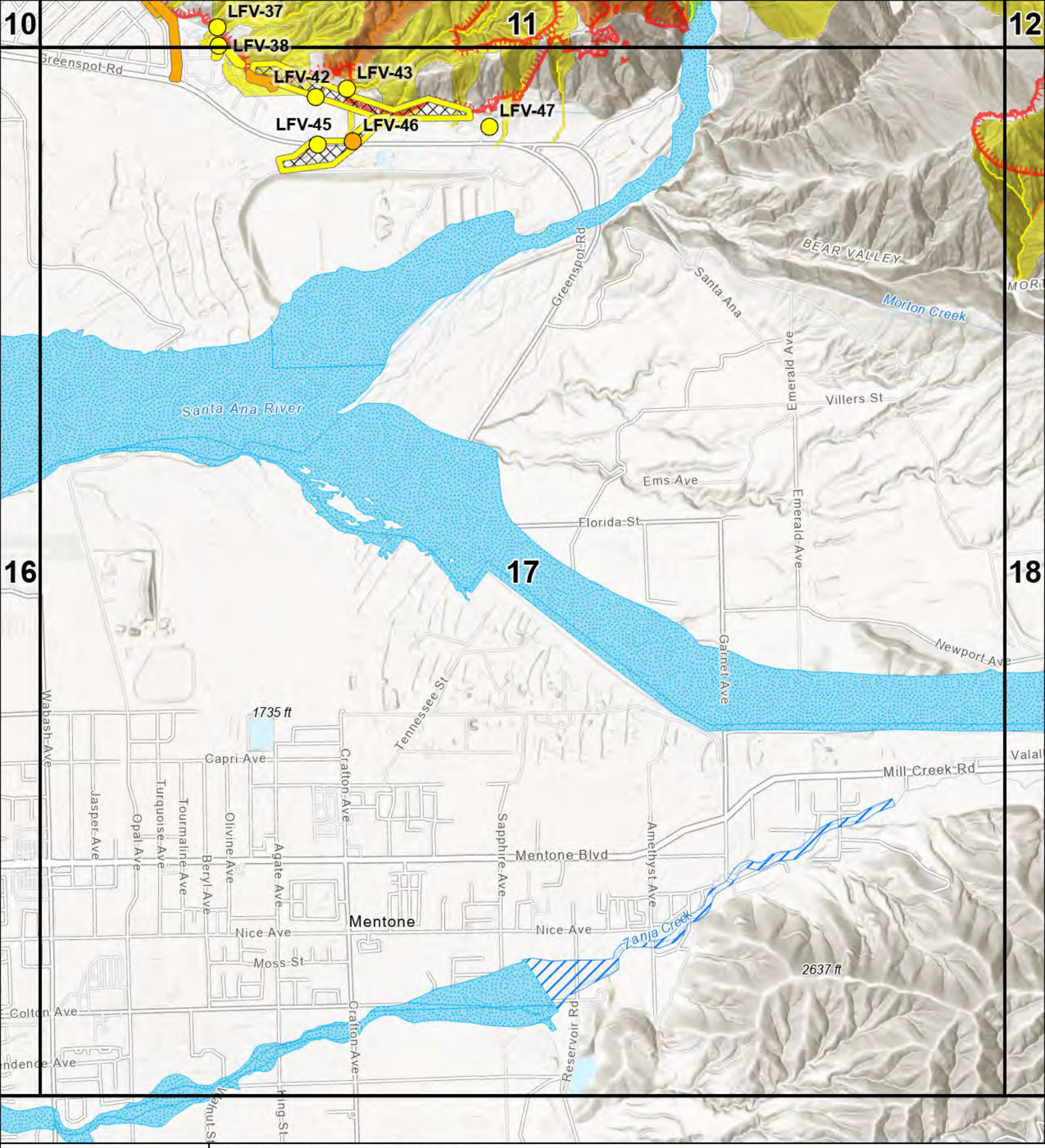
Segment Combined Hazard
15 min 24 mm/h
- Low
- Moderate
- High

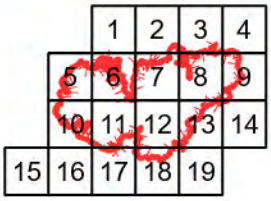
N

0 1,000 2,000 ft

0 300 600 m

- Fire Perimeter
- FEMA Special Flood Hazard Areas
- DWR 100yr Awareness Floodplains





Incident: Line Fire CA-BDF-012520

Values at Risk (Polygon)
Potential hazard to life
- Low
- Moderate
- High

Value at Risk (Point)
Potential hazard to life
- Low
- Moderate
- High

Basin Combined Hazard
15 min 24 mm/h
- Low
- Moderate
- High

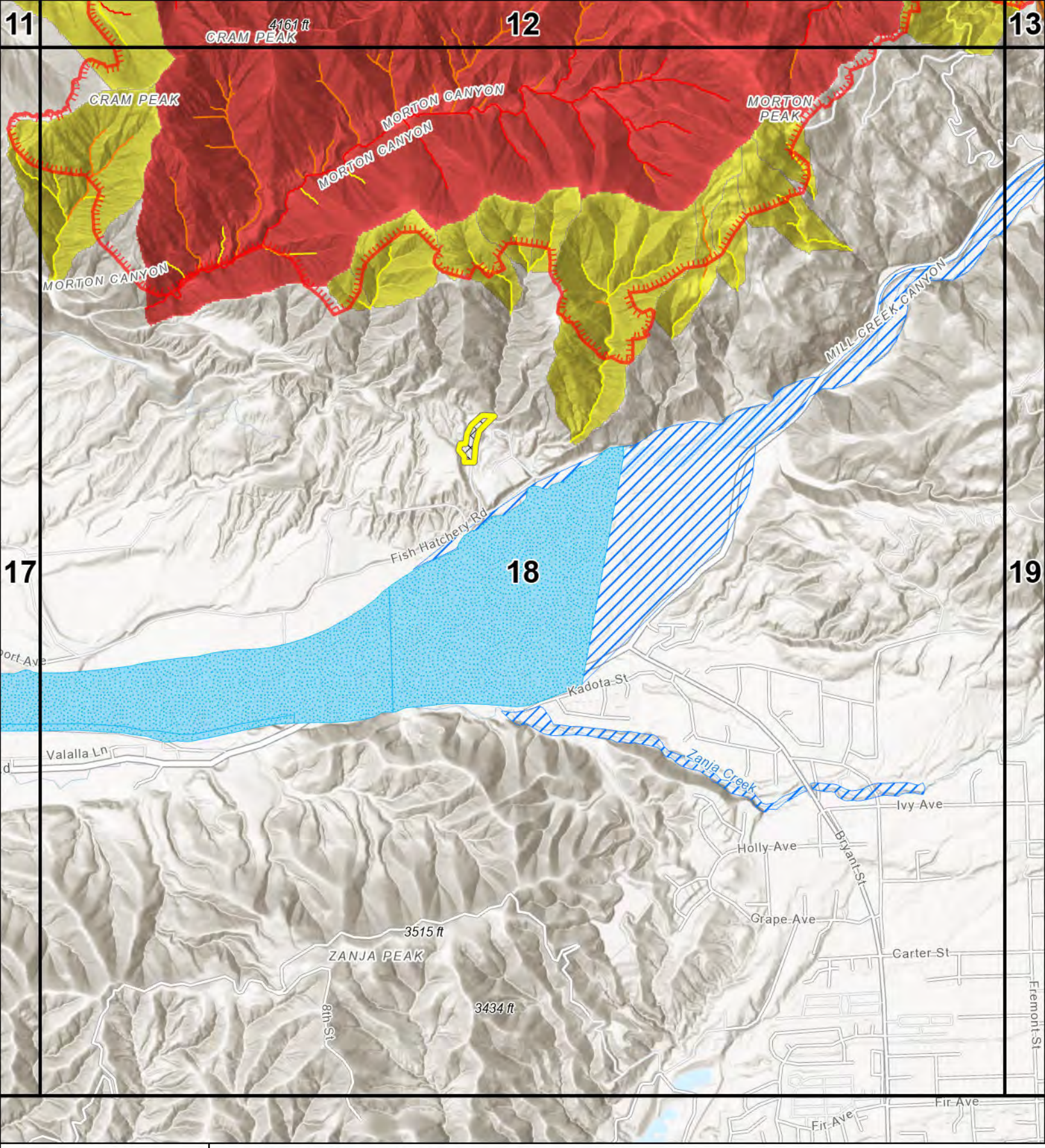
Segment Combined Hazard
15 min 24 mm/h
- Low
- Moderate
- High

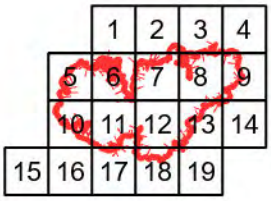
N

0 1,000 2,000 ft

0 300 600 m

- Fire Perimeter
- FEMA Special Flood Hazard Areas
- DWR 100yr Awareness Floodplains





Incident: Line Fire CA-BDF-012520

Values at Risk (Polygon)
Potential hazard to life
- Low
- Moderate
- High

Value at Risk (Point)
Potential hazard to life
- Low
- Moderate
- High

Basin Combined Hazard
15 min 24 mm/h
- Low
- Moderate
- High

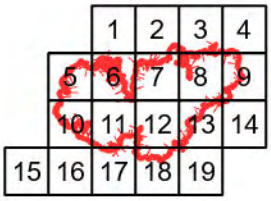
Segment Combined Hazard
15 min 24 mm/h
- Low
- Moderate
- High

N

0 1,000 2,000 ft

0 300 600 m

- Fire Perimeter
- FEMA Special Flood Hazard Areas
- DWR 100yr Awareness Floodplains



Incident: Line Fire CA-BDF-012520

Values at Risk (Polygon)
Potential hazard to life
- Low
- Moderate
- High

Value at Risk (Point)
Potential hazard to life
- Low
- Moderate
- High

Basin Combined Hazard
15 min 24 mm/h
- Low
- Moderate
- High

Segment Combined Hazard
15 min 24 mm/h
- Low
- Moderate
- High

N

0 1,000 2,000 ft

0 300 600 m

- Fire Perimeter
- FEMA Special Flood Hazard Areas
- DWR 100yr Awareness Floodplains

Appendix D – Values-at-Risk Detail Sheets

VALUE AT RISK DETAIL

Incident: Line Fire *Incident Number: CA-BDF-012520*

Community: **Hwy 330**

Site Number: **HWY-01**

Feature: **Culverted road crossing**

Feature Category: **drainage structure**

Field Observation or Potential Hazard: Culverted road crossing. Potential hazard is debris flow/flood and plugged culvert.

Possible probability of occurrence with moderate consequence = Intermediate risk.

Potential Hazard to Life: **low**

Potential Hazard to Property: **high**

Preliminary Emergency Protective Measures

(1) **Early Warning**

(2) **Clear and maintain culvert**

(3) **NA**

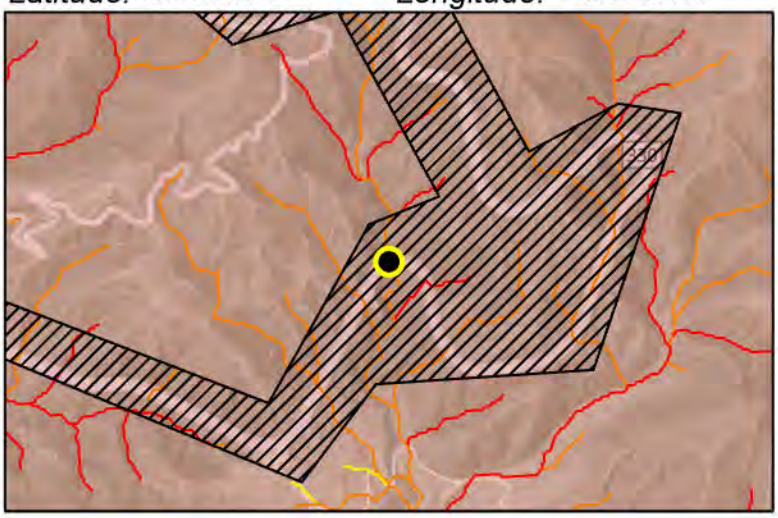
(4) **NA**

Text: NA

Description: 8' CMP culvert from basin burned at mostly moderate and high. Burned trash rack with debris plugging potential. 50' high culvert crossing creates a large-sized detention basin.

LOCATION AND PHOTO

Latitude: 34.182021 *Longitude:* -117.149894



VALUE AT RISK DETAIL

Incident: Line Fire *Incident Number: CA-BDF-012520*

Community: **Hwy 330**

Site Number: **HWY-02**

Feature: **Highway 330 within burn perimeter**

Feature Category: **multiple**

Field Observation or Potential Hazard: Potential hazard is debris flow/flood, rockfalls, and flooding of roadway, and plugging of culverts along stretch of highway intersecting burned drainages.

Potential Hazard to Life: **moderate**

Potential Hazard to Property: **high**

Preliminary Emergency Protective Measures

(1) **Early Warning**

(2) **Signage**

(3) **Monitor and maintain**

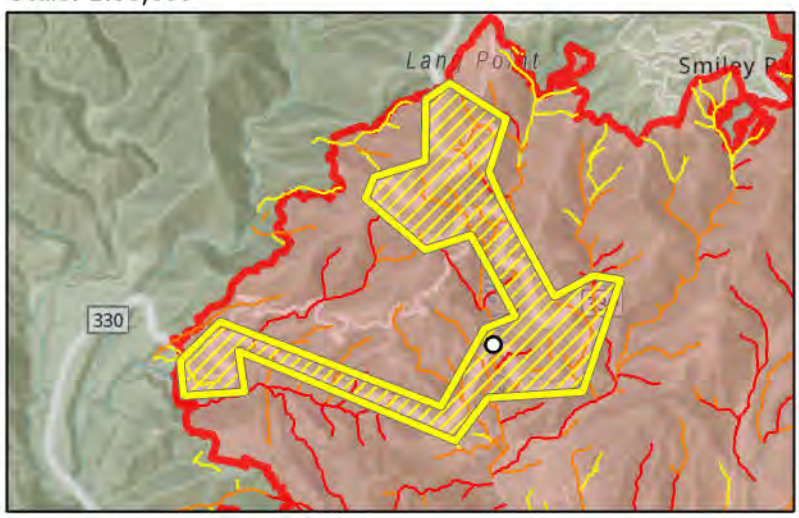
(4) **Deflection structure**

Text: Traffic control

Description: High potential for flows to impact roadway throughout highway. Rockfalls likely in steep areas with loose rocks. Multiple small drainages with active channels that empty onto roadway.

LOCATION AND PHOTO

Scale: 1:55,000



VALUE AT RISK DETAIL

Incident: Line Fire *Incident Number: CA-BDF-012520*

Community: **Keller Peak**

Site Number: **KP-01**

Feature: **Keller Peak Road**

Feature Category: **other**

Field Observation or Potential Hazard: Access roadway to communications towers. Potential hazard is debris flow/flood impacting roadway and vehicle access.

Potential Hazard to Life: **low**

Potential Hazard to Property: **low**

Preliminary Emergency Protective Measures

(1) **Early Warning**

(2) **Monitor and maintain**

(3) **Signage**

(4) **NA**

Text: NA

Description: Severely burned slope with large granitic boulders and daylighted bedrock throughout. Rain may mobilize sand (grus) and deposit along roadway.

LOCATION AND PHOTO

Value at Risk (Point)

Values at Risk (Polygon)

Values at Risk (Polygon) (Focused)

Fire Perimeter

Segment Combined Hazard

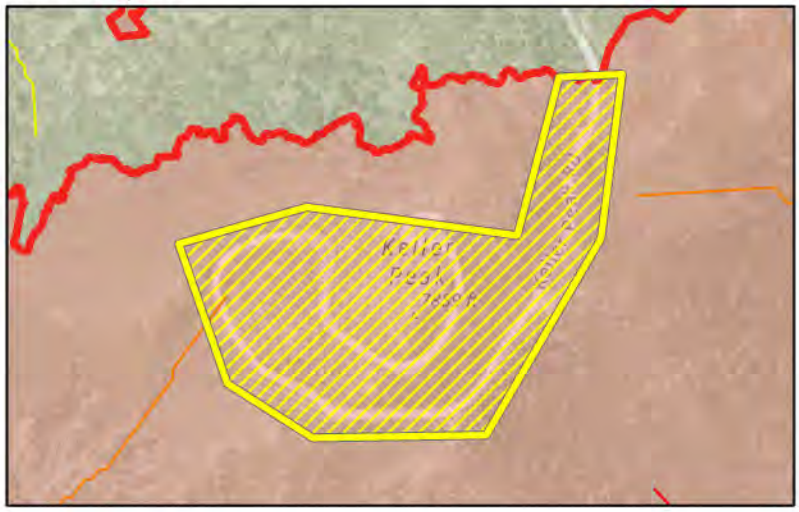
15 min 24 mm/hr

Low

Moderate

High

Scale: 1:9,000



VALUE AT RISK DETAIL

Incident: Line Fire *Incident Number: CA-BDF-012520*

Community: **Highland / Cook Creek**

Site Number: **LFV-01**

Feature: **Bridge culvert**

Feature Category: **drainage structure**

Field Observation or Potential Hazard: Bridge over Cook Creek for access road to Water Plant. Potential hazard is plugging of bridge arch culvert in large debris flow event; debris could divert to Highland Ave.

Possible probability of occurrence with moderate consequence = Intermediate risk.

Potential Hazard to Life: **low**

Potential Hazard to Property: **moderate**

Preliminary Emergency Protective Measures

(1) **Early Warning**

(2) **Clear and maintain culvert**

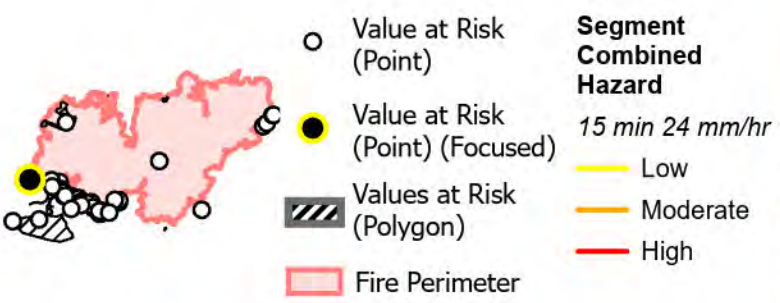
(3) **Debris barrier**

(4) **NA**

Text: NA

Description:

LOCATION AND PHOTO



Latitude: 34.136305 *Longitude:* -117.189397

VALUE AT RISK DETAIL

Incident: Line Fire *Incident Number: CA-BDF-012520*

Community: **Highland**

Site Number: **LFV-02**

Feature: **Building, community hall**

Feature Category: **recreational**

Field Observation or Potential Hazard: American Legion Post 421 in path of possible avulsion flow from Cook Creek.

Possible probability of occurrence with moderate consequence = Intermediate risk.

Potential Hazard to Life: **low**

Potential Hazard to Property: **moderate**

Preliminary Emergency Protective Measures

(1) **Early Warning**

(2) **Deflection structure**

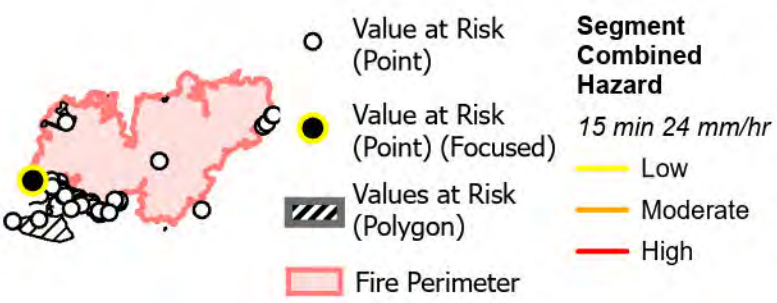
(3) **NA**

(4) **NA**

Text: NA

Description:

LOCATION AND PHOTO



Latitude: 34.135274 *Longitude:* -117.186620

VALUE AT RISK DETAIL

Incident: Line Fire *Incident Number: CA-BDF-012520*

Community: **Highland**

Site Number: **LFV-03**

Feature: **Fill dam and downstream crossings**

Feature Category: **utilities**

Field Observation or Potential Hazard: Large fill crossing has no observed structure (for example no culvert), water is draining out of base of fill, fill is about 60' thick on downstream side, 25' on upstream.

The fill crossing is acting as a basin that appears to be trapping debris and filling up. Overtopping and or dam failure possible. Possible probability of occurrence with moderate consequence = Intermediate risk.

Potential Hazard to Life: **low**

Potential Hazard to Property: **high**

Preliminary Emergency Protective Measures

(1) **Early Warning**

(2) **Monitor and maintain**

(3) **NA**

(4) **NA**

Text: NA

Description: Basin may need clearing. Need approximate volume of existing sediment in basin. Appears ~25% full. Significant elevation difference between upstream and downstream side: ~40 ft.

LOCATION AND PHOTO

Latitude: 34.134720 *Longitude:* -117.167935

VALUE AT RISK DETAIL

Incident: Line Fire *Incident Number: CA-BDF-012520*

Community: **Highland / Bledsoe Gulch**

Site Number: **LFV-04**

Feature: **Watercourse crossing**

Feature Category: **drainage structure**

Field Observation or Potential Hazard: Debris basin with standpipe. Potential hazard is debris flow plugging standpipe and filling basin, with potential to overtop and impact downstream watercourse.

Possible probability of occurrence with major consequence = High risk.

Potential Hazard to Life: **low**

Potential Hazard to Property: **high**

Preliminary Emergency Protective Measures

(1) **Clear and maintain basin**

(2) **Monitor and maintain**

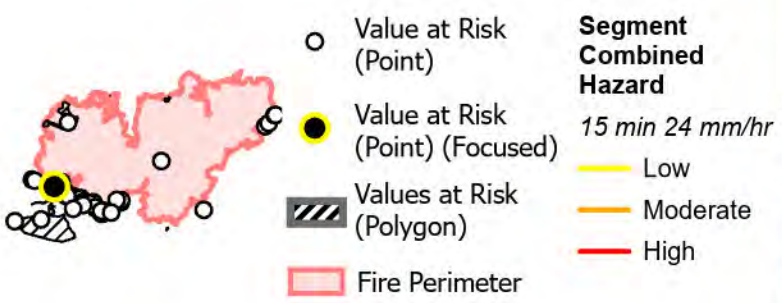
(3) **NA**

(4) **NA**

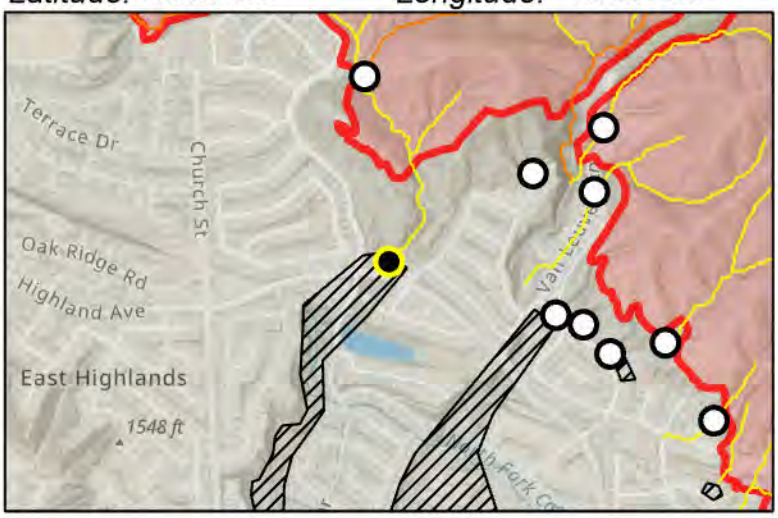
Text: NA

Description:

LOCATION AND PHOTO



Latitude: 34.129403 *Longitude:* -117.167466



VALUE AT RISK DETAIL

Incident: Line Fire *Incident Number: CA-BDF-012520*

Community: **Highland**

Site Number: **LFV-05**

Feature: **Homes, drainage channels, culverts**

Feature Category: **multiple**

Field Observation or Potential Hazard: Possible zone of debris flow and flood inundation through the built environment.

Potential Hazard to Life: **moderate**

Potential Hazard to Property: **high**

Preliminary Emergency Protective Measures

(1) **Early Warning**

(2) **Monitor and maintain**

(3) **Signage**

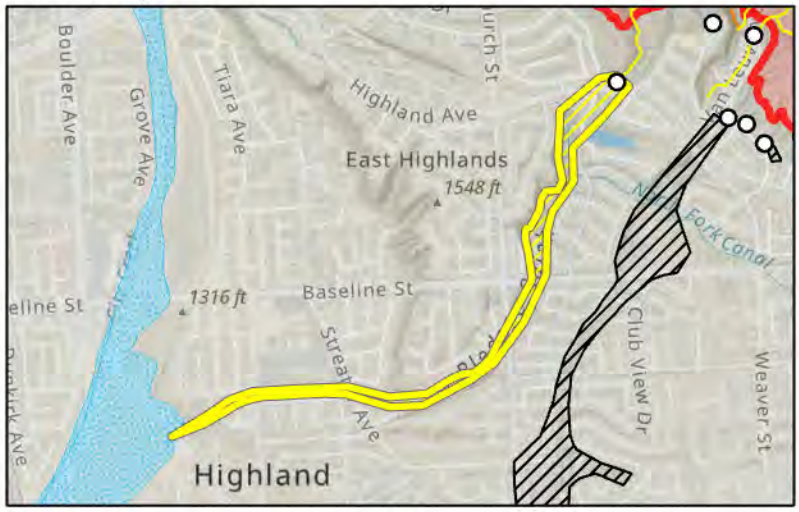
(4) **NA**

Text: NA

Description:

LOCATION AND PHOTO

Scale: 1:36,000



VALUE AT RISK DETAIL

Incident: Line Fire *Incident Number: CA-BDF-012520*

Community: **Highland**

Site Number: **LFV-06**

Feature: **Home**

Feature Category: **home**

Field Observation or Potential Hazard: Residence located at the outlet of a small drainage. The potential hazard is debris flood that could avulse from concrete drainage ditch and impact rear yard, swimming pool, and residence.

Possible probability of occurrence with moderate consequence = Intermediate risk.

Potential Hazard to Life: **low**

Potential Hazard to Property: **moderate**

Preliminary Emergency Protective Measures

(1) **Early Warning**

(2) **Monitor and maintain**

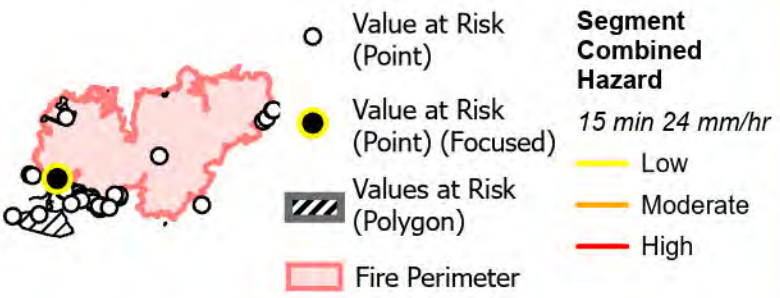
(3) **Deflection structure**

(4) **NA**

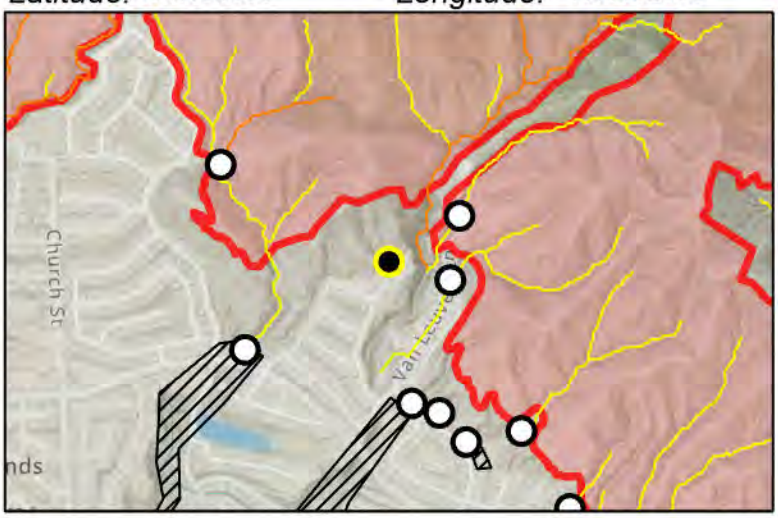
Text: NA

Description: Drainage outlets into v-ditch that runs adjacent to north side yard. Rear yard fencing includes block wall and wrought iron. Upslope basin is relatively small, with the upper portion burned at low severity.

LOCATION AND PHOTO



Latitude: 34.131680 *Longitude:* -117.162360



VALUE AT RISK DETAIL

Incident: Line Fire *Incident Number: CA-BDF-012520*

Community: **Highland**

Site Number: **LFV-07**

Feature: **Culvert road crossing**

Feature Category: **drainage structure**

Field Observation or Potential Hazard: Culverted road crossing providing access to water tank. Potential hazard is plugging of culvert with debris, leading to overtopping and nuisance flooding along paved access road.

Possible probability of occurrence with low consequence = Low risk.

Potential Hazard to Life: **low**

Potential Hazard to Property: **low**

Preliminary Emergency Protective Measures

(1) **Early Warning**

(2) **Clear and maintain culvert**

(3) **NA**

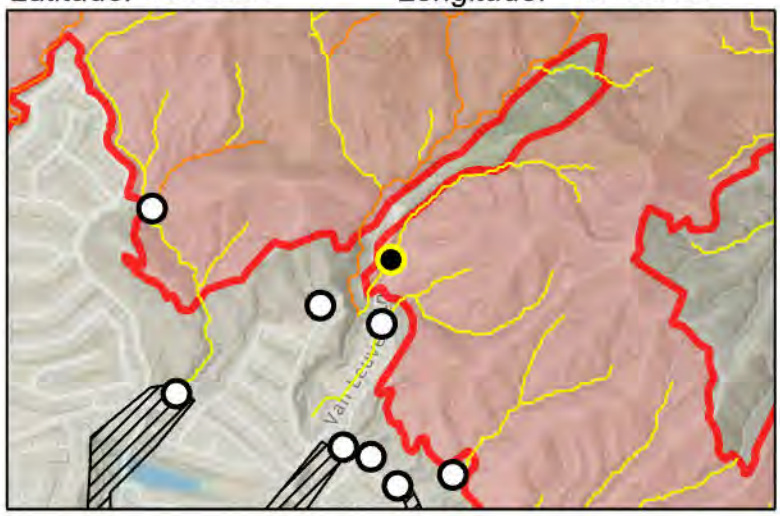
(4) **NA**

Text: NA

Description: Upstream basin relatively small and burned at low severity with some moderate. Evidence of past overtopping was observed that included minor scour on downstream slope of crossing. Culvert is 48-inch CMP with top of pipe about 2 ft below road surface.

LOCATION AND PHOTO

Latitude: 34.132870 *Longitude:* -117.159852



VALUE AT RISK DETAIL

Incident: Line Fire *Incident Number: CA-BDF-012520*

Community: **Highland**

Site Number: **LFV-08**

Feature: **Home**

Feature Category: **home**

Field Observation or Potential Hazard: Residence located at the outlet of a small drainage. Potential hazard is debris flow / flood that could mobilize burnt debris and sediment and impact property fence wall and rear yard of residence.

Possible probability of occurrence with low consequence = Low risk.

Potential Hazard to Life: **low**

Potential Hazard to Property: **low**

Preliminary Emergency Protective Measures

(1) **Early Warning**

(2) **Monitor and maintain**

(3) **NA**

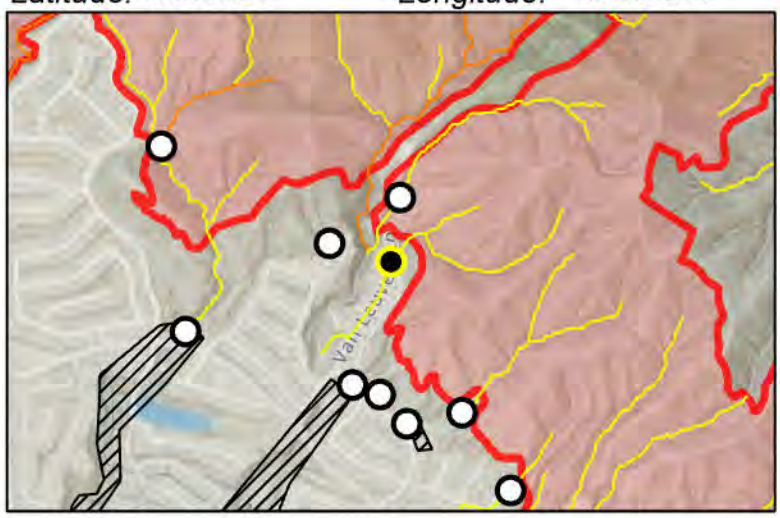
(4) **NA**

Text: NA

Description: Upstream basin is small and burned at low severity. No notable incision in drainage channel. Unknown if rear yard fence wall was designed / constructed as an impact / diversion wall.

LOCATION AND PHOTO

Latitude: 34.131057 *Longitude:* -117.160294



VALUE AT RISK DETAIL

Incident: Line Fire *Incident Number: CA-BDF-012520*

Community: **Highland**

Site Number: **LFV-09**

Feature: **Drainage crossing structure**

Feature Category: **drainage structure**

Field Observation or Potential Hazard: Culverted road crossing. Potential hazard is plugging of culvert with debris, leading to overtopping, impacting road surface with overland flow being directed easterly along Pleasant View Lane.

Possible probability of occurrence with minor consequence = Low risk.

Potential Hazard to Life: **low**

Potential Hazard to Property: **low**

Preliminary Emergency Protective Measures

(1) **Early Warning**

(2) **Clear and maintain culvert**

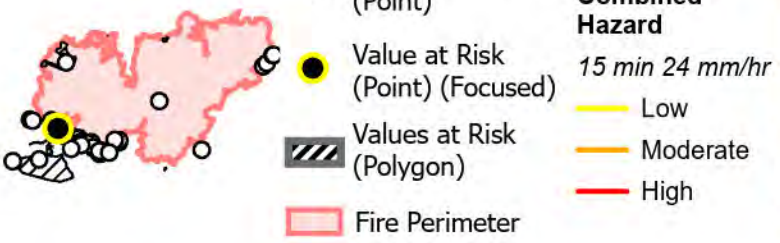
(3) **NA**

(4) **NA**

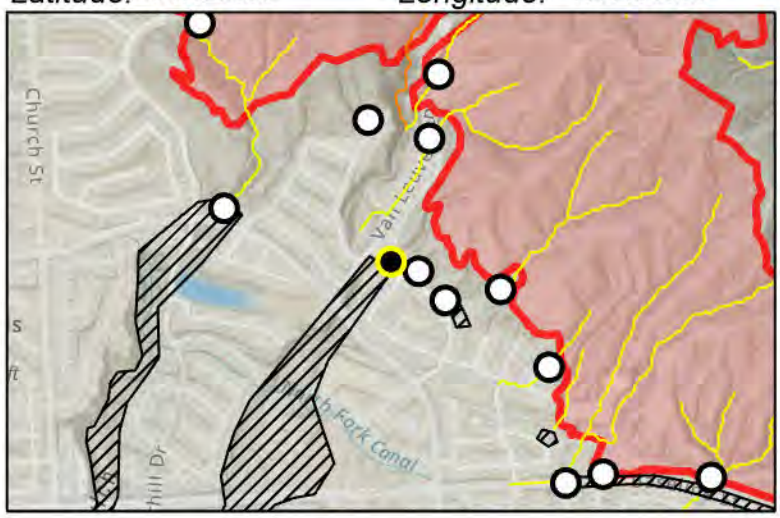
Text: NA

Description: Crossing consists of 36" CMP drop structure to pipe that extends below paved roadway. Debris has accumulated around inlet from recent rains. Upstream basin is small and burned at low severity. Concrete v-ditch leading to inlet is about 8' wide at crest by 3' deep.

LOCATION AND PHOTO



Latitude: 34.127608 *Longitude:* -117.161856



VALUE AT RISK DETAIL

Incident: Line Fire *Incident Number: CA-BDF-012520*

Community: **East Highlands Ranch**

Site Number: **LFV-10**

Feature: **Homes and Arroyo Verde elementary school**

Feature Category: **multiple**

Field Observation or Potential Hazard: Inundation area along former Elder Gulch drainage that is converted to a walkway.

Potential Hazard to Life: **high**

Potential Hazard to Property: **high**

Preliminary Emergency Protective Measures

(1) **Early Warning**

(2) **Signage**

(3) **Debris barrier**

(4) **NA**

Text: NA

Description:

LOCATION AND PHOTO

Value at Risk (Point)

Values at Risk (Polygon)

Values at Risk (Polygon) (Focused)

Fire Perimeter

Segment Combined Hazard

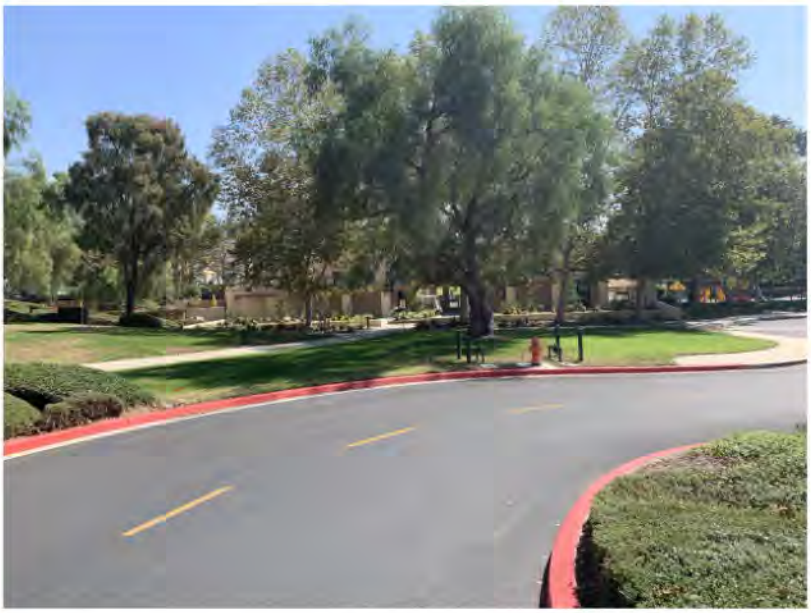
15 min 24 mm/hr

Low

Moderate

High

Scale: 1:52,000



VALUE AT RISK DETAIL

Incident: Line Fire *Incident Number: CA-BDF-012520*

Community: **Highland**

Site Number: **LFV-11**

Feature: **Residence, drainage structure**

Feature Category: **multiple**

Field Observation or Potential Hazard: Residence located at the outlet of a small drainage, with drainage (concrete v-ditch) extending below rear yard fence wall and through residence yard. Potential hazard is for flood / debris flood to impact residence and rear yard.

Low probability of occurrence with minor consequence = Low risk.

Potential Hazard to Life: **low**

Potential Hazard to Property: **low**

Preliminary Emergency Protective Measures

(1) **Early Warning**

(2) **Monitor and maintain**

(3) **NA**

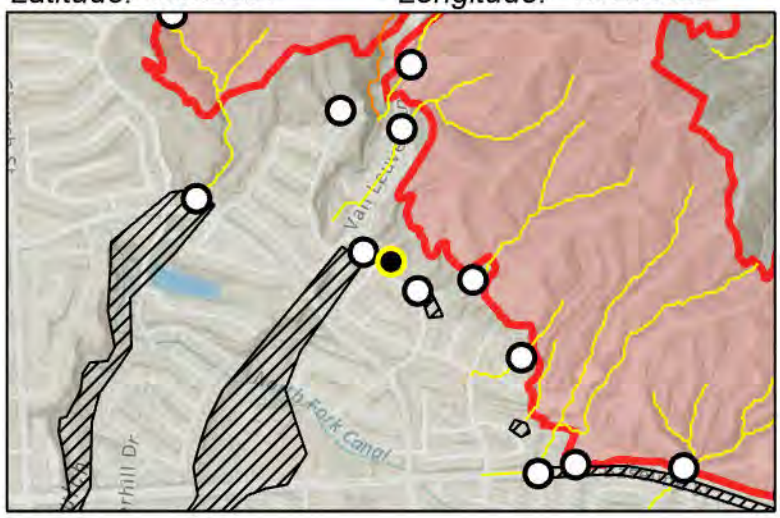
(4) **NA**

Text: NA

Description: Small basin burned at low severity drains to small v-ditch directed toward rear yard of home. V-ditch extends below block wall, running through rear / side yard to street.

LOCATION AND PHOTO

Latitude: 34.127291 *Longitude:* -117.160929



VALUE AT RISK DETAIL

Incident: Line Fire *Incident Number: CA-BDF-012520*

Community: **Highland**

Site Number: **LFV-12**

Feature: **Roadway**

Feature Category: **multiple**

Field Observation or Potential Hazard: Pleasant View Lane adjacent to drainage inlet structure and water tank access road. Potential hazard is nuisance, sediment-laden flood flows down the water tank access road and across and down Pleasant View Lane.

Potential for inlet to plug up, leading to backwater effects that will contribute to runoff down access road toward public street.

Potential Hazard to Life: **low**

Potential Hazard to Property: **low**

Preliminary Emergency Protective Measures

(1) **Early Warning**

(2) **Monitor and maintain**

(3) **Deflection structure**

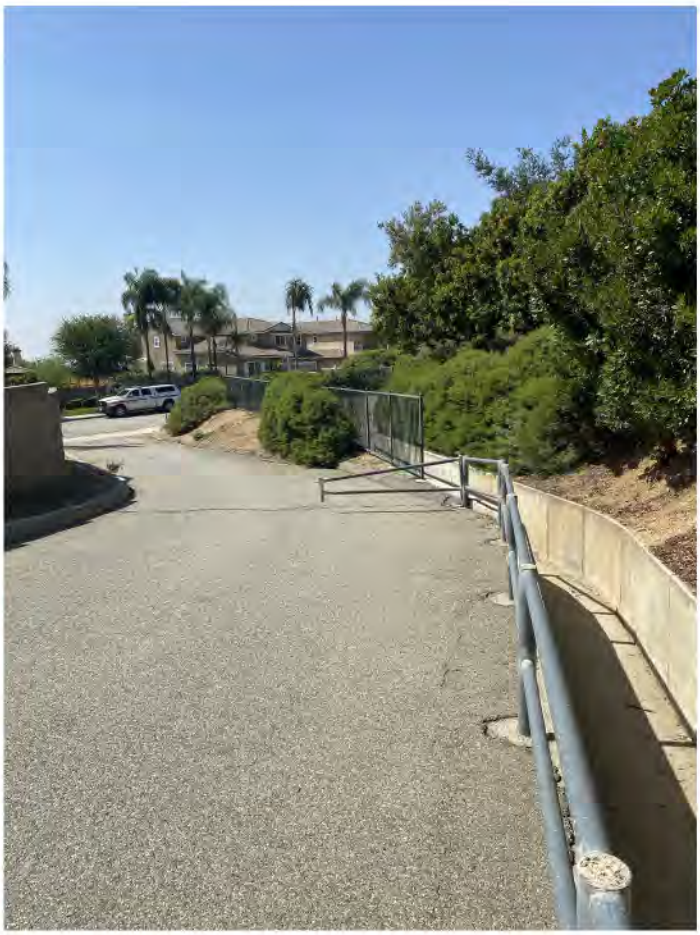
(4) **NA**

Text: NA

Description: Flow path is perceived to be unrestrained down water tank access road, with much of the runoff not being directed into adjacent drainage ditch. The inlet structure includes a 48-inch RCP drop structure with 6 ft freeboard so backwater effects are more likely than overtopping.

LOCATION AND PHOTO

Latitude: 34.126416 *Longitude:* -117.160070



VALUE AT RISK DETAIL

Incident: Line Fire *Incident Number: CA-BDF-012520*

Community: **Highland**

Site Number: **LFV-13**

Feature: **Homes**

Feature Category: **home**

Field Observation or Potential Hazard: Multiple residences located adjacent to potential flow path. Potential hazard is avulsion of sediment laden flow from water tank access road toward homes, resulting in impacts to rear fence wall and inundation of rear yards and residences.

Potential Hazard to Life: **low**

Potential Hazard to Property: **moderate**

Preliminary Emergency Protective Measures

(1) **Early Warning**

(2) **Monitor and maintain**

(3) **Deflection structure**

(4) **NA**

Text: NA

Description: Upslope drainage burned at moderate severity. Some k-rail has been placed to impede / maintain flow down access road, with some k-rail retaining 1-2 ft of sediment.

LOCATION AND PHOTO

Value at Risk (Point)

Values at Risk (Polygon)

Values at Risk (Polygon) (Focused)

Fire Perimeter

Segment Combined Hazard

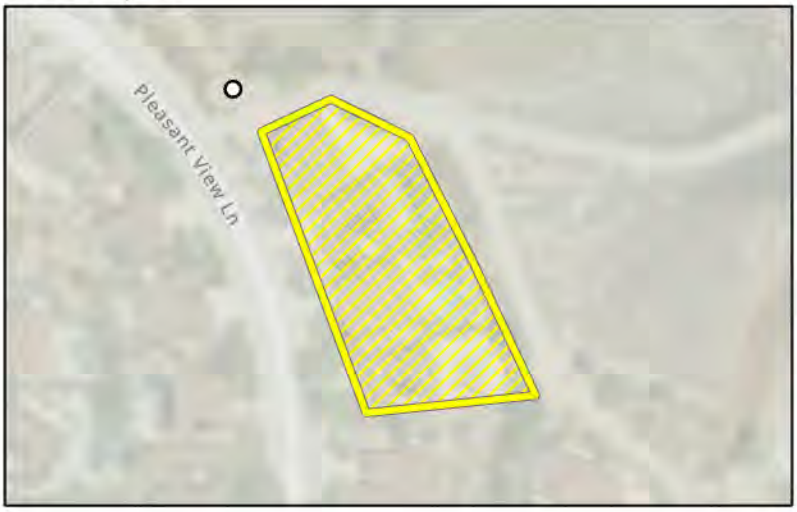
15 min 24 mm/hr

Low

Moderate

High

Scale: 1:2,000



VALUE AT RISK DETAIL

Incident: Line Fire *Incident Number: CA-BDF-012520*

Community: **Highland**

Site Number: **LFV-14**

Feature: **Water tank and equipment**

Feature Category: **utilities**

Field Observation or Potential Hazard: Water tank and associated equipment obstructing canyon drainage and within potential flow path. The potential hazard is for debris flood to impact water tank and equipment.

Possible probability of occurrence with high consequence = High risk.

Potential Hazard to Life: **low**

Potential Hazard to Property: **high**

Preliminary Emergency Protective Measures

(1) **Early Warning**

(2) **Monitor and maintain**

(3) **Deflection structure**

(4) **NA**

Text: NA

Description: Moderately sized basin burned at low severity. Tank is situated on a fill pad that has essentially plugged the canyon. Drainage broadens just upstream of tank, but limited area for flow around improvements. K rail has been installed to help protect structures and direct flow around tank and along / down access road toward Pleasant View Lane.

LOCATION AND PHOTO

Latitude: 34.126641 *Longitude:* -117.158155

VALUE AT RISK DETAIL

Incident: Line Fire *Incident Number: CA-BDF-012520*

Community: **Highland**

Site Number: **LFV-15**

Feature: **Home**

Feature Category: **home**

Field Observation or Potential Hazard: Residence located at the outlet of a small drainage. Potential hazard is for flood that could mobilize burnt debris and available sediment and impact fence wall, rear yard, and residence.

Possible probability of occurrence with moderate consequence = Intermediate risk.

Potential Hazard to Life: **low**

Potential Hazard to Property: **moderate**

Preliminary Emergency Protective Measures

(1) **Early Warning**

(2) **Monitor and maintain**

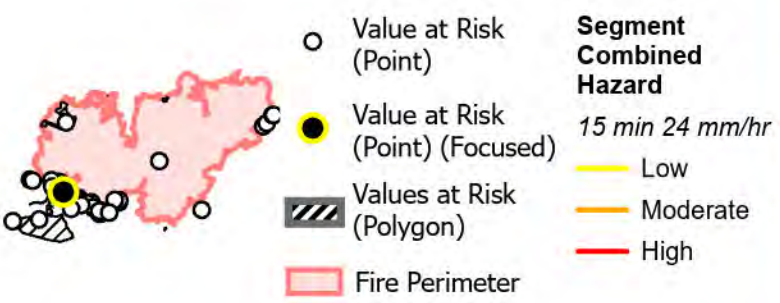
(3) **Deflection structure**

(4) **NA**

Text: NA

Description: Basin burned at low severity. No incised channel but drainage has U-shape feature with abundant sediment.

LOCATION AND PHOTO



Latitude: 34.124344 *Longitude:* -117.156648

VALUE AT RISK DETAIL

Incident: Line Fire *Incident Number: CA-BDF-012520*

Community: **Highland**

Site Number: **LFV-16**

Feature: **Multiple homes**

Feature Category: **home**

Field Observation or Potential Hazard: Multiple residences located adjacent to potential flow path. Potential hazard is flood flows avulsing from constructed drainage channels, impacting rear yard fence walls and inundating property.

Potential Hazard to Life: **low**

Potential Hazard to Property: **moderate**

Preliminary Emergency Protective Measures

(1) **Early Warning**

(2) **Monitor and maintain**

(3) **Deflection structure**

(4) **NA**

Text: NA

Description: The basin is moderately sized and burned at low severity. There is a small upstream debris basin that could be overwhelmed during a significant storm event, and overtopping flows would follow down along access roads and directed toward the rear yard of homes.

LOCATION AND PHOTO

Value at Risk (Point)

Values at Risk (Polygon)

Values at Risk (Polygon) (Focused)

Fire Perimeter

Segment Combined Hazard

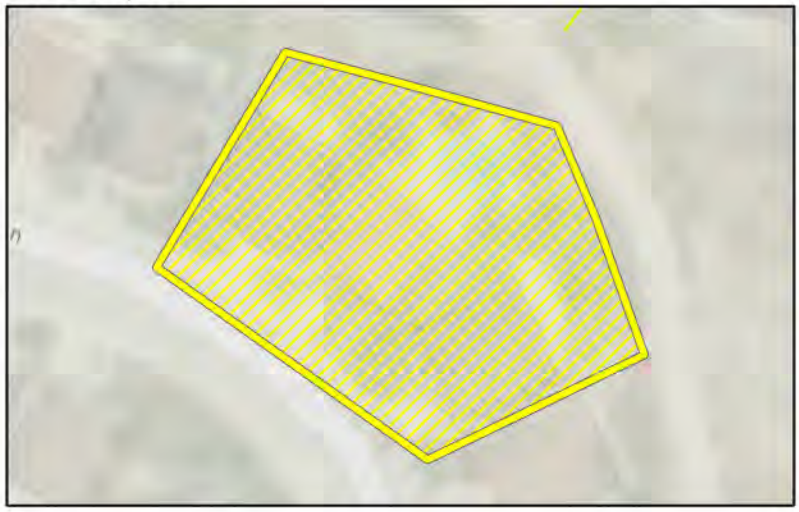
15 min 24 mm/hr

Low

Moderate

High

Scale: 1:1,000



VALUE AT RISK DETAIL

Incident: Line Fire *Incident Number: CA-BDF-012520*

Community: **Highland**

Site Number: **LFV-17**

Feature: **Roadway**

Feature Category: **other**

Field Observation or Potential Hazard: Potential for nuisance flood flows across Baseline Road emanating from recreational trail and adjacent v-ditch. Upstream debris basin has evidence of past overtopping. Flows would be directed down this trail and onto Baseline.

Possible probability of occurrence with minor consequence = Low risk.

Potential Hazard to Life: **low**

Potential Hazard to Property: **low**

Preliminary Emergency Protective Measures

(1) **Monitor and maintain**

(2) **Sandbags**

(3) **NA**

(4) **NA**

Text: NA

Description:

LOCATION AND PHOTO

Latitude: 34.121017 *Longitude:* -117.156300

VALUE AT RISK DETAIL

Incident: Line Fire *Incident Number: CA-BDF-012520*

Community: **Highland**

Site Number: **LFV-18**

Feature: **Storm drain inlet**

Feature Category: **drainage structure**

Field Observation or Potential Hazard: Small debris basin with 48-inch CMP drop structure. Potential hazard is plugging of inlet, leading to overtopping of basin and nuisance flood flow diverted to spillway and onto Baseline Road.

Possible probability of occurence and minor consequence = Low risk.

Potential Hazard to Life: **low**

Potential Hazard to Property: **low**

Preliminary Emergency Protective Measures

(1) **Clear and maintain culvert**

(2) **Sandbags**

(3) **NA**

(4) **NA**

Text: NA

Description:

LOCATION AND PHOTO

Latitude: 34.121208 *Longitude:* -117.155006

VALUE AT RISK DETAIL

Incident: Line Fire *Incident Number: CA-BDF-012520*

Community: **Highland Area**

Site Number: **LFV-19**

Feature: **Culvert, avulsion to residential area**

Feature Category: **multiple**

Field Observation or Potential Hazard: 48" diameter culvert that contains trash rack. Potential hazard is plugging of culvert resulting in flood flows that would be diverted onto Baseline Road.

Possible probability of occurrence with moderate consequence = Intermediate risk.

Potential Hazard to Life: **low**

Potential Hazard to Property: **moderate**

Preliminary Emergency Protective Measures

(1) **Clear and maintain basin**

(2) **Monitor and maintain**

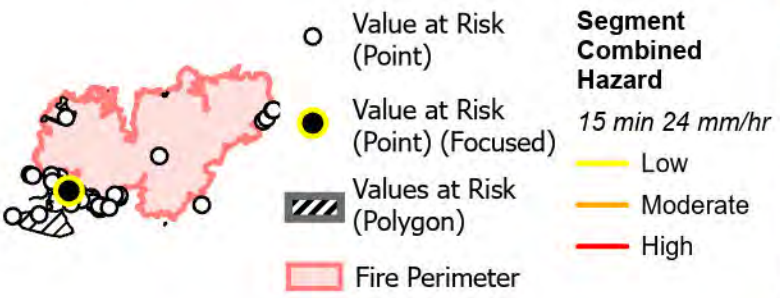
(3) **Early Warning**

(4) **NA**

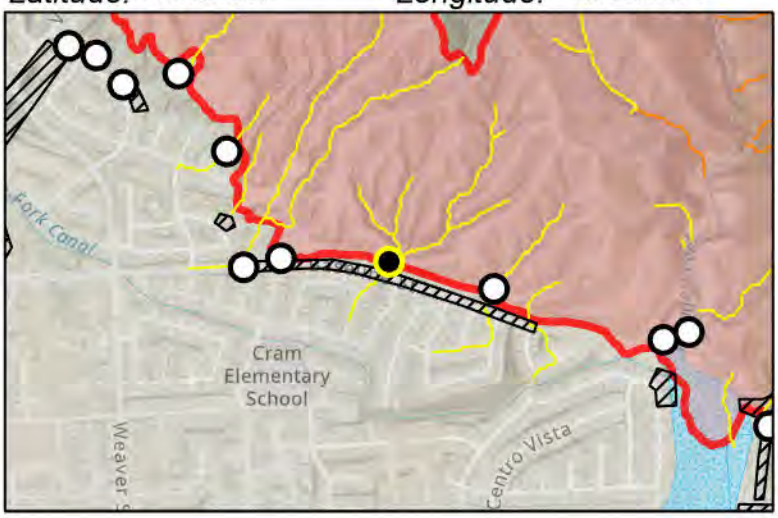
Text: NA

Description: Not able to determine where culvert flows to, did not find outlet.

LOCATION AND PHOTO



Latitude: 34.120937 *Longitude:* -117.151311



VALUE AT RISK DETAIL

Incident: Line Fire *Incident Number: CA-BDF-012520*

Community: **Highland**

Site Number: **LFV-20**

Feature: **Roadway**

Feature Category: **other**

Field Observation or Potential Hazard: Portion of Baseline Road along slope toe with upslope burned drainages. Potential hazard is nuisance flood and sediment-laden flows over road surface as a result of multiple drainages that exit mountain front and direct runoff toward roadway.

Potential Hazard to Life: **low**

Potential Hazard to Property: **low**

Preliminary Emergency Protective Measures

(1) **Early Warning**

(2) **Monitor and maintain**

(3) **NA**

(4) **NA**

Text: NA

Description: Flow path is unknown across manipulated terrain between road and drainage outlets.

LOCATION AND PHOTO

Value at Risk (Point)

Values at Risk (Polygon)

Values at Risk (Polygon) (Focused)

Fire Perimeter

Segment Combined Hazard

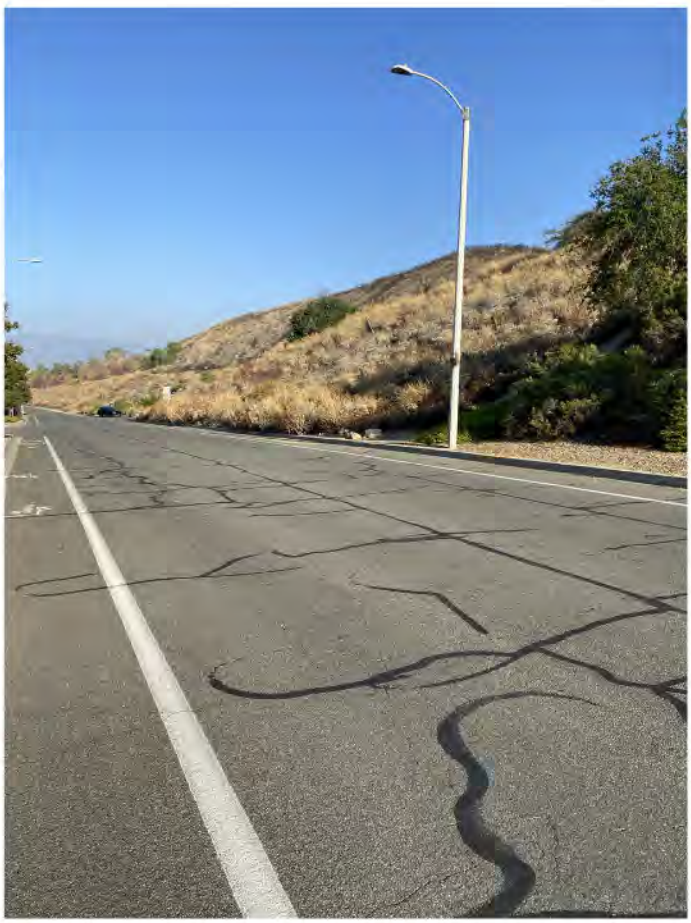
15 min 24 mm/hr

Low

Moderate

High

Scale: 1:13,000



VALUE AT RISK DETAIL

Incident: Line Fire *Incident Number: CA-BDF-012520*

Community: **Highland Area**

Site Number: **LFV-21**

Feature: **Culvert**

Feature Category: **drainage structure**

Field Observation or Potential Hazard: 36" diameter culvert that contains trash rack. Potential hazard is plugging of culvert resulting in flood flows that would be diverted onto Baseline Road.

Possible probability of occurrence with moderate consequence = Intermediate risk.

Potential Hazard to Life: **low**

Potential Hazard to Property: **moderate**

Preliminary Emergency Protective Measures

(1) **Monitor and maintain**

(2) **Clear and maintain basin**

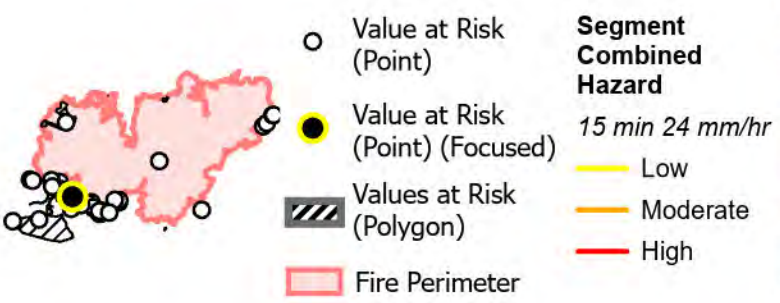
(3) **Early Warning**

(4) **NA**

Text: NA

Description:

LOCATION AND PHOTO



Latitude: 34.119992 *Longitude:* -117.147769

VALUE AT RISK DETAIL

Incident: Line Fire *Incident Number: CA-BDF-012520*

Community: **Highland / Plunge Creek**

Site Number: **LFV-22**

Feature: **Homes**

Feature Category: **home**

Field Observation or Potential Hazard: Multiple residences located adjacent to watercourse. Potential hazard is debris flood / flow avulsing from channel and impacting residences.

Potential Hazard to Life: **low**

Potential Hazard to Property: **low**

Preliminary Emergency Protective Measures

(1) **Early Warning**

(2) **Monitor and maintain**

(3) **Sandbags**

(4) **NA**

Text: NA

Description: Spoke to homeowner at 7539 Vista Rio

LOCATION AND PHOTO

Value at Risk (Point)

Values at Risk (Polygon)

Values at Risk (Polygon) (Focused)

Fire Perimeter

Segment Combined Hazard

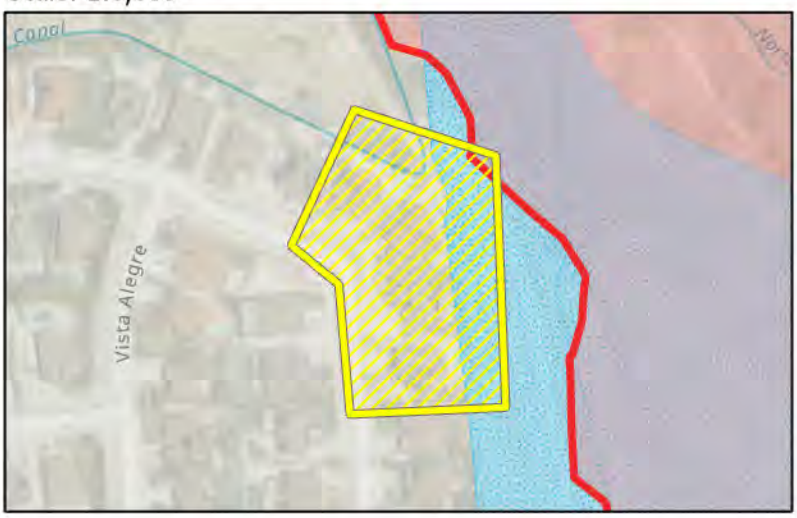
15 min 24 mm/hr

Low

Moderate

High

Scale: 1:3,000



VALUE AT RISK DETAIL

Incident: Line Fire *Incident Number: CA-BDF-012520*

Community: **Highland / Plunge Creek**

Site Number: **LFV-23**

Feature: **Water line**

Feature Category: **utilities**

Field Observation or Potential Hazard: North Fork Canal crossing over Plunge Creek supported on bents located adjacent to active channel. Potential hazard is debris flood / flow impacting canal (36" steel pipe supported on concrete bents).

Likely probability with moderate consequence = High risk.

Potential Hazard to Life: **low**

Potential Hazard to Property: **high**

Preliminary Emergency Protective Measures

(1) **Monitor and maintain**

(2) **NA**

(3) **NA**

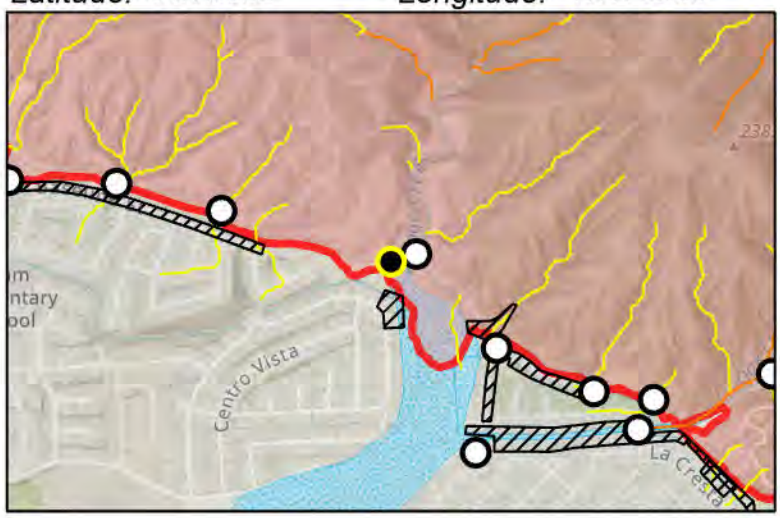
(4) **NA**

Text: NA

Description: Upstream basin burned at low mod and high. Significant burnt woody debris and boulders that could become entrained.

LOCATION AND PHOTO

Latitude: 34.118262 *Longitude:* -117.142065



VALUE AT RISK DETAIL

Incident: Line Fire *Incident Number: CA-BDF-012520*

Community: **Highland / Plunge Creek**

Site Number: **LFV-24**

Feature: **Water siphon**

Feature Category: **utilities**

Field Observation or Potential Hazard: Water utility structure (siphon?) adjacent to watercourse. Potential hazard is debris flood / flow impacting structure.

Possible probability of occurrence with major consequence = High risk.

Potential Hazard to Life: **low**

Potential Hazard to Property: **moderate**

Preliminary Emergency Protective Measures

(1) **Monitor and maintain**

(2) **Early Warning**

(3) **NA**

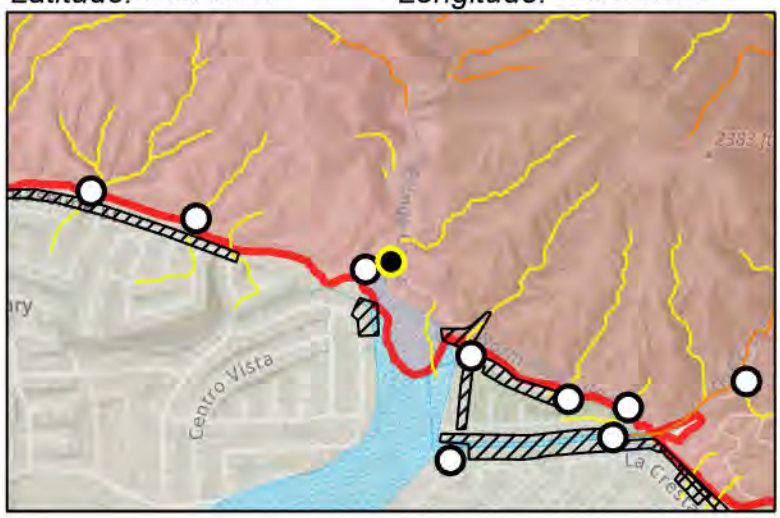
(4) **NA**

Text: NA

Description: Upstream basin burned at low mod and high. Significant burnt woody debris and boulders that could become entrained.

LOCATION AND PHOTO

Latitude: 34.118441 *Longitude:* -117.141179



VALUE AT RISK DETAIL

Incident: Line Fire *Incident Number: CA-BDF-012520*

Community: **East Highland**

Site Number: **LFV-25**

Feature: **Bridge**

Feature Category: **drainage structure**

Field Observation or Potential Hazard: Potential impact to bridge crossing of Plunge Creek via Greenspot Rd from flooding and debris flows

Possible probability of occurrence with moderate consequence = Intermediate risk.

Potential Hazard to Life: **low**

Potential Hazard to Property: **moderate**

Preliminary Emergency Protective Measures

(1) **Early Warning**

(2) **Signage**

(3) **NA**

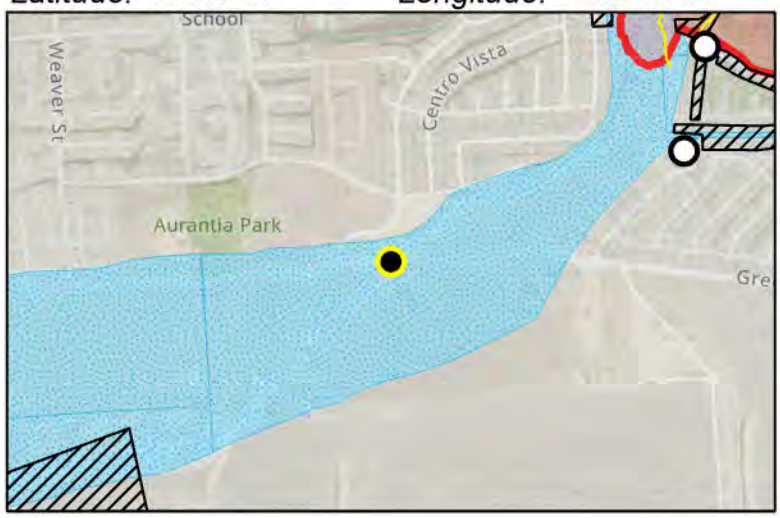
(4) **NA**

Text: NA

Description:

LOCATION AND PHOTO

Latitude: 34.110011 *Longitude:* -117.149793



VALUE AT RISK DETAIL

Incident: Line Fire *Incident Number: CA-BDF-012520*

Community: **Highland**

Site Number: **LFV-26**

Feature: **Storage containers**

Feature Category: **other**

Field Observation or Potential Hazard: Storage / junk yard situated within a drainage and at the outlet. Potential hazard is flood flow mobilizing debris and materials and impacting on site storage containers.

Potential Hazard to Life: **low**

Potential Hazard to Property: **low**

Preliminary Emergency Protective Measures

(1) **Early Warning**

(2) **Monitor and maintain**

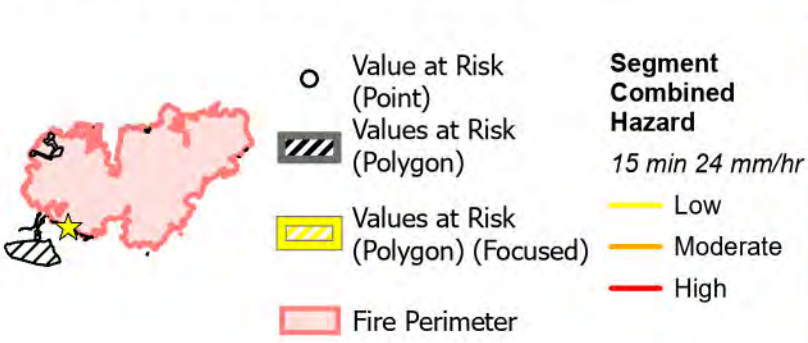
(3) **NA**

(4) **NA**

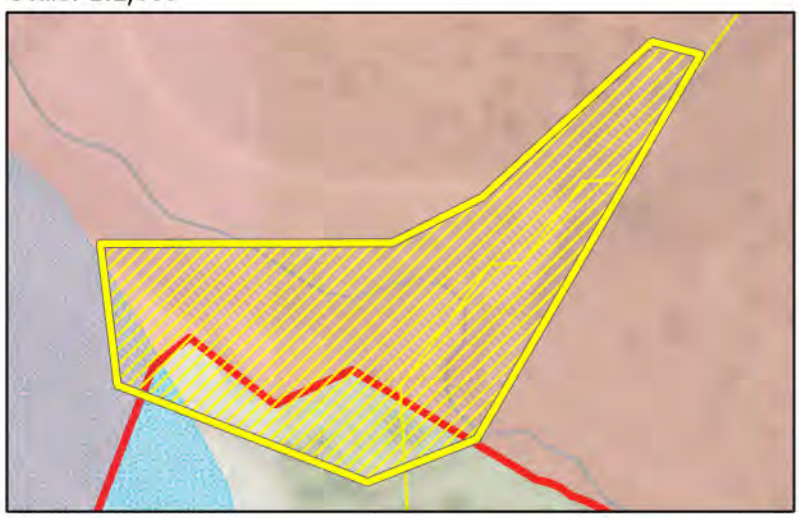
Text: NA

Description: Potential to impact downstream residential street and property line wall.

LOCATION AND PHOTO



Scale: 1:2,000



VALUE AT RISK DETAIL

Incident: Line Fire *Incident Number: CA-BDF-012520*

Community: **Highland**

Site Number: **LFV-27**

Feature: **Storm drain inlet**

Feature Category: **drainage structure**

Field Observation or Potential Hazard: Storm drain inlet adjacent to Cochrane Street. Potential hazard is clogging of inlet, resulting in overtopping flows spilling onto Cochrane Street.

Probable probability of occurrence with minor consequence = Low risk.

Potential Hazard to Life: **low**

Potential Hazard to Property: **low**

Preliminary Emergency Protective Measures

(1) **Monitor and maintain**

(2) **Sandbags**

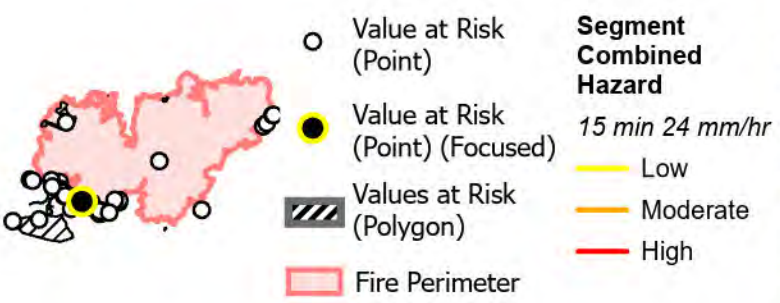
(3) **NA**

(4) **NA**

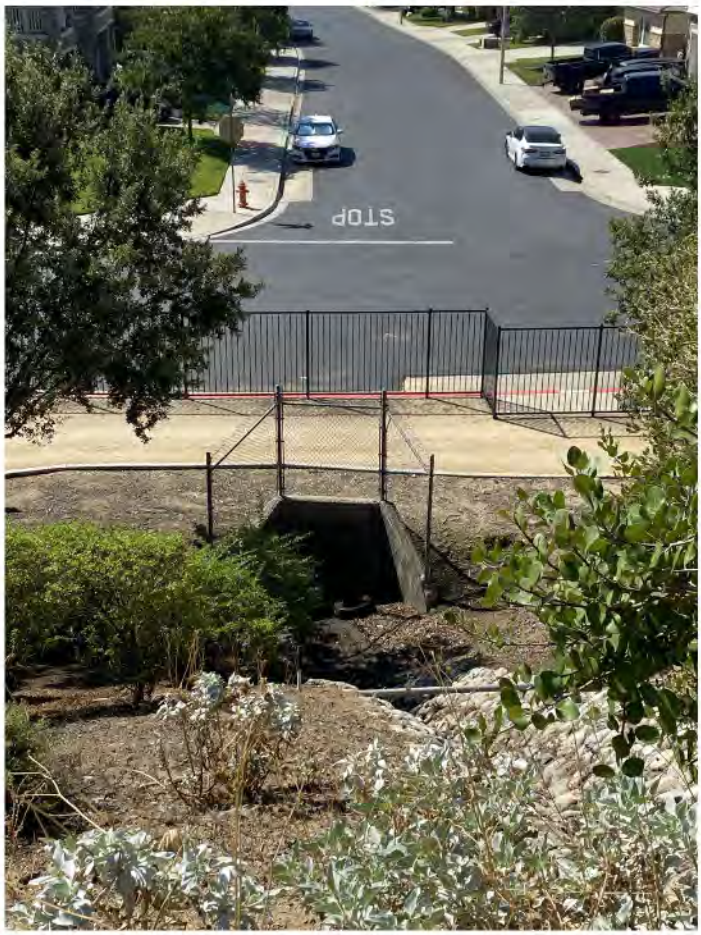
Text: NA

Description: 36" RCP with flared wing walls at base of rock-lined v-ditch.

LOCATION AND PHOTO



Latitude: 34.115627 *Longitude:* -117.138619



VALUE AT RISK DETAIL

Incident: Line Fire *Incident Number: CA-BDF-012520*

Community: **Highland**

Site Number: **LFV-28**

Feature: **Roadways, front yards of residences**

Feature Category: **multiple**

Field Observation or Potential Hazard: Kent Street and Cochrane Street located in potential flood flow path. Potential hazard is sediment-laden flows emanating from adjacent slopes onto Cochrane Street, with overland nuisance flow down Cochrane and Kent Street.

Potential Hazard to Life: **low**

Potential Hazard to Property: **moderate**

Preliminary Emergency Protective Measures

(1) **Monitor and maintain**

(2) **Sandbags**

(3) **NA**

(4) **NA**

Text: NA

Description: Upstream drainages are relatively small, steep, and burned at low severity. Runoff is conveyed from drainage outlet to concrete brow ditches and rock-lined down drains that direct flows onto Cochrane.

LOCATION AND PHOTO

Value at Risk (Point)

Values at Risk (Polygon)

Values at Risk (Polygon) (Focused)

Fire Perimeter

Segment Combined Hazard

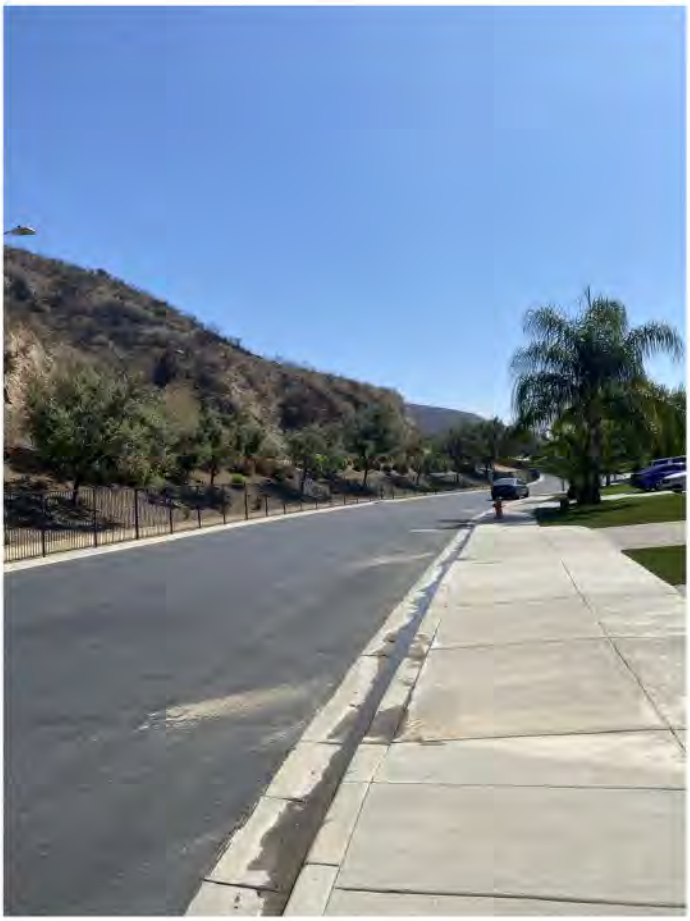
15 min 24 mm/hr

Low

Moderate

High

Scale: 1:5,000



VALUE AT RISK DETAIL

Incident: Line Fire *Incident Number: CA-BDF-012520*

Community: **Highland**

Site Number: **LFV-29**

Feature: **Storm drain inlet**

Feature Category: **drainage structure**

Field Observation or Potential Hazard: Storm drain inlet adjacent to Cochrane Street. Potential hazard is clogging of inlet, resulting in overtopping flows spilling onto Cochrane Street.

Probable probability of occurrence with minor consequence = Low risk.

Potential Hazard to Life: **low**

Potential Hazard to Property: **low**

Preliminary Emergency Protective Measures

(1) **Monitor and maintain**

(2) **Sandbags**

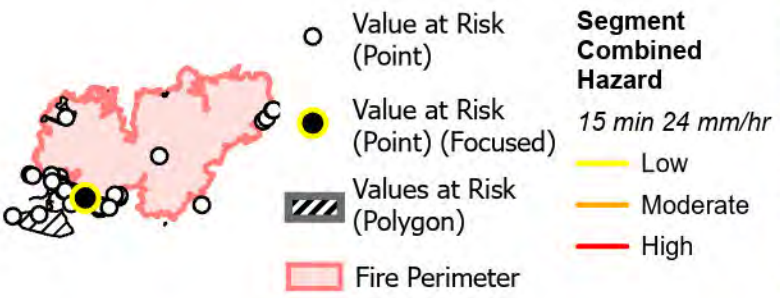
(3) **NA**

(4) **NA**

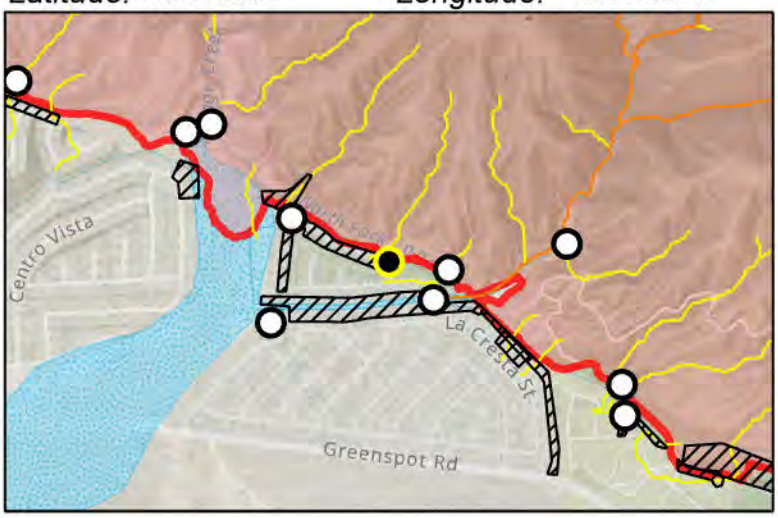
Text: NA

Description: 36" RCP with flared wing walls at base of rock-lined v-ditch. Upslope contains a small debris basin and additional runoff routing devices.

LOCATION AND PHOTO



Latitude: 34.114232 *Longitude:* -117.135373



VALUE AT RISK DETAIL

Incident: Line Fire *Incident Number: CA-BDF-012520*

Community: **Highland**

Site Number: **LFV-30**

Feature: **Park site**

Feature Category: **recreational**

Field Observation or Potential Hazard: Community park located near outlet of steep drainage. Potential hazard is flood and mobilized burnt debris and sediment impacting park site.

Probable probability of occurrence with minor consequence = Low risk.

Potential Hazard to Life: **low**

Potential Hazard to Property: **low**

Preliminary Emergency Protective Measures

(1) **Monitor and maintain**

(2) **NA**

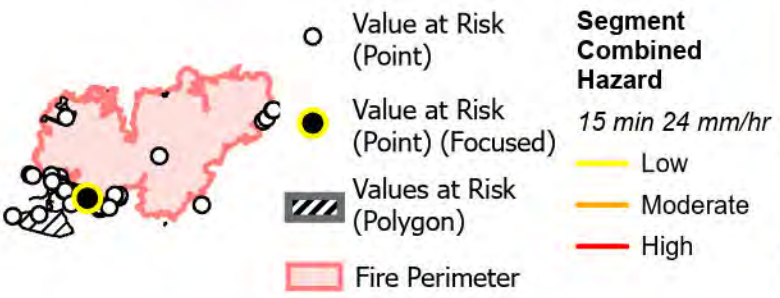
(3) **NA**

(4) **NA**

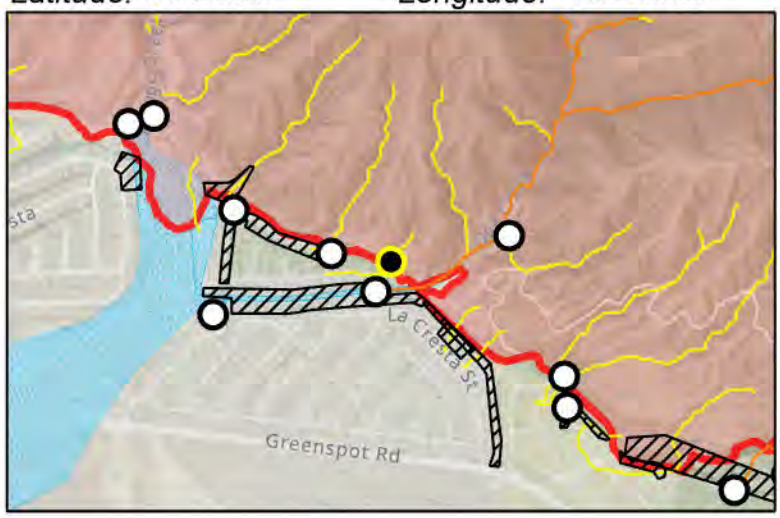
Text: NA

Description:

LOCATION AND PHOTO



Latitude: 34.113900 *Longitude:* -117.133343



VALUE AT RISK DETAIL

Incident: Line Fire *Incident Number: CA-BDF-012520*

Community: **Highland**

Site Number: **LFV-31**

Feature: **Water tanks and associated equipment**

Feature Category: **utilities**

Field Observation or Potential Hazard: Water storage tanks adjacent to Oak Creek controlled drainage channel. Potential hazard is debris flood / flow overtopping channel and inundating water tank site.

Possible probability of occurrence with major consequence = High risk.

Potential Hazard to Life:

Potential Hazard to Property: **low**

Preliminary Emergency Protective Measures

(1) **Early Warning**

(2) **Monitor and maintain**

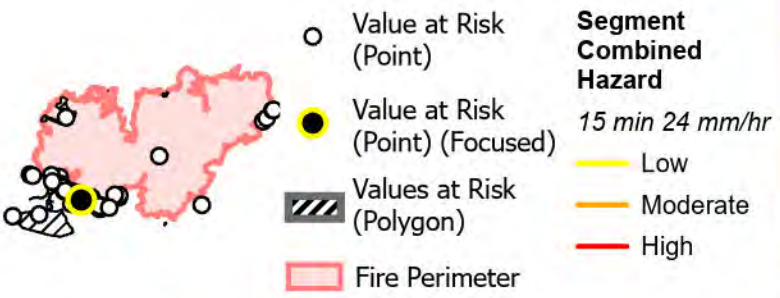
(3) **Debris barrier**

(4) **NA**

Text: NA

Description: Upstream basin is moderately-sized and steep, and was burned at low and moderate severity. There is a debris basin upstream with debris racks on both ends. This basin could reach capacity during significant storm events or following back-to-back events.

LOCATION AND PHOTO



Latitude: 34.112686 *Longitude:* -117.139538

VALUE AT RISK DETAIL

Incident: Line Fire *Incident Number: CA-BDF-012520*

Community: **Highland**

Site Number: **LFV-32**

Feature: **Homes**

Feature Category: **home**

Field Observation or Potential Hazard: Multiple single-family residences adjacent to Oak Creek controlled drainage channel. Potential hazard is debris flood / flow overtopping banks and impacting rear block walls, inundating backyards and residences.

Potential Hazard to Life: **low**

Potential Hazard to Property: **moderate**

Preliminary Emergency Protective Measures

(1) **Early Warning**

(2) **Monitor and maintain**

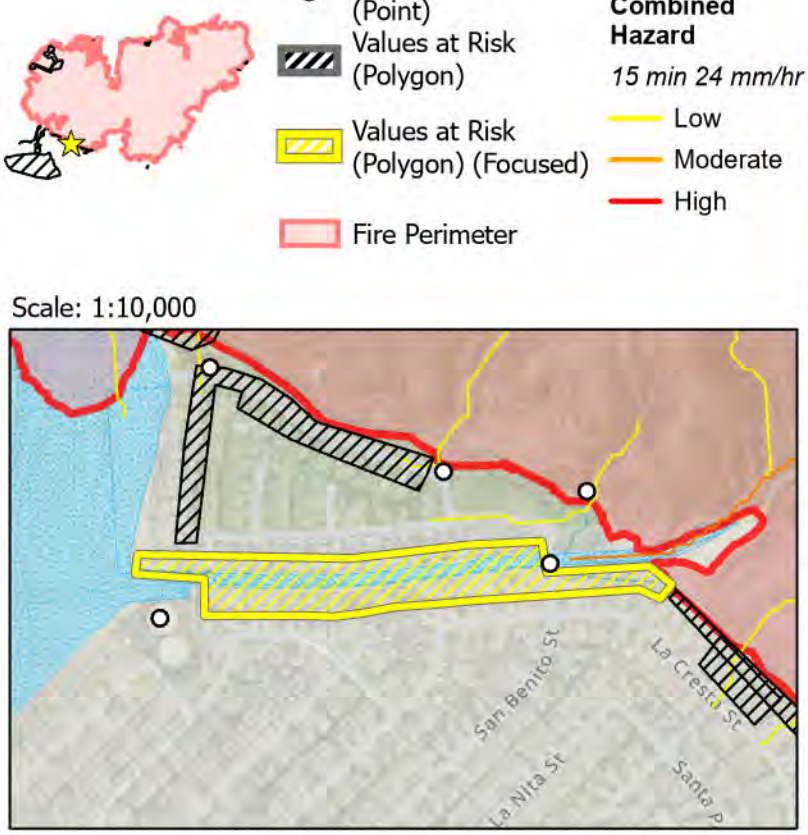
(3) **Debris barrier**

(4) **NA**

Text: K-rails may be used to help protect impacts to block walls.

Description: Upstream basin is moderately-sized and steep, and was burned at low and moderate severity. There is a debris basin upstream with debris racks on both ends. This basin could reach capacity during significant storm events or following back-to-back events.

LOCATION AND PHOTO



VALUE AT RISK DETAIL

Incident: Line Fire *Incident Number: CA-BDF-012520*

Community: **East Highlands**

Site Number: **LFV-33**

Feature: **Double-barrel box culvert**

Feature Category: **drainage structure**

Field Observation or Potential Hazard: San Benito Street crossing over channelized portion of Oak Creek. Potential hazard is plugging of culvert crossing from debris flood / flow with overtopping flows and backwater effects impacting roads and structures.

Possible probability of occurrence with moderate consequence = Intermediate risk.

Potential Hazard to Life: **low**

Potential Hazard to Property: **moderate**

Preliminary Emergency Protective Measures

(1) **Early Warning**

(2) **Clear and maintain culvert**

(3) **NA**

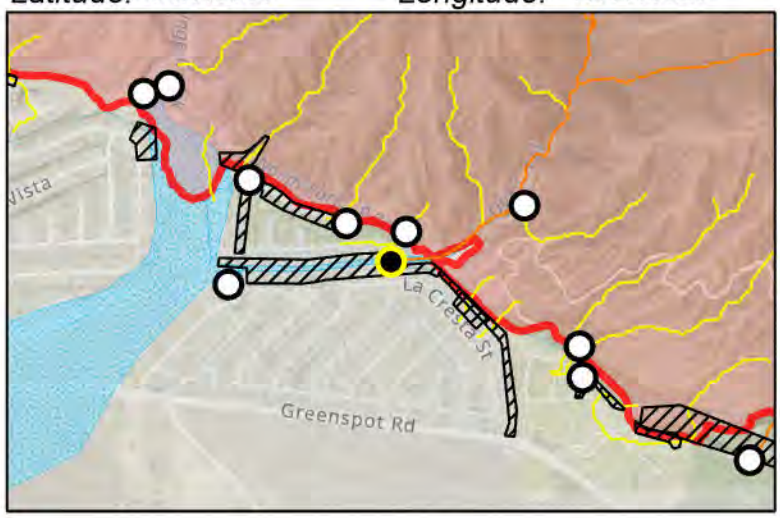
(4) **NA**

Text: NA

Description: Downstream of detention basin. Experienced very minor (inches) of flow during 9/20. Past flows reached channelized bankfull and plugged bridge. Post fire effects may elevate risk of overtopping roadway. Overtopping flows may divert into park to the north or into community south of the bridge.

LOCATION AND PHOTO

Latitude: 34.113069 *Longitude:* -117.133926



VALUE AT RISK DETAIL

Incident: Line Fire *Incident Number: CA-BDF-012520*

Community: **Oak Creek**

Site Number: **LFV-34**

Feature: **Debris basin**

Feature Category: **drainage structure**

Field Observation or Potential Hazard: Debris basin with standpipe. Potential hazard is debris flow/flood filling and overtopping basin, resulting in increased flows downstream.

Likely possibility of occurrence with moderate consequence = High risk.

Potential Hazard to Life: **low**

Potential Hazard to Property: **moderate**

Preliminary Emergency Protective Measures

(1) **Clear and maintain basin**

(2) **Early Warning**

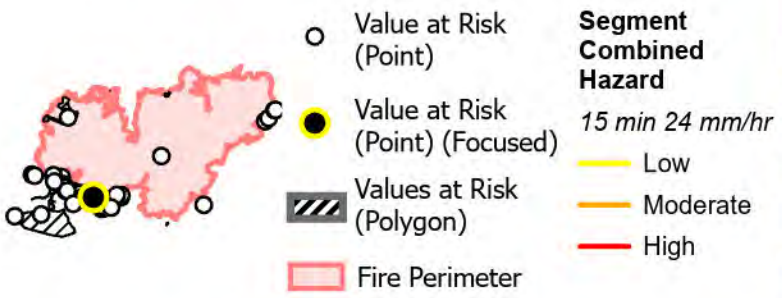
(3) **NA**

(4) **NA**

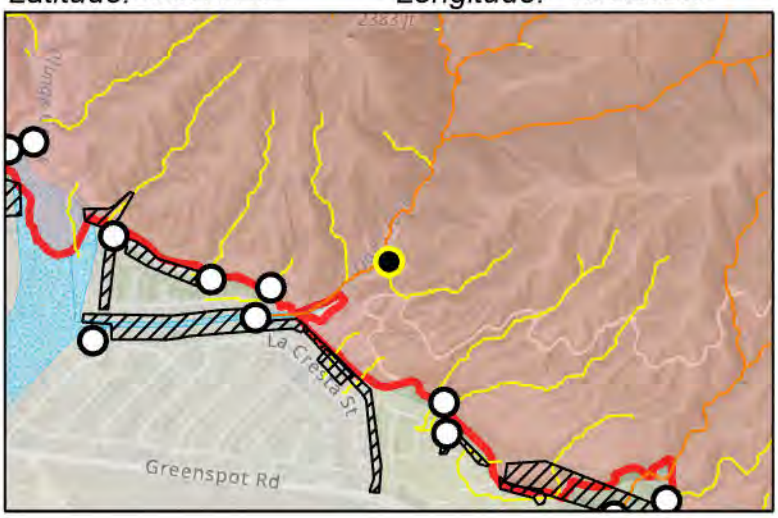
Text: NA

Description: Debris basin experienced 12ft of deposition on 9/20. 5000+ cubic yards deposited. Trash racks above and downstream of basin. Future deposition and overtopping flows likely.

LOCATION AND PHOTO



Latitude: 34.114446 *Longitude:* -117.129243



VALUE AT RISK DETAIL

Incident: Line Fire *Incident Number: CA-BDF-012520*

Community: **East Highlands**

Site Number: **LFV-35**

Feature: **Ditch and homes**

Feature Category: **multiple**

Field Observation or Potential Hazard: Residence located at outlet of small drainage. Potential hazard is debris flow/flood overwhelming drainage ditch and impacting multiple residences.

Potential Hazard to Life: **moderate**

Potential Hazard to Property: **high**

Preliminary Emergency Protective Measures

(1) **Early Warning**

(2) **Monitor and maintain**

(3) **Deflection structure**

(4) **NA**

Text: Clear ditch

Description: Small drainage burnt mostly at low. Highly altered upper drainage with multiple road crossings, fills, and small detention basins. Ditch is roughly 80% full. No debris basin observed at ditch. Loaded channel with boulders up to 2' diameter. Subsequent flows may mobilize boulders that may impact brick walls of residential yard. K-rails in place.

LOCATION AND PHOTO

Value at Risk (Point)

Values at Risk (Polygon)

Values at Risk (Polygon) (Focused)

Fire Perimeter

Segment Combined Hazard

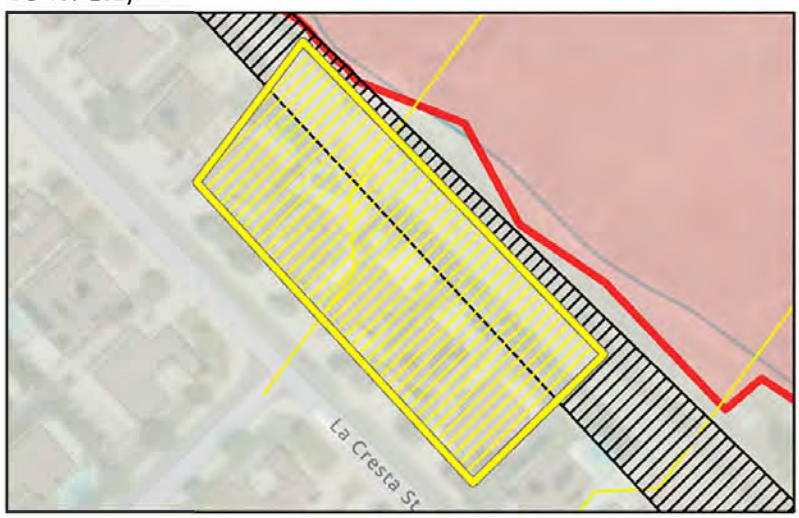
15 min 24 mm/hr

Low

Moderate

High

Scale: 1:2,000



VALUE AT RISK DETAIL

Incident: Line Fire *Incident Number: CA-BDF-012520*

Community: **East Highlands**

Site Number: **LFV-36**

Feature: **V-ditch behind homes on La Cresta St.**

Feature Category: **drainage structure**

Field Observation or Potential Hazard: Drainage ditch located along service road and adjacent to residential back yards. Potential hazard is debris flow/flood avulsing from ditch and impacting homes and road surfaces.

Potential Hazard to Life: **moderate**

Potential Hazard to Property: **moderate**

Preliminary Emergency Protective Measures

(1) **Early Warning**

(2) **Monitor and maintain**

(3) **Deflection structure**

(4) **NA**

Text: NA

Description: Multiple mud deposits observed within and adjacent to the channel. Trash racks observed to effectively hold back debris. Service road adjacent ditch seems to also serve as secondary conveyance if ditch capacity is exceeded. Detention basin along south end of ditch system seems to have a vented culvert with a few feet of sediment deposition within CMP. Large flow event may exceed deposition capacity of this detention basin. Excess flow will likely deposit onto Greenspot Rd. which is the only eastern ingress/egress for the entire City of Highlands. V-ditch north of Marbella Way and down-slope of Alder Creek Rd will likely contribute flows into this v-ditch line. Dirt road (Alder Creek Rd.) upslope from ditch may serve as source area for debris. Home at 7855 La Cresta St, Highland, CA

LOCATION AND PHOTO

Value at Risk (Point)

Values at Risk (Polygon)

Values at Risk (Polygon) (Focused)

Fire Perimeter

Segment Combined Hazard

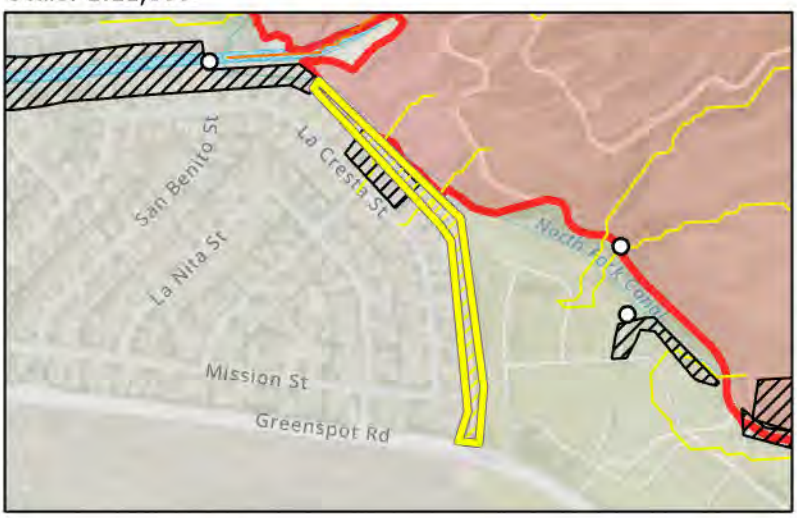
15 min 24 mm/hr

Low

Moderate

High

Scale: 1:11,000



VALUE AT RISK DETAIL

Incident: Line Fire *Incident Number: CA-BDF-012520*

Community: **East Highlands**

Site Number: **LFV-37**

Feature: **Storm drain inlet.**

Feature Category: **drainage structure**

Field Observation or Potential Hazard: Storm drain inlet adjacent to roadway. Potential hazard is plugging of the inlet with debris and overtopping road. Impacts to downstream storm drain also expected.

Very likely probability of occurrence with moderate consequence = High risk.

Potential Hazard to Life: **low**

Potential Hazard to Property: **moderate**

Preliminary Emergency Protective Measures

(1) **Early Warning**

(2) **Clear and maintain culvert**

(3) **NA**

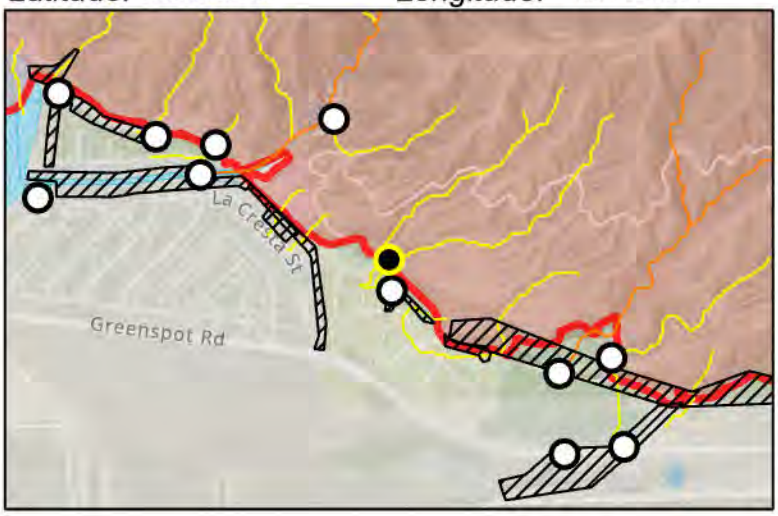
(4) **NA**

Text: Add debris guard

Description: Storm drain inlet that crosses beneath Alder Creek Road and presumed to enter storm drain system in downslope development. Debris flood / flow appears to have occurred here on 9/20/24, resulting in clogging of storm drain downstream, and debris flowing out of manhole riser onto access road and neighborhood street. Inlet is 48" CMP.

LOCATION AND PHOTO

Latitude: 34.110347 *Longitude:* -117.127637



VALUE AT RISK DETAIL

Incident: Line Fire *Incident Number: CA-BDF-012520*

Community: **East Highland**

Site Number: **LFV-38**

Feature: **Home**

Feature Category: **home**

Field Observation or Potential Hazard: Residence located adjacent to potential flow path. Potential hazard is debris flood/flow impacting residence and Ravello Court.

Likely probability of occurrence with moderate consequence = High risk.

Potential Hazard to Life: **low**

Potential Hazard to Property: **moderate**

Preliminary Emergency Protective Measures

(1) **Early Warning**

(2) **Monitor and maintain**

(3) **NA**

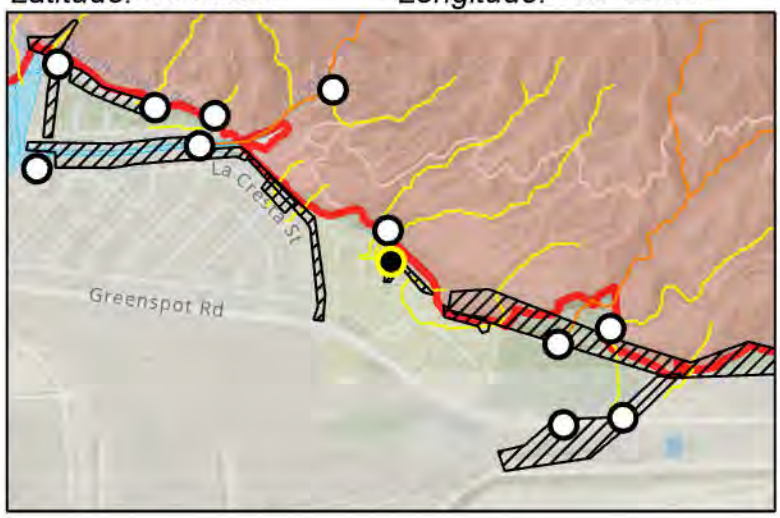
(4) **NA**

Text: NA

Description: Sediment-laden flow occurred during 9/20 storm event that spilled out of a storm drain manhole, down an access driveway and onto roadway and front yard at north end of cul-de-sac. Flow then progressed south along Ravello Ct. towards future development and Alder Creek Rd. Manhole likely delivered flow from LFV-37 that drains towards Marbella Way. Culvert at LFV-37 is believed to be tied-in to this manhole. Neighbor described flow as a "river," therefore flow was significant for an upwelling manhole. Possible compromised stormwater piping. Underground blockage likely. If this is repaired, larger flows may be diverted towards Marbella Way from LFV-37.

LOCATION AND PHOTO

Latitude: 34.109454 *Longitude:* -117.127597



VALUE AT RISK DETAIL

Incident: Line Fire *Incident Number: CA-BDF-012520*

Community: **East Highland**

Site Number: **LFV-39**

Feature: **Drainage ditch, block walls, yards, road**

Feature Category: **multiple**

Field Observation or Potential Hazard: Concrete drainage ditch collecting flow from small upstream basins located along an access road behind several residences. Potential hazard is filling and overtopping of ditch, and debris floods impacting block walls and homes.

Potential Hazard to Life: **low**

Potential Hazard to Property: **low**

Preliminary Emergency Protective Measures

(1) **Early Warning**

(2) **Clear and maintain culvert**

(3) **Deflection structure**

(4) **NA**

Text: NA

Description: Ditch likely to become plugged and overtop. Flow may then progress northwest towards block wall of backyards. Flows may then progress towards and deposit on Ravello Ct as it travels along the v-ditch service road. Discharge from upstream drainage splits into 3 segments. This VAR is a recipient of a majority of that discharge.

LOCATION AND PHOTO

Value at Risk (Point)

Values at Risk (Polygon)

Values at Risk (Polygon) (Focused)

Fire Perimeter

Segment Combined Hazard

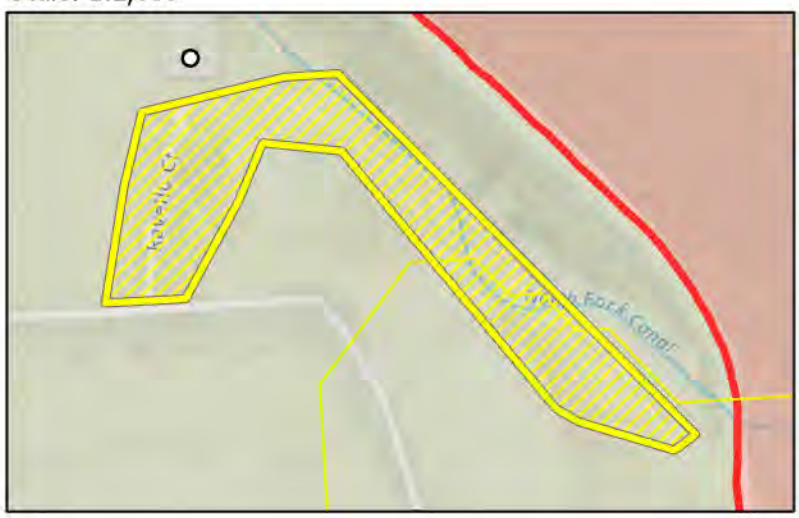
15 min 24 mm/hr

Low

Moderate

High

Scale: 1:2,000



VALUE AT RISK DETAIL

Incident: Line Fire *Incident Number: CA-BDF-012520*

Community: **Mediterra**

Site Number: **LFV-40**

Feature: **Two homes at end of cul-de-sac and road**

Feature Category: **multiple**

Field Observation or Potential Hazard: Two homes located adjacent to v-ditch and service road. Potential hazard is cobbles and debris may mobilize and proceed downgradient toward homes. If v-ditch conveyance capacity is exceeded, flows will deposit along roadway and impact homes.

Potential Hazard to Life: **moderate**

Potential Hazard to Property: **moderate**

Preliminary Emergency Protective Measures

(1) **Early Warning**

(2) **Monitor and maintain**

(3) **Deflection structure**

(4) **NA**

Text: Suggest changing rod iron fence to something less penetrative.

Description: Small drainage burnt at mostly low. Mountain front immediately upstream of VAR has been altered. Human activity diverted flows into 3 directions: southeast towards homes, south through orchard and down to road, and west toward LFV-39 and Alder Creek Rd. Man made rock revetments with loose cobbles observed at channel fork upstream of VAR. Capri Way serves as the only ingress/egress route for the cul-de-sac community.

LOCATION AND PHOTO

Value at Risk (Point)

Values at Risk (Polygon)

Values at Risk (Polygon) (Focused)

Fire Perimeter

Segment Combined Hazard

15 min 24 mm/hr

Low

Moderate

High

Scale: 1:2,000

VALUE AT RISK DETAIL

Incident: Line Fire *Incident Number: CA-BDF-012520*

Community: **East Highland**

Site Number: **LFV-41**

Feature: **Orchards and agricultural equipment**

Feature Category: **business**

Field Observation or Potential Hazard: Orchards, agricultural equipment and damaged water infrastructure in / adjacent to potential flow paths of a minor drainage. Potential hazard is debris flow/flood impacting these features.

Potential Hazard to Life: **low**

Potential Hazard to Property: **high**

Preliminary Emergency Protective Measures

(1) **Early Warning**

(2) **Monitor and maintain**

(3) **NA**

(4) **NA**

Text: NA

Description: Water tanks and pumps are placed adjacent channel and will likely be impacted by flows. Orchards may experience debris and sediment from slopes. Slopes appear to be susceptible to rilling and gullying.

LOCATION AND PHOTO

Value at Risk (Point)

Values at Risk (Polygon)

Values at Risk (Polygon) (Focused)

Fire Perimeter

Segment Combined Hazard

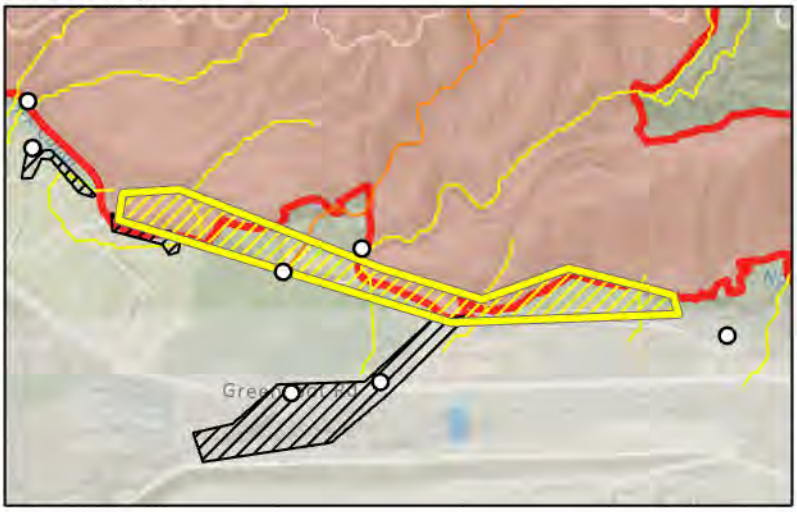
15 min 24 mm/hr

Low

Moderate

High

Scale: 1:16,000



VALUE AT RISK DETAIL

Incident: Line Fire *Incident Number: CA-BDF-012520*

Community: **East Highland**

Site Number: **LFV-42**

Feature: **Storage area and orchard**

Feature Category: **multiple**

Field Observation or Potential Hazard: Debris flow/flood of storage area and orchards

Possible probability of occurrence with minor consequence = Low risk.

Potential Hazard to Life: **low** *Potential Hazard to Property:* **low**

Preliminary Emergency Protective Measures

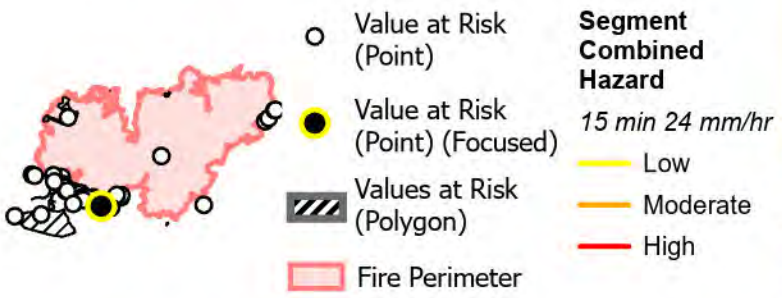
(1) **Early Warning** *(2)* **Monitor and maintain**

(3) **Deflection structure** *(4)* **NA**

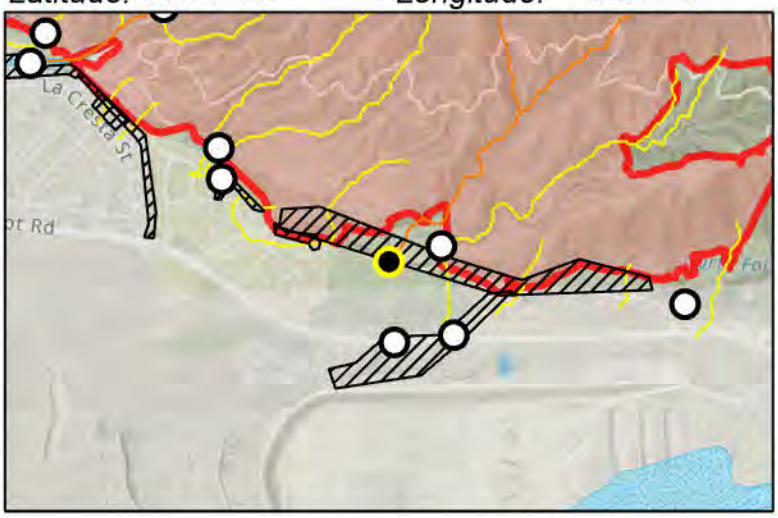
Text: Remove equipment from alluvial fan.

Description: Alluvial fan located upstream and partially within orchard. Flows may impact a portion of orchard downstream of the fan. Equipment stored on fan may be impacted by flows. Flows more likely to progress towards LFV-43 as evidenced by 9/20 event.

LOCATION AND PHOTO



Latitude: 34.106828 *Longitude:* -117.122033



VALUE AT RISK DETAIL

Incident: Line Fire *Incident Number: CA-BDF-012520*

Community: **East Highland**

Site Number: **LFV-43**

Feature: **Home and private access road**

Feature Category: **multiple**

Field Observation or Potential Hazard: Debris flow/flood of private road and home

Possible probability of damage with moderate consequence = Intermediate risk.

Potential Hazard to Life: **low**

Potential Hazard to Property: **moderate**

Preliminary Emergency Protective Measures

(1) **Early Warning**

(2) **Deflection structure**

(3) **NA**

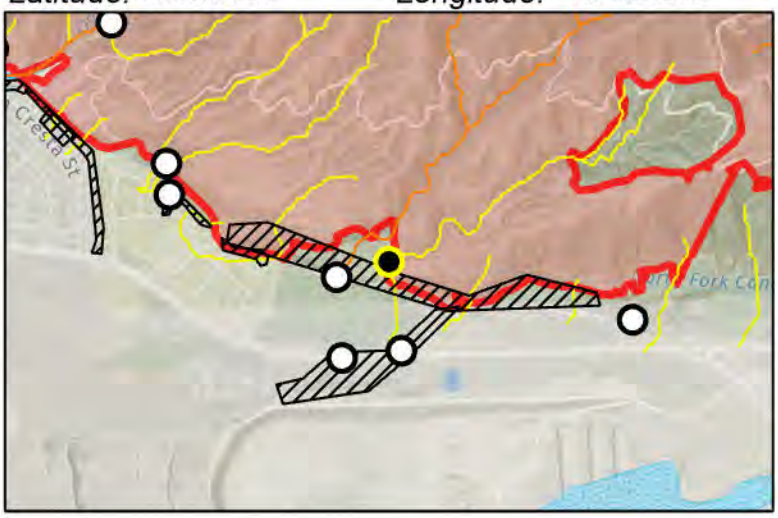
(4) **NA**

Text: NA

Description: Basin burned at mostly low. Farm home placed between drainages but 9/20 flows almost reached backyard after losing confinement. Future flows may lap against property, but unlikely due to rock revetment adjacent structure. Water tanks placed on what appears to be an upstream berm that protects the structure and diverts flows. Channel adjacent house is concrete and armored. Engineered channel walls act as berms to focus flow along northern boundary of property away from the home and orchards. Evidence of overbanking observed following 9/20 flows, particularly at the sharp 90-degree bend. Pipeline upstream and spanning channel.

LOCATION AND PHOTO

Latitude: 34.107185 *Longitude:* -117.120210



VALUE AT RISK DETAIL

Incident: Line Fire *Incident Number: CA-BDF-012520*

Community: **East Highland**

Site Number: **LFV-44**

Feature: **Culvert, road, multiple water facilities**

Feature Category: **utilities**

Field Observation or Potential Hazard: Debris flow/flood of roadways, culverts, and utilities

Potential Hazard to Life: **low**

Potential Hazard to Property: **moderate**

Preliminary Emergency Protective Measures

(1) **Early Warning**

(2) **Deflection structure**

(3) **Monitor and maintain**

(4) **NA**

Text: NA

Description: Flow likely to escape channel upstream of Greenspot Road. Flows likely to then re-enter channel after impacting culvert, inundating road, and flooding water facility south of the road. Flows may then impact gate and weir adjacent to East Valley Water District facility.

LOCATION AND PHOTO

Value at Risk (Point)

Values at Risk (Polygon)

Values at Risk (Polygon) (Focused)

Fire Perimeter

Segment Combined Hazard

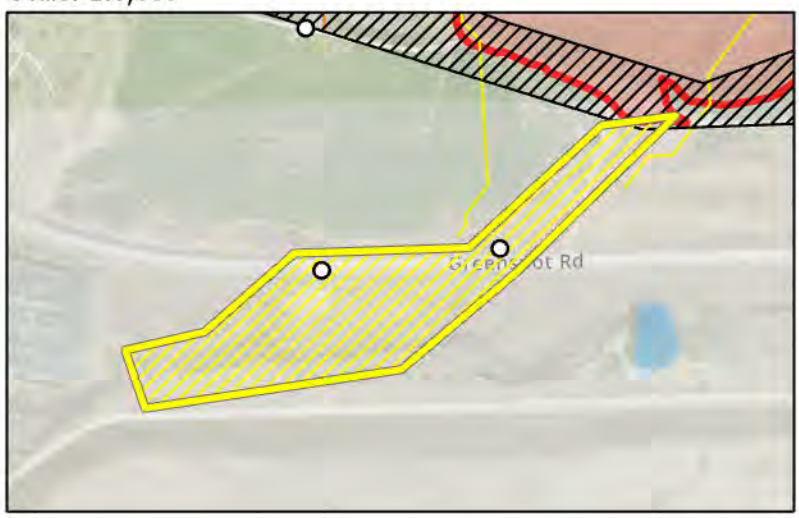
15 min 24 mm/hr

Low

Moderate

High

Scale: 1:8,000



VALUE AT RISK DETAIL

Incident: Line Fire *Incident Number: CA-BDF-012520*

Community: **East Highland**

Site Number: **LFV-45**

Feature: **San Bernardino MWD Santa Ana Turnout**

Feature Category: **utilities**

Field Observation or Potential Hazard: Flooding of water facility

Likely probability of occurrence with moderate consequence = High risk.

Potential Hazard to Life: **low**

Potential Hazard to Property: **moderate**

Preliminary Emergency Protective Measures

(1) **Early Warning**

(2) **Deflection structure**

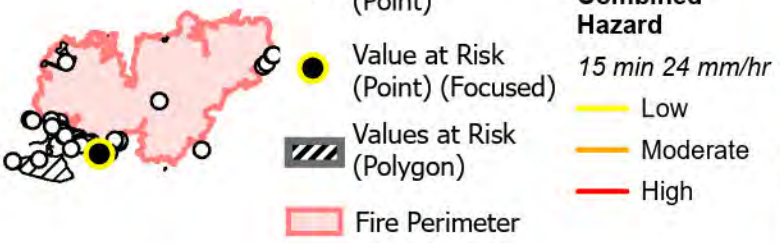
(3) **NA**

(4) **NA**

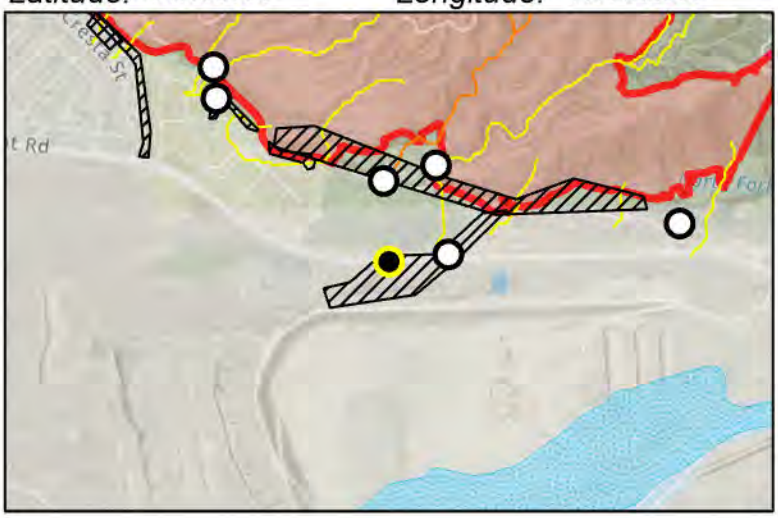
Text: NA

Description: Santa Ana low turnout fully buried in sediment. Plugged culvert downstream from farm diverted flows west along Greenspot Road into water facility. Basin was mostly low severity. Larger flow would likely deposit downstream of this facility and enter the adjacent channel.

LOCATION AND PHOTO



Latitude: 34.104520 *Longitude:* -117.122009



VALUE AT RISK DETAIL

Incident: Line Fire *Incident Number: CA-BDF-012520*

Community: **East Highland**

Site Number: **LFV-46**

Feature: **Culvert crossing**

Feature Category: **drainage structure**

Field Observation or Potential Hazard: Plugging of culvert and inundate roadway

Likely probability of occurrence with moderate consequence = High risk.

Potential Hazard to Life: **moderate**

Potential Hazard to Property: **moderate**

Preliminary Emergency Protective Measures

(1) **Early Warning**

(2) **Clear and maintain culvert**

(3) **NA**

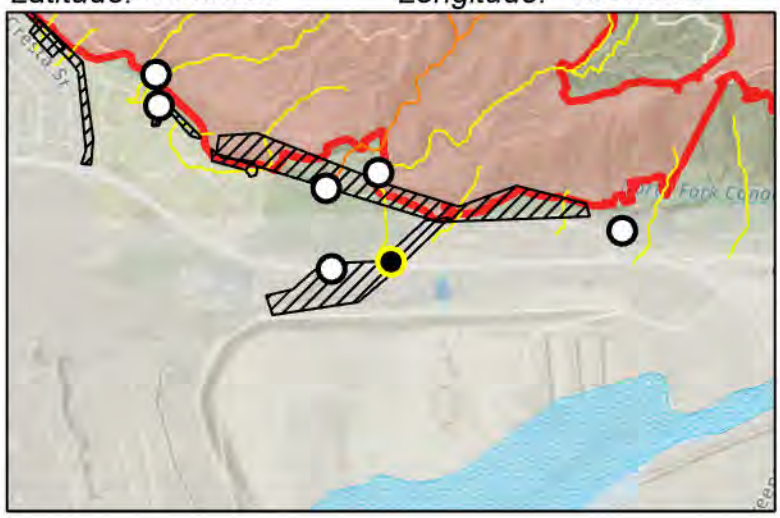
(4) **NA**

Text: NA

Description: Moderately trafficked, 2-lane road acts as the only source of eastern ingress/egress for the community of Highlands. Paved culvert crossing with concrete head wall. 4' culvert width and 2' head wall length. Culvert fully plugged and buried. Evidence of overtopping during 9/20. Culvert crossing likely to experience similar flows.

LOCATION AND PHOTO

Latitude: 34.104629 *Longitude:* -117.119960



VALUE AT RISK DETAIL

Incident: Line Fire *Incident Number: CA-BDF-012520*

Community: **East Highland**

Site Number: **LFV-47**

Feature: **Water turnout facility**

Feature Category: **utilities**

Field Observation or Potential Hazard: Debris flow/flood of San Bernardino water turnout facility

Possible probability of occurrence with moderate consequence = Intermediate risk.

Potential Hazard to Life: **low**

Potential Hazard to Property: **moderate**

Preliminary Emergency Protective Measures

(1) **Early Warning**

(2) **Monitor and maintain**

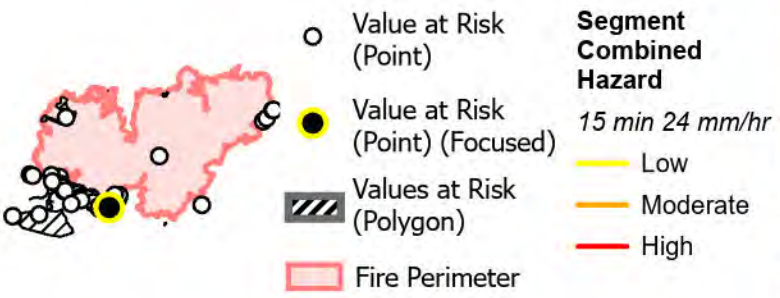
(3) **Deflection structure**

(4) **NA**

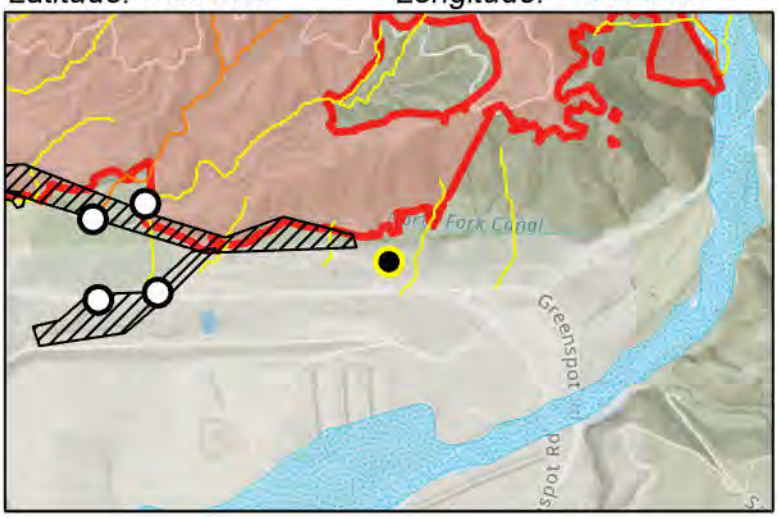
Text: NA

Description: Small drainage upstream burned at low. Deposits from 9/20 storm contacted edge of facility but no impacts observed. Plentiful debris on alluvial fan upstream of facility. Facility situated mid-fan. Larger flow may inundate the facility. 2 rock check dams that have been filled-in, where one has a plugged 12' boiler pipe culvert.

LOCATION AND PHOTO



Latitude: 34.105130 *Longitude:* -117.111982



VALUE AT RISK DETAIL

Incident: Line Fire *Incident Number: CA-BDF-012520*

Community: **Seven Oaks Dam**

Site Number: **LFV-48**

Feature: **County maintained road**

Feature Category: **other**

Field Observation or Potential Hazard: Debris flow/flood of dirt roadway

Likely probability of occurrence with minor consequence = Low risk.

Potential Hazard to Life: **low**

Potential Hazard to Property: **moderate**

Preliminary Emergency Protective Measures

(1) **Clear and maintain culvert**

(2) **Early Warning**

(3) **Monitor and maintain**

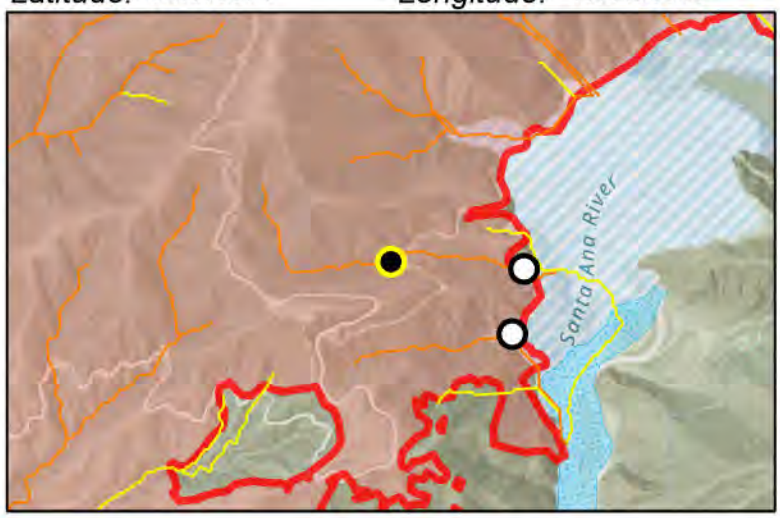
(4) **Signage**

Text: NA

Description: Basin largely burned at moderate severity. Basin upslope of large, triple-benched fill with 5' deep vented culverts on downstream side. Fully clogged upstream culvert with very small 30'x30' basin. Sediment deposition along roadway. Entire road observed to have similar characteristics from a distance. High diversion potential throughout road. This was communicated to us as a CalFire road that is maintained by the county.

LOCATION AND PHOTO

Latitude: 34.115371 *Longitude:* -117.105819



VALUE AT RISK DETAIL

Incident: Line Fire *Incident Number: CA-BDF-012520*

Community: **Seven Oaks Dam**

Site Number: **LFV-49**

Feature: **Roadway**

Feature Category: **other**

Field Observation or Potential Hazard: Debris flow/flood of roadway

Likely probability of occurrence with minor consequence = Low risk.

Potential Hazard to Life: **low**

Potential Hazard to Property: **moderate**

Preliminary Emergency Protective Measures

(1) **Early Warning**

(2) **Monitor and maintain**

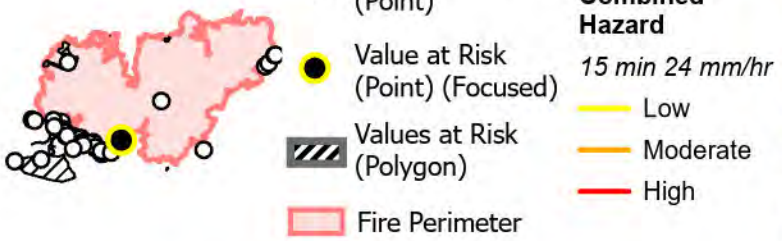
(3) **NA**

(4) **NA**

Text: NA

Description: Basin burned at roughly half moderate. Culvert crossing at road crossing likely blew out. Flow deposited cobble sized debris downstream and along roadway on 9/20. Flows tracked along roadway all the way to the bottom of the dam.

LOCATION AND PHOTO



Latitude: 34.114947 *Longitude:* -117.101277

VALUE AT RISK DETAIL

Incident: Line Fire *Incident Number: CA-BDF-012520*

Community: **Seven Oaks Dam**

Site Number: **LFV-50**

Feature: **Roadway and ditch**

Feature Category: **multiple**

Field Observation or Potential Hazard: Debris flow/flood of roadway

Likely probability of occurrence with moderate consequence = High risk

Potential Hazard to Life: **low**

Potential Hazard to Property: **moderate**

Preliminary Emergency Protective Measures

(1) **Early Warning**

(2) **Clear and maintain culvert**

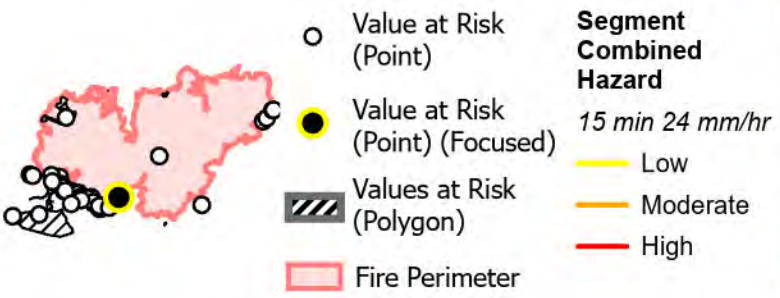
(3) **Monitor and maintain**

(4) **NA**

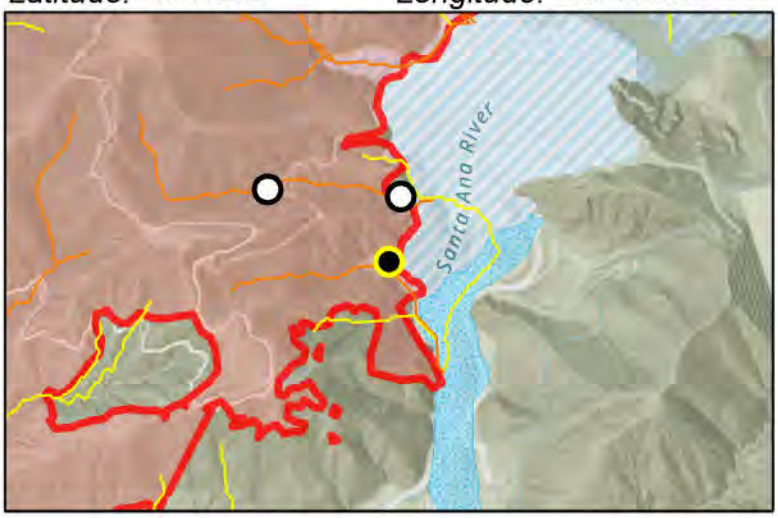
Text: NA

Description: Small basin burned at largely low severity. Half of basin unburned. 9/20 storm caused minor sediment laden flood onto roadway. 36" steel culvert with concrete headwalls. A portion of flow missed the culvert. The flow progressed down along the road, and due south off the road and down the engineered slope.

LOCATION AND PHOTO



Latitude: 34.113111 *Longitude:* -117.101809



VALUE AT RISK DETAIL

Incident: Line Fire *Incident Number: CA-BDF-012520*

Community: **Santa Ana River**

Site Number: **LFV-51**

Feature: **Hydro-electric intake**

Feature Category: **utilities**

Field Observation or Potential Hazard: Hydro-electric station adjacent to the Santa Ana River. Potential hazard is debris flood / flow impacting structures.

Likely probability of occurrence with moderate consequence = High risk.

Potential Hazard to Life: **low**

Potential Hazard to Property: **moderate**

Preliminary Emergency Protective Measures

(1) **Early Warning**

(2) **NA**

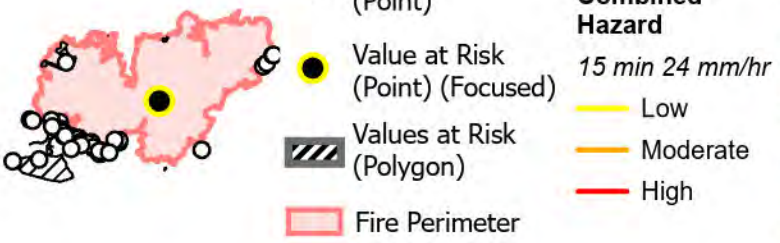
(3) **NA**

(4) **NA**

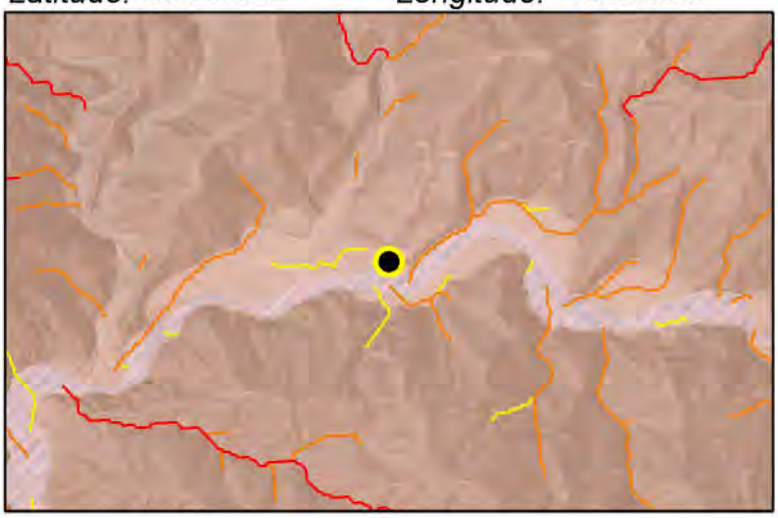
Text: Communicate hazard risk to So Cal Edison.

Description: Assessed remotely. This site was inaccessible during the WERT field work. It is unknown if this facility is currently operating. Upslope basins burned at low, mod and high severity.

LOCATION AND PHOTO



Latitude: 34.145474 *Longitude:* -117.058936



VALUE AT RISK DETAIL

Incident: Line Fire *Incident Number: CA-BDF-012520*

Community: **Mentone**

Site Number: **LFV-52**

Feature: **Ranch**

Feature Category: **home**

Field Observation or Potential Hazard: Ranch, house, livestock located adjacent to watercourse and/or within potential flood path. Potential hazard is debris flood overtopping or avulsing from channel and impacting home and structures.

Potential Hazard to Life: **low**

Potential Hazard to Property: **low**

Preliminary Emergency Protective Measures

(1) **Early Warning**

(2) **Signage**

(3) **Deflection structure**

(4) **NA**

Text: NA

Description: Upper 25% of basin burned at low severity, while the rest was unburned.

LOCATION AND PHOTO

Value at Risk (Point)

Values at Risk (Polygon)

Values at Risk (Polygon) (Focused)

Fire Perimeter

Segment Combined Hazard

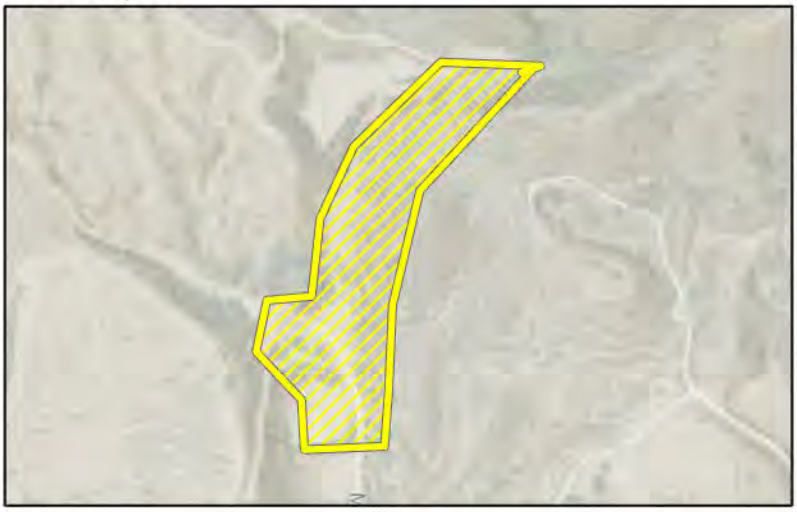
15 min 24 mm/hr

Low

Moderate

High

Scale: 1:5,000



VALUE AT RISK DETAIL

Incident: Line Fire *Incident Number: CA-BDF-012520*

Community: **Mill Creek Road**

Site Number: **LFV-53**

Feature: **Culvert crossing**

Feature Category: **drainage structure**

Field Observation or Potential Hazard: Culverted crossing below Mill Creek Road. Potential hazard is debris flow/flood impacting the crossing.

Unlikely probability of occurrence with minor consequence = Very low risk.

Potential Hazard to Life: **low**

Potential Hazard to Property: **low**

Preliminary Emergency Protective Measures

(1) **Early Warning**

(2) **Monitor and maintain**

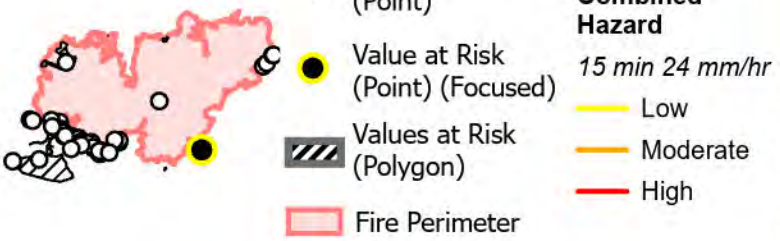
(3) **NA**

(4) **NA**

Text: NA

Description: Small upper tributaries burned at low and moderate. Substantial live vegetation in channel. Any flow would likely get attenuated. Large basin to retain debris due to culvert crossing acting as a dam. Road grade is roughly 50' above debris basin bottom. Unable to access culvert.

LOCATION AND PHOTO



Latitude: 34.102830 *Longitude:* -117.019479

VALUE AT RISK DETAIL

Incident: Line Fire *Incident Number: CA-BDF-012520*

Community: **San Bernardino**

Site Number: **LFV-54**

Feature: **Culvert road crossing**

Feature Category: **drainage structure**

Field Observation or Potential Hazard: City Creek culvert at Alabama St., just downstream of confluence with Plunge Creek. Potential hazard is flood flow with entrained debris plugging all / portions of culverts, leading to backwater effects and inundation of adjacent areas.

Possible probability of occurrence with moderate consequence = Intermediate risk.

Potential Hazard to Life: **low**

Potential Hazard to Property: **moderate**

Preliminary Emergency Protective Measures

(1) **Early Warning**

(2) **Monitor and maintain**

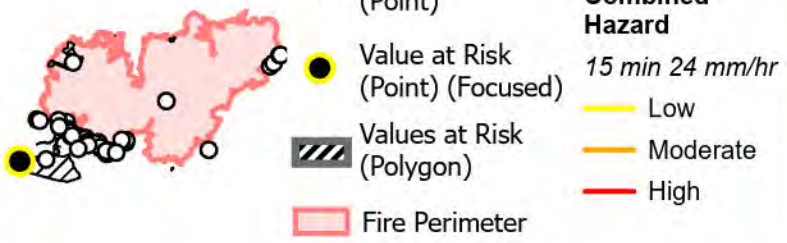
(3) **NA**

(4) **NA**

Text: NA

Description: Crossing is a single structure with three components, including a double-barrel box culvert and two arch culverts. Source area burned predominantly at low severity, with some mod and high in the upper elevations.

LOCATION AND PHOTO



Latitude: 34.102492 *Longitude:* -117.208825

VALUE AT RISK DETAIL

Incident: Line Fire *Incident Number: CA-BDF-012520*

Community: **East Highland**

Site Number: **LFV-55**

Feature: **bridge**

Feature Category: **drainage structure**

Field Observation or Potential Hazard: Orange Street bridge over Plunge Creek. Potential hazard is debris flow / flood impacts to bridge.

Possible probability of occurrence with moderate consequence = Intermediate risk.

Potential Hazard to Life: **low**

Potential Hazard to Property: **moderate**

Preliminary Emergency Protective Measures

(1) **Early Warning**

(2) **Signage**

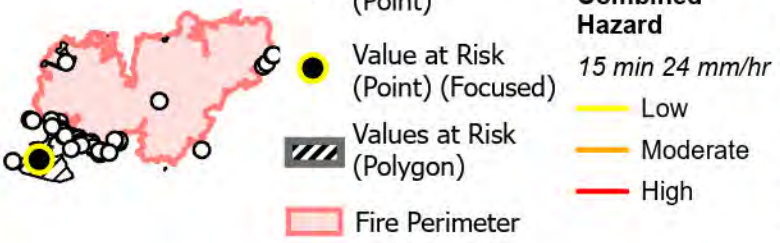
(3) **NA**

(4) **NA**

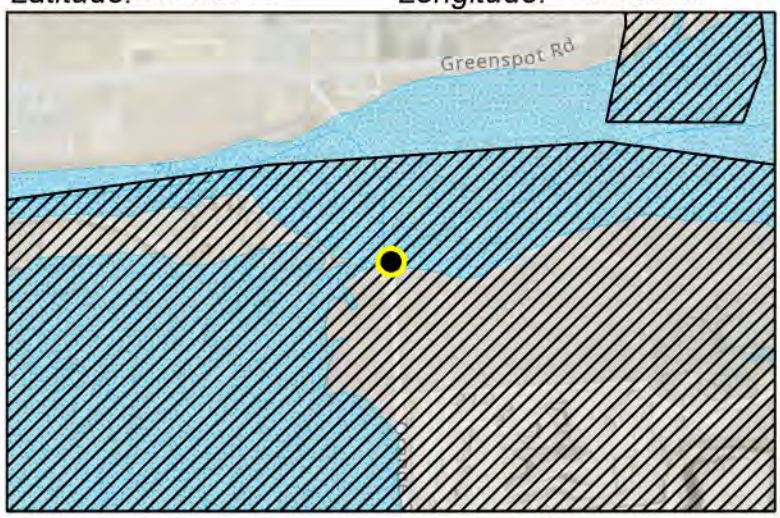
Text: NA

Description:

LOCATION AND PHOTO



Latitude: 34.102745 *Longitude:* -117.182408



VALUE AT RISK DETAIL

Incident: Line Fire *Incident Number: CA-BDF-012520*

Community: **Elder Gulch, Plunge Creek, Santa Ana River conflu**

Site Number: **LFV-56**

Feature: **Existing quarry pits**

Feature Category: **business**

Field Observation or Potential Hazard: Quarries located within the Plunge Creek / Santa Ana wash. Potential hazard is flooding impacting the quarry pits.

Potential Hazard to Life: **low**

Potential Hazard to Property: **moderate**

Preliminary Emergency Protective Measures

(1) **Early Warning**

(2) **NA**

(3) **NA**

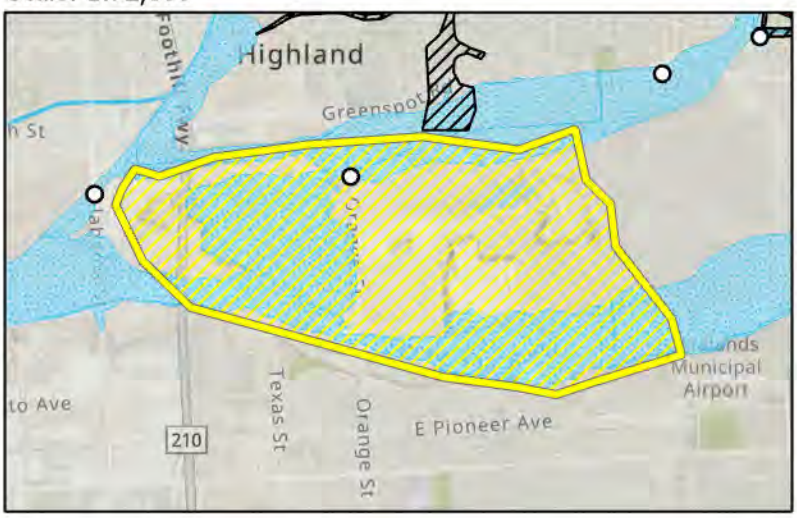
(4) **NA**

Text: NA

Description:

LOCATION AND PHOTO

Scale: 1:72,000



VALUE AT RISK DETAIL

Incident: Line Fire *Incident Number: CA-BDF-012520*

Community: **Running Springs**

Site Number: **RS-01**

Feature: **Home and private road**

Feature Category: **home**

Field Observation or Potential Hazard: Progressive erosion (rilling and gullying) downstream and adjacent structure.

Potential Hazard to Life: **low**

Potential Hazard to Property: **low**

Preliminary Emergency Protective Measures

(1) **Early Warning**

(2) **NA**

(3) **NA**

(4) **NA**

Text: NA

Description: Burnt slope immediately downstream of burnt structure. Low burn severity down gradient of home with loosened surface material. Loss of ground cover may intensify erosion immediately down gradient and adjacent of structure that may possibly cause subsequent failure. Evidence of soil creep along private dirt road below structure. High burn severity further down gradient. Moderately steep slopes (~25deg) below structure. Rilling and gullying likely adjacent and near structure.

LOCATION AND PHOTO

Value at Risk (Point)

Values at Risk (Polygon)

Values at Risk (Polygon) (Focused)

Fire Perimeter

Segment Combined Hazard

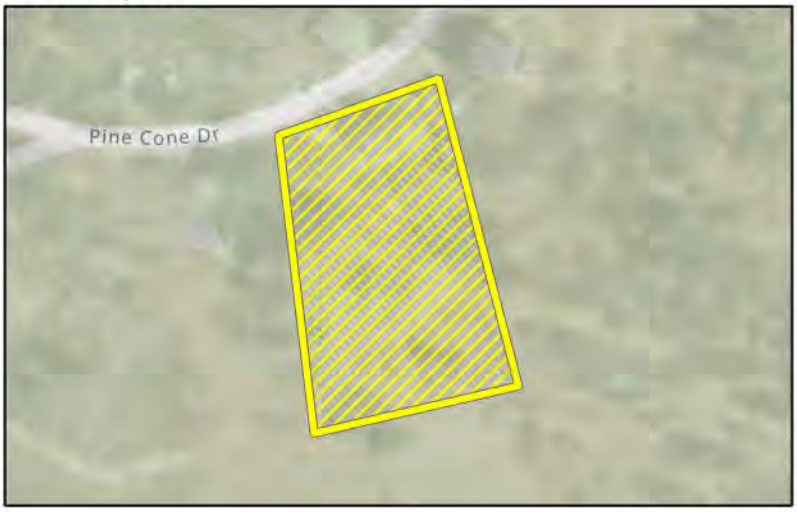
15 min 24 mm/hr

Low

Moderate

High

Scale: 1:2,000



VALUE AT RISK DETAIL

Incident: Line Fire *Incident Number: CA-BDF-012520*

Community: **Seven Oaks**

Site Number: **SO-01**

Feature: **Barn, water well**

Feature Category: **multiple**

Field Observation or Potential Hazard: Barn structure and water well located adjacent to watercourse. Potential hazard is flood flows mobilizing debris and overtopping banks, resulting in inundation and impact to structures.

Potential Hazard to Life: **low**

Potential Hazard to Property: **moderate**

Preliminary Emergency Protective Measures

(1) **Early Warning**

(2) **NA**

(3) **NA**

(4) **NA**

Text: If the barn is a habitable structure, evacuation prior to stressing storm events should be considered.

Description: The barn sustained minor damage from a debris flood that occurred during TS Hilary in August 2023. Since then, grading has been performed to infill the north side bank, which was significantly scoured out immediately adjacent to the barn. A porch has recently been added to the barn, with footings located where the scour occurred. A small portion of the upstream watershed burned at moderate and low severity within Mile Canyon, which may result in elevated flood hazard immediately downstream along the Santa Ana River. The residence at this location is more removed and elevated above watercourse (above high water from TS Hilary response).

LOCATION AND PHOTO

Value at Risk (Point)

Values at Risk (Polygon)

Values at Risk (Polygon) (Focused)

Fire Perimeter

Segment Combined Hazard

15 min 24 mm/hr

Low

Moderate

High

Scale: 1:3,000

VALUE AT RISK DETAIL

Incident: Line Fire *Incident Number: CA-BDF-012520*

Community: **Seven Oaks**

Site Number: **SO-02**

Feature: **Home**

Feature Category: **home**

Field Observation or Potential Hazard: Residence located adjacent to watercourse. Potential hazard is debris flood/flow overtopping bank and inundating residence.

Possible probability of occurrence with moderate consequence = Intermediate risk.

Potential Hazard to Life: **moderate**

Potential Hazard to Property: **moderate**

Preliminary Emergency Protective Measures

(1) **Early Warning**

(2) **NA**

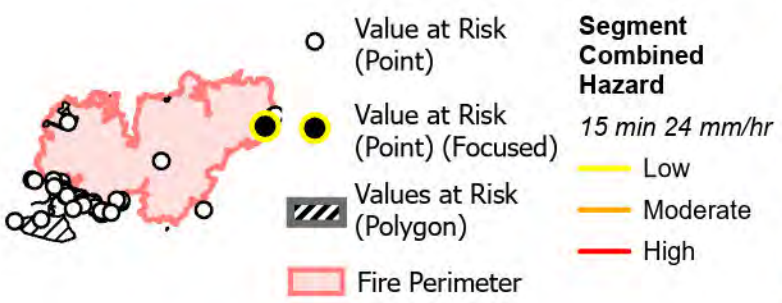
(3) **NA**

(4) **NA**

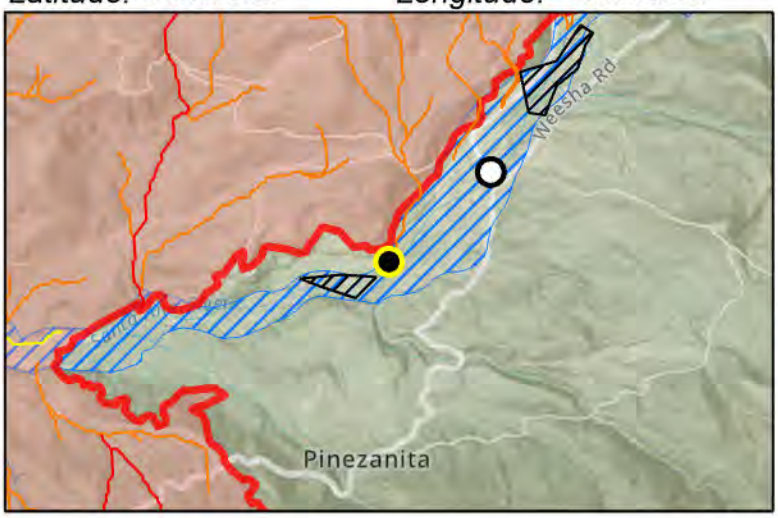
Text: NA

Description: Bank was scoured out during TS Hilary response resulting in near vertical adjacent to southeast corner of structure. Structure is elevated above watercourse though additional scour could compromise foundation support.

LOCATION AND PHOTO



Latitude: 34.169275 *Longitude:* -116.953224



VALUE AT RISK DETAIL

Incident: Line Fire *Incident Number: CA-BDF-012520*

Community: **Seven Oaks**

Site Number: **SO-03**

Feature: **Bridge, road**

Feature Category: **drainage structure**

Field Observation or Potential Hazard: Bridge crossing over Santa Ana River drainage. Potential hazard is flood flows mobilizing debris and boulders, plugging bridge culvert and overtopping. Potential for stranding residences along east bank.

Possible probability of occurrence with major consequence = High risk.

Potential Hazard to Life: **low**

Potential Hazard to Property: **moderate**

Preliminary Emergency Protective Measures

(1) **Early Warning**

(2) **Monitor and maintain**

(3) **Signage**

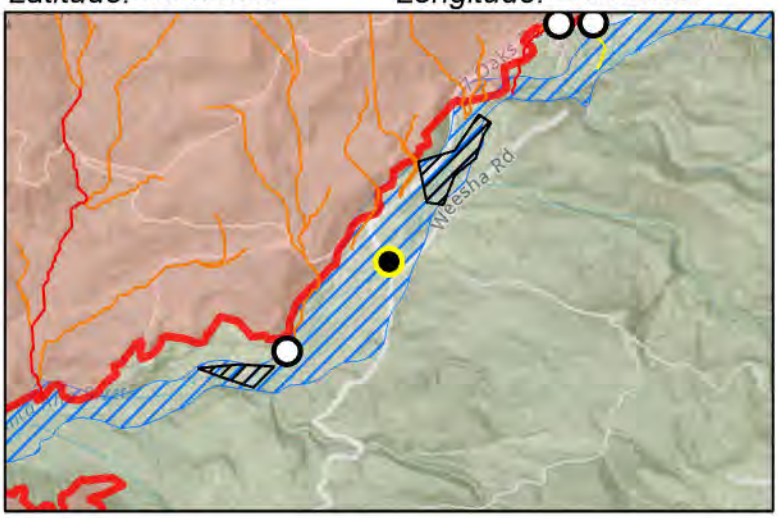
(4) **NA**

Text: NA

Description: Bridge spans 27' with 6-7' from thalweg to bottom of bridge deck. Concrete deck supported on steel I beams. Bridge is downstream of Mile Creek tributary to Santa Ana that contains steep hill slopes burned at mod and low severity. Area impacted by debris flow from TS Hilary on 8/20/23.

LOCATION AND PHOTO

Latitude: 34.171655 *Longitude:* -116.949551



VALUE AT RISK DETAIL

Incident: Line Fire *Incident Number: CA-BDF-012520*

Community: **Seven Oaks**

Site Number: **SO-04**

Feature: **Homes**

Feature Category: **home**

Field Observation or Potential Hazard: Multiple residences located adjacent to Santa Ana River watercourse. Potential hazard is debris flood overtopping channel banks and inundating homes.

Potential Hazard to Life: **low**

Potential Hazard to Property: **moderate**

Preliminary Emergency Protective Measures

(1) **Early Warning**

(2) **NA**

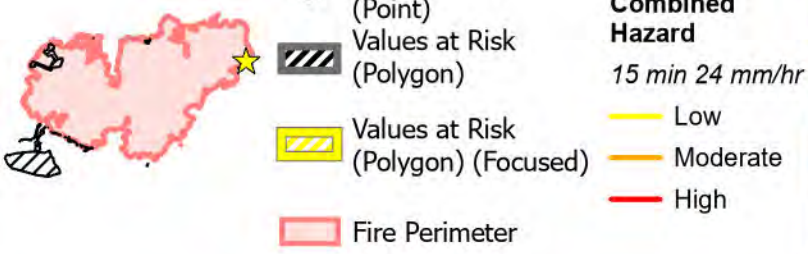
(3) **NA**

(4) **NA**

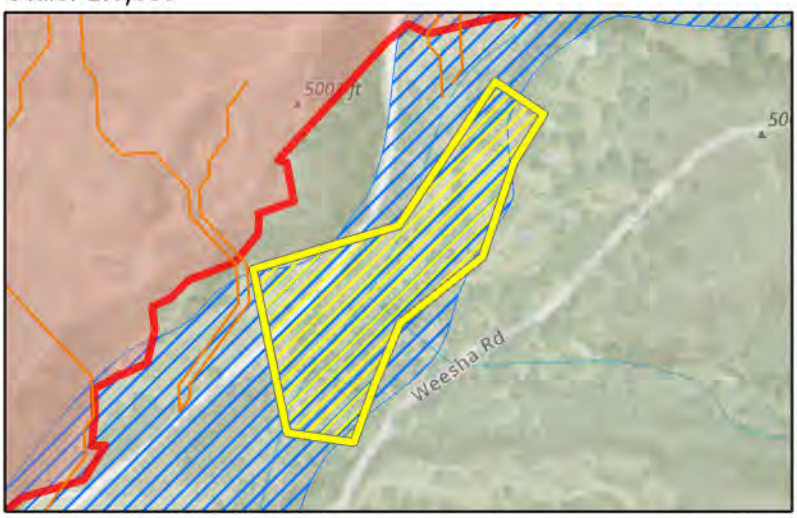
Text: NA

Description: Upstream watershed is largely outside of the burn perimeter; however, the Mile Creek tributary just upstream contains steep slopes with moderate and low burn severity. Flooding from this drainage could mobilize burned debris in Mile Canyon and downed woody debris and boulders scattered along the Santa Ana River drainage from the TS Hilary event

LOCATION AND PHOTO



Scale: 1:6,000



VALUE AT RISK DETAIL

Incident: Line Fire *Incident Number: CA-BDF-012520*

Community: **Seven Oaks**

Site Number: **SO-05**

Feature: **Culvert crossing**

Feature Category: **drainage structure**

Field Observation or Potential Hazard: Seven Oaks Road culverted crossing over Mile Creek. Potential hazard is flood flow mobilizing woody debris, leading to plugging of culvert and overtopping of road. road inundation may impact ingress/egress to residences.

Likely probability of occurrence with moderate consequence = High risk.

Potential Hazard to Life: **low**

Potential Hazard to Property: **moderate**

Preliminary Emergency Protective Measures

(1) **Early Warning**

(2) **Clear and maintain culvert**

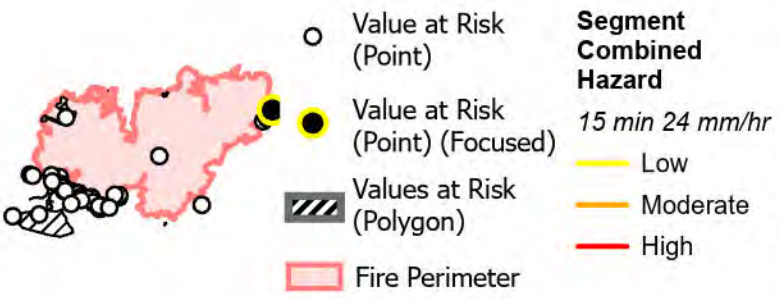
(3) **Signage**

(4) **NA**

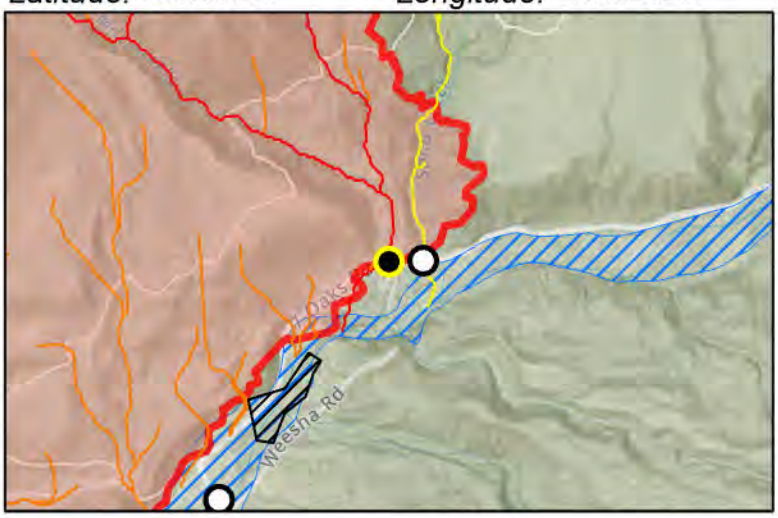
Text: NA

Description: 4' x 10' box culvert with approx. 1.5 ft of freeboard. overland flow along road surface in both directions. Crossing is at road high point. Boulders and mature tress present just upstream of crossing. Mile Creek drainage burned mostly at moderate severity.

LOCATION AND PHOTO



Latitude: 34.178145 *Longitude:* -116.943241



VALUE AT RISK DETAIL

Incident: Line Fire *Incident Number: CA-BDF-012520*

Community: **Seven Oaks**

Site Number: **SO-06**

Feature: **Road crossing culvert**

Feature Category: **drainage structure**

Field Observation or Potential Hazard: Seven Oaks Road culverted crossing over Sand Creek. Potential hazard is flood flow mobilizing woody debris, leading to plugging of culvert and overtopping of road. Road inundation may impact ingress/egress to residences.

Possible probability of occurrence with moderate consequence = Intermediate risk.

Potential Hazard to Life: **low**

Potential Hazard to Property: **low**

Preliminary Emergency Protective Measures

(1) **Early Warning**

(2) **Clear and maintain culvert**

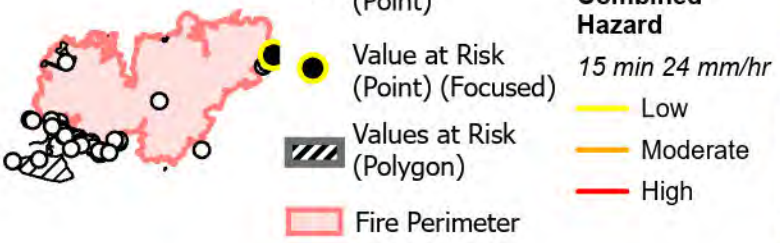
(3) **Signage**

(4) **NA**

Text: NA

Description: 30-inch diameter RCP with 48-inch head wall. Small drainage burned at low severity.

LOCATION AND PHOTO



Latitude: 34.178117 *Longitude:* -116.942067