Notes from: Report of Atlas Fire Watershed Emergency Response Team, Oct, 2017.

Whole report can be found at:

http://www.fire.ca.gov/communications/downloads/Watershed_reports/20171115_AtlasFireWERT.pdf

(1 CAL FIRE's Incident Information page states an area of 51,624 acres.

The area within the Atlas Fire perimeter has had an active fire history, with approximately fifty-eight percent of the area having been previously burned since 1980. The Atlas Peak Fire burned approximately 23,000 acres in 1981 in the northern half of the current Atlas Fire perimeter (Figure 2). Post-fire surface water quality impacts from the 1981 Atlas Peak Fire were documented in a MS thesis from U.C. Davis (Cohen, 1982).
 Thirteen sub-watersheds (i.e., pour points) were analyzed for increased post-fire flood hazards, including sub-watersheds that had vital crossing structures identified as having a moderate risk of being overtopped and causing damage to surrounding improvements and resources and sub-watersheds identified as having resources at risk within identified FEMA 100-year flood zones, DWR awareness floodplains, and USGS designated Watchstreams.

342 sub-watersheds were evaluated for post-fire debris flow hazards**.** Using a 15-minute rainfall intensity of 0.94 inches/hour (24 mm/hr) threshold precipitation event, 23 of 342 basins (~7 percent) have a likelihood of 60 percent or greater to produce post-fire debris flows.

The burn area was analyzed using an erosion model (ERMIT). For a 2-year recurrence storm event, the majority of hillslopes with extremely low to low soil burn severity are expected to have post-fire erosion rates of at least 8 tons/acre the first year following wildfire. Post-fire erosion rates collected from the 2015 Valley Fire at Boggs Mountain Demonstration State Forest (BMDSF) suggest erosion rates of 6.2, 0.9, and 0.3 tons per acre for high, moderate, and low soil burn severities, respectively. The sites at Boggs were subject to a 1- to 2-year recurrence interval 30-minute storm event, so are comparable to the design storm modeled under ERMIT. This indicates that the erosion model results appear to overestimate erosion rates for low soil burn severity by more than an order of magnitude.

High and moderate soil burn severity categories have evidence of severe soil heating and the consumption of organic material. Increased runoff due to ground cover reduction, burned soils and hydrophobic conditions is reflected in the flood flow analysis conducted for these watersheds. In summary, field observations and modeling of the high and moderately burned area support a general trend of increased flood flows, sedimentation, erosion, debris flows, and shallow landslides due to post-fire effects.

Identified Values-

Emergency post-fire conditions for the Atlas Fire identified by the WERT include threats to the values-at-risk resulting from the potential for increased flood flows, increased erosion and sediment delivery, debris flow occurrence, and rock fall. The values-at-risk are reported as isolated points (55%) and as polygons (46%) depending on site characteristics. Generally, areas of concentrated values-at-risk, such as along a road segment, in a floodway, or at the base of a slide prone slope, are reported as polygons; isolated, standalone values-at-risk are reported as points. Overall, 74 specific values-at risk were identified, including 40 ---- drainage structures (culverts and bridges)18 ---- multiple structures (generally includes an area of concentrated values within a polygon)7 ------ utilities (such as community drinking water reservoirs and associate infrastructure)

None of the values-at-risk were identified as being at high risk to life or property. One drainage structure (VAR 54) was identified at moderate risk to life and high risk to property in the event the crossing fails. Several homes adjacent to a FEMA 100-year flood zone along Milliken Creek were identified as having a moderate risk to life and property (VAR47). Additionally, one home (VAR 53) was identified as having a moderate risk to life and property as a result of increased debris flow and flooding potential. *No exigencies were observed or identified by the WERT.*\

Key areas of concern are:

- Flooding and debris flow impacts to main access roads, such as Soda Canyon Road and Atlas Peak Road, County Roads, such as Wooden Valley Road and Suisun Valley Road, and to state Highways 121 and 128. Signage is recommended to notify drivers and local residents of flood and geologic hazards.
- Flooding and debris jams within designated FEMA 100-year flood zones, DWR awareness floodplains, and USGS modelled Watch streams.
- Debris flow impacts to structures near the outlet of basins with a debris flow probability estimated to be greater than 60%, based on a 15-minute rainfall intensity of 0.94 inches/hour (24 mm/hr) threshold precipitation event.
- Impacts to water quality within local reservoirs used for municipal drinking Water supply.

General Recommendations

- Utilizing early warning systems available to homeowners, particularly those located in flood prone areas.
- Performing storm patrols and monitor road drainage infrastructure.
- Properly locating temporary housing when rebuilding.
- Placing temporary signage in areas of potential post-fire rockfall, debris flow, and flooding hazards. Monitoring and/or removing accumulated debris from within channels that are subject to post-fire flooding, where there is an elevated risk to property.

Debris flows are among the most hazardous consequences of rainfall on burned
Hill slopes. Debris flows pose a hazard distinct from other sediment-laden flows because of their unique destructive power. Debris flows can occur with little warning and can exert great impulsive loads on objects in their paths. Even small debris flows can strip vegetation, block drainage ways, damage structures, and endanger human life. Additionally, sediment delivery from debris flows can "bulk" the volume of flood flows, creating an even greater downstream flooding hazard. As winter approaches, it is critical that people who live in and downstream from large wildfires implement emergency protection measures where appropriate, remain steadfast and alert of weather conditions, and be ready to evacuate if necessary during large storms.

In areas of high and moderate burn severity, water repellant soils can develop where waxy substances released by plant materials during hot fires follow thermal gradients into the soil and condense onto soil particles. Additionally, the headwaters of these watersheds are very steep. Dry ravel (i.e., downslope mobilization of loose bedrock, soils, and sediment wedges accumulated behind vegetation removed during the fire) was observed on very steep slopes in numerous locations in the burn area. The loose materials may become mobilized into sediment-laden runoff during heavy rains, leading to the development of debris flows and debris torrents that may flow downstream from the watershed headwater source areas. Additionally, large rocks and boulders on steep slopes that were previously supported by vegetation may roll downslope and cause damage to buildings and infrastructure. The magnitude of post-fire damage will ultimately be determined by the intensity and duration of storms that impact the burn area for several wet seasons until vegetation recovers.

The Atlas Fire burned more than 28,000 acres of the Napa River watershed, or approximately 10 percent of the watershed area, within the Napa River, Conn Creek, and Tulocay HUC-10 watersheds. In total, approximately 21 percent of the Napa River watershed was affected by the Atlas, Nuns, and Tubbs fires.
The Atlas Fire burned approximately 44 percent of the Suisun Creek, entirely within the Wooden Valley Creek HUC-10 watershed. Only two percent, or 8,706 acres, of the Putah Creek watershed was affected by the Atlas Fire.

In the field, WERT team members observed that the under burn areas in forest types often had a very high percent of consumed surface fuels, even when the over story canopy was left intact and green. The grasslands also had a large percentage of consumed surface fuels. Moderate burn severity was typically in forest or dense chaparral vegetation types, and had roughly 50% canopy consumption or more. The surface soil heating was relatively low in moderate SBS areas, even where 100% canopy was consumed because of the fast-moving fire conditions and low fire residence time.

For the “Percent Runoff Increase”, an assumption of 100% flow increase (doubling of flows) for high and moderate burn severity areas was used in most cases, which is typical of flow increases used by U.S. Forest Service BAER teams (Foltz et al. 2009). In areas where rocky soils and bedrock outcrops exceeded 60% of ground cover (see Table 3), a 75% flow increase for high and moderate burn severity areas was used to account for the unchanged portion of ground cover. Johansen et al. (2001) noted a significant decrease in post-fire sediment yield and runoff from grasslands and shrub lands relative to forested landscapes in rainfall simulations. Due to the extensive grass and shrub cover within the burn area, low burn severity areas were combined with the unburned area and assumed to have no flow increase under post-fire conditions.

ERMIT predicts that for a 2-year recurrence storm event, the majority of hillslopes with extremely low to low soil burn severity are expected to have post-fire erosion rates of at least 8 tons per acre the first year following wildfire. This would roughly be a 22-foldincrease in sedimentation the first post-fire winter compared to pre-fire conditions with this level of probability. This prediction is higher (i.e., more than an order of magnitude) than the rate of 0.3 tons per acre documented at BMDSF for low soil burn severity. The rates from BMDSF reflect a 1- to 2-year storm event of 0.53 in hr-1, or slightly less than the 2-year storm event of 0.60 in hr-1. ERMIT predicts a higher mean rate for low soil burn severity (i.e., 8.0 tons per acre) than the rate collected for high soil burn severity at BMDSF (i.e., 6.2 tons per acre), despite the fact that the soils at BMDSF are deeper and less rocky. Altogether, this suggests that ERMIT may over predict erosion rates within the
Atlas Fire burn area.

4.7.5 CIRCLE OAKS DRIVE SUBDIVISION

Observations:
VARs (65-68). Residential structures identified near the outlet of steep draws that drain headwall slopes underlain by Sonoma Volcanics. Many of the identified residential structures are founded within landslide deposits at the toe of the headwall slopes. The headwall slopes were burned at low to moderate soil burn severity and, according to USGS debris flow modeling, have basin debris flow probabilities on the order of 0 to 20% and segment debris flow probabilities on the order of 20 to 40% (at 15-minute 24 mm hr-1 rainfall thresholds). It is anticipated that the effects of the moderate to high soil burn severity in the upper watershed may increase and magnify the size and intensity of rainfall runoff that could lead to flooding, debris flows, and mud flows that may impact the residential structures.

Recommendations:

- Contact Napa County and request they notify the owner(s) of the anticipated risks.
- Utilize early warning systems available to homeowners. Values at Risk Map Appendix C, pg 5 Circle Oaks (page 78 of overall document)

4.7.6

VARs (25-29, 45, 71). There are four known community water-supply reservoirs that were impacted by the Atlas Fire. From north to south, they include: Rector Reservoir (VAR-25), managed by the California Department of Veterans Affairs; Milliken Reservoir (VAR-26), managed by City of Napa; and Lake Madigan (VAR-27) and Lake Frey (VAR-28), managed by City of Vallejo Water Department. Potential, post-fire impacts to these reservoirs can include elevated sediment loading and turbidity, and increased concentration in nitrates, phosphates, organic carbon, and trace metals that could place an added demand on water treatment systems.

The Milliken Reservoir access road (VAR-29) is a gravel-surfaced road with an inside ditch that is drained via cross-drain culverts. The road traverses steep slopes with moderate soil burn severity immediately upslope of the reservoir. Excessive runoff and debris from these slopes may impact the road surface. Additionally, the fire is known to have impacted water conveyance structures downstream of the Milliken Reservoir (VAR-45) and Lake Frey (VAR-71). In both cases, the water conveyance structures (above ground pipe lines) and associated access roads were impacted by rock fall that damaged the waterline and limited access. If not mitigated, future damage to the conveyance structures and obstruction along the access roads may occur.

Previous data from the 1981 Atlas Peak Fire and its effect on water quality on the Milliken Reservoir water system (Cohen, 1982) can be used as a basis for determining the relative risk to water quality and water treatment facilities. For instance, the study indicated that turbidity increased by more than a factor of twenty (20) when discharge in upper Milliken Creek increased from approximately 100 to 700 cfs (Figure 16). Data from the thesis also indicated that turbidity in Milliken Reservoir and the reservoir outlet remained elevated, even after upper Milliken Creek turbidity recovered. This basic pattern was consistent for other water quality constituents, such as nitrate and nitrite. Toxic materials which could be released by damaged areas include toxins in burned homes, Mercury mines Asbestos, Natural Gas seeps
Portions of the Atlas Fire burn area may be underlain by naturally occurring hazardous minerals (particularly naturally occurring asbestos (NOA)). Rock and associated soil in these areas may contain naturally occurring asbestos. Information regarding these hazardous minerals can be found at the Bay Area Air Quality Management District for both Napa and Solano counties (http://www.baaqmd.gov/pERMITs/asbestos/naturally-occuringasbestos) and Cal EPA Air Resources Board (http://www.arb.ca.gov/toxics/asbestos/geninfo.htm).

We recommend consultation with the Bay Area Air Quality Management District to develop mitigations that are centered on limiting dust generation and limiting dust exposure consistent with NOA mitigations

Recommendation for temporary housing :

When there is need for temporary housing or new building construction for residents displaced by the fire, site-specific evaluation of hazards for temporary housing should be conducted by a qualified professional and in accordance with the local lead agency. In addition to evaluating flood risks, the following factors should be considered as part of the evaluation. On hillslopes above potential temporary housing and building sites:

- Could runoff from the hillslope concentrate in swales and small drainages and flow onto the site, and flood or otherwise damage the proposed structure, or present a life-safety hazard?
- Is the hillslope behind the structure steep and erodible, where rilling, gullying, or shallow failures could deliver a sufficient volume of sediment and debris to damage the proposed structure or pose a life-safety hazard?
- Are large rocks, boulders, or other material present on the slope that pose a rock or debris fall hazard that could impact the proposed structure, or present a life safety hazard?
- Is there evidence of recent or impending erosion or mass wasting that could damage the proposed structure or pose a life/safety hazard (e.g., debris torrents/flows, deep-seated slides or slumps)? On hillslopes below potential temporary housing and building sites: Is there evidence of recent or impending fill slope landslide-type failures that indicate an elevated risk of building pad failure?
- Is the building pad located above a watercourse where normal or flood flows could potentially erode the toe of the slope and trigger failure? If any of these conditions are present, then mitigations need to be implemented, or alternative sites need to be identified and evaluated. Technical experts such as licensed engineers or geologists may be needed to support the evaluation.