Title

The Value of Sharing and Consolidating Critical Community, Electricity, and Natural Hazard Information

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Prepared for the California Public Utilities Commission

Chelsi Sparti, Peter Larsen and Tyler Huntington

August 2023

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We would also like to acknowledge the Bishop Paiute Tribe and Brian Adkins, Bishop Paiute Environmental Director, for sharing selected information on community infrastructure—thus allowing us to demonstrate the value of overlaying electricity infrastructure on top of this information. Kristen Pfeiler from Inyo County shared preliminary wildfire risk shape files with the team. Peter Cappers (Berkeley Lab) provided an independent review of this manuscript before it was published. Finally, we thank Kristan Johnson, also with Berkeley Lab, for her assistance with the formatting of this document.

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1. Background and Introduction

1.1 Motivation

Investor-owned utilities (IOUs) across California have expended significant resources to respond to and prepare for natural hazards. These efforts will likely reduce the number of customers affected when public safety power shut-offs (PSPS) events are required. But no one expects that they will eliminate the need for them entirely over the foreseeable future. To minimize expected hardships, the IOUs have also increased communications to inform customers of their options to prepare for interruptions and also to help guide their actions when events are in progress. These activities are often conducted in coordination with other parties with responsibilities for the welfare of Californians, including first responders and hazard mitigation planners.

Unfortunately, there is no centralized system that contains the location and characteristics of *both* critical community and electricity infrastructure. To date, geographic information system (GIS)-based information about infrastructure exists in two or more separate data streams. First, the CPUC has required–via CPUC Proceeding R.19-09-009–that utilities upload the location and other details about their electricity infrastructure into *Microgrid Planning Portals* (CPUC 2019). Second, local and tribal governments often collect information on their critical infrastructure, including the location of police/fire stations, telecommunications, water/wastewater treatment plants, hospitals, and emergency shelters (among other categories). This information is often compiled and disseminated within state, local, and tribal *hazard mitigation plans*, which are required by the U.S. government to receive "certain types of non-emergency disaster assistance" (FEMA 2023). The Federal Emergency Management Agency (FEMA) indicates that:

> "Hazard mitigation planning reduces loss of life and property by minimizing the impact of disasters. It begins with state, tribal and local governments identifying natural disaster risks and vulnerabilities that are common in their area. After identifying these risks, they develop long-term strategies for protecting people and property from similar events. Mitigation plans are key to breaking the cycle of disaster damage and reconstruction." (FEMA 2023)

It is anticipated that the existence of a single GIS-based system containing both critical community and electricity infrastructure—as well as natural hazard layers—would facilitate greater degrees of communication, coordination, and long-term planning between the IOUs, first responders, and emergency coordinators within individual communities and beyond.

1.2 Request for technical assistance

For this reason, the California Public Utilities Commission (CPUC) requested technical assistance from Lawrence Berkeley National Laboratory (Berkeley Lab). The CPUC asked Berkeley Lab to investigate the challenges and opportunities of sharing the location of electricity and critical infrastructure between utilities and hazard planners throughout California. Adding critical community infrastructure locations to the Microgrid Planning Portals will improve the value of the portal, because it will help stakeholders consider where and how to prioritize future investments to make the power system more resilient. Accordingly, this technical assistance activity involved Berkeley Lab researchers reviewing hazard mitigation plans to assess (1) the natural hazards that communities are most concerned about; (2) the variety of–and terminology used to describe–critical community infrastructure; and (3) the availability of GIS information that could be incorporated into the Microgrid Planning Portals. In addition, we develop a common, but generic data taxonomy showing what fields to collect to encourage consolidating and sharing of this information in the future.

This report is organized as follows. Section II details the methods we used to assess the hazards, the terminology describing critical community infrastructure, and the availability of community infrastructure in a GIS format. In Section III, we describe our compilation of the preceding information from local and tribal hazard mitigation plans. Section IV presents a basic data taxonomy that can help the sharing of GIS information between the utilities and local/tribal governments. We present an example in Section V and conclude in Section VI. The successful completion of a single system containing both electric utility and community infrastructure data will help the state of California, the IOUs, first responders, and long-term planners better prepare for—and thus lower their exposure to these ongoing and emerging hazards.

2. Method

The overall objective of this effort is to identify the hazards of most concern to local governments and demonstrate the benefits of consolidating disparate GIS data streams detailing the location of hazards, critical community infrastructure, and electricity infrastructure. We started by selecting a representative group of hazard mitigation plans and then reviewing these plans prepared by county and tribal governments across the state of California. We focused our review on the (1) hazards that each community is concerned about, (2) naming conventions used to describe critical community infrastructure, and (3) presence of dedicated geographic information systems (GIS) staff.

2.1 Hazard mitigation plan selection criteria

We selected county and tribal hazard mitigation plans based on the public availability of these plans, the geographic spread, the variety of utilities providing electricity service, the type of government, and a range of hazards. We reviewed the most recently published hazard mitigation plan for each community and nearly all plans analyzed were published between 2016 and 2022. However, the Yurok Tribe hazard mitigation plan was published about ten years ago in June 2013.

The hazard mitigation plans selected for deeper analysis are served by nine electric utilities, including Pacific Gas and Electric (PG&E), PacifiCorp (PC), Surprise Valley Electrification Corporation (SVEC), Lassen Municipal Utility District (LMUD), Sacramento Municipal Utility District (SMUD), Southern California Edison (SCE), Los Angeles Department of Water and Power (LADWP), and Imperial Irrigation District (IID). The location of the plans reviewed is depicted in Figure 1, below.

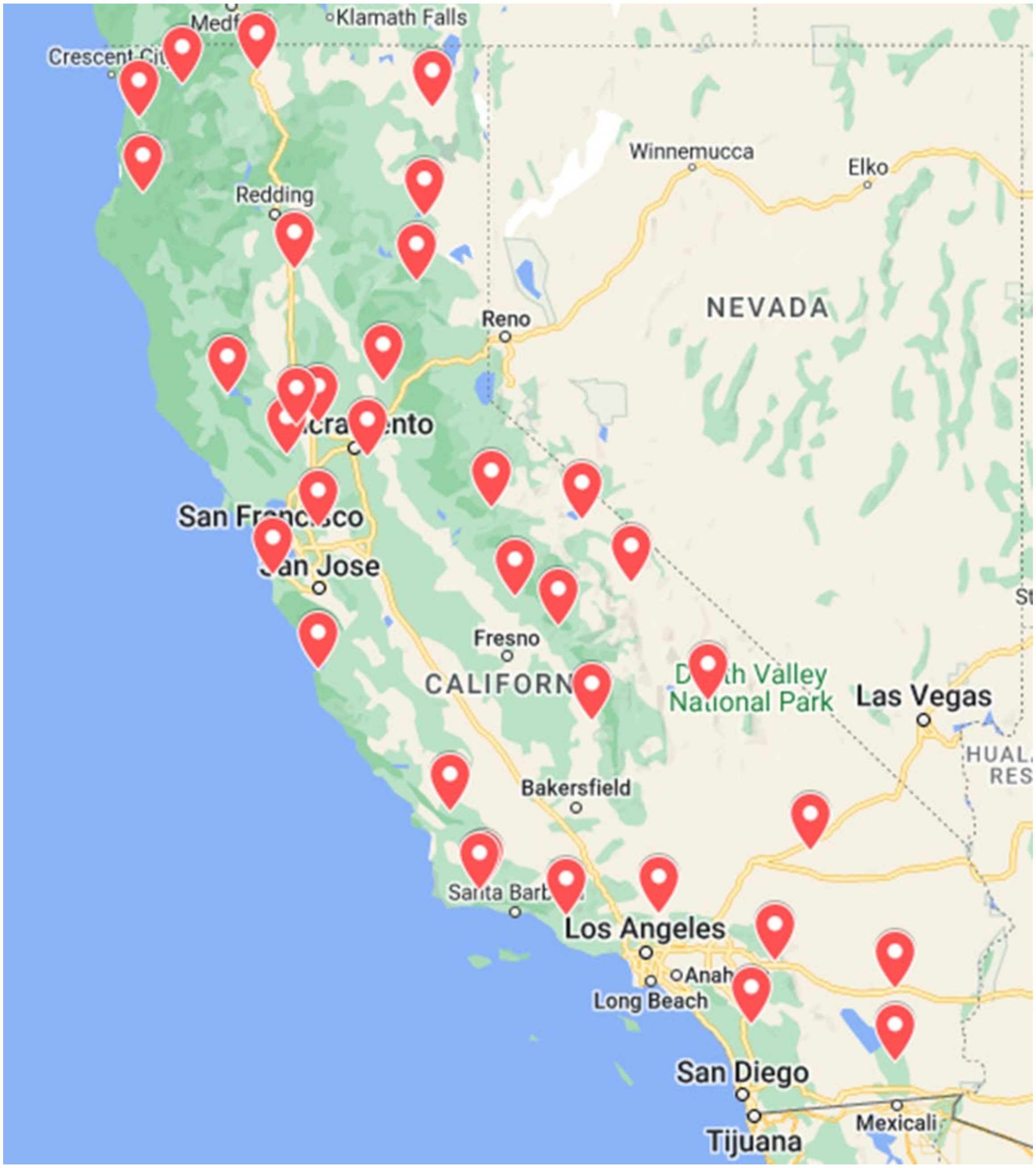

Figure 1. Location of 34 hazard mitigation plans reviewed

To ensure that we had broad geographic coverage, we divided the state into a number of regions including (see Table 1, below):

- north coastal (5 plans reviewed);
- north inland (12);
- central coastal (3);
- central inland (7);

- south coastal (3); and
- south inland (4).

The types of government represented in our collection of hazard mitigation plans include eight tribes and 26 counties, as shown in Table 1. We analyzed at least one tribal hazard mitigation plan per region. North coastal tribes include the Karuk Tribe and Yurok Tribe. The Scotts Valley Band of Pomo Indians and Yocha Dehe Wintun Nation are located within the north inland region. The Santa Ynez Chumash Tribe is in the central coastal region. The Bishop Paiute Tribe is in the central inland region. The Pala Tribe and Morongo Band of Mission Indians are in the south coastal and south inland regions, respectively.

Table 1. Hazard mitigation plans reviewed by region

Region	County or Tribe
North Coastal (five hazard mitigation plans)	Yurok Tribe, Humboldt County, Contra Costa County, San Mateo County, Monterey County*.
North Inland (12 plans)	Karuk Tribe, Siskiyou County, Modoc County, Lassen County*, Tehama County*, Plumas County, Nevada County, Scotts Valley Band of Pomo Indians, Napa County*, Sacramento County*, Yolo County*, Yocha Dehe Wintun Nation.
Central Coastal (three plans)	San Luis Obispo County*, Santa Barbara County*, Santa Ynez Chumash Tribe.
Central Inland (seven plans)	Tuolumne County*, Madera County, Mono County*, Bishop Paiute Tribe, Inyo County*, Fresno County, Tulare County*.
South Coastal (three plans)	Ventura County*, Los Angeles County*, Pala Tribe.
South Inland (four plans)	San Bernardino County*, Riverside County*, Morongo Band of Mission Indians, Imperial County*.

Legend: *Indicates a multi-jurisdictional hazard mitigation plan

The review of 34 hazard mitigation plans allowed us to identify the hazards that were of most concern across all jurisdictions. The hazards, which are not mutually exclusive, identified in the plans are listed in the following sub-section.

2.2 Standardizing disparate hazard risk ratings into common system

The risk rating methodology employed by most jurisdictions in this analysis was the Calculated Priority Risk Index (CPRI). Some plans used the FEMA Hazards USA Multi-Hazard (Hazus-MH) prioritization methodology. A number of plans did not explicitly state the methodology used to rate hazard risk. Not surprisingly, risk rating scales of natural hazards varied across the hazard mitigation plans. Most use a "*high-medium-low*" or a "*catastrophic-critical-limited*" risk rating scale. Some jurisdictions add a fourth rating category of "*severe*," "*extreme*" or "*very high*" to denote the highest risk rating. Others include a fifth rating category of "*possible,*" "*minor,*" or "*very low*" to capture the lowest risk rating. The rating "*moderate*" was synonymous with a rating of "*medium.*" Hazards that were mentioned to be of concern, but unranked are marked as "*mentioned*." Any hazards that were rated as "*none*" or "*no* *impact*" were excluded from the count. Some jurisdictions, like Riverside County, use a numeric rating scale[1].

For consistency and to facilitate comparison, we created a common risk rating system that was uniform across all jurisdictions. We employed a simple approach to convert all text risk ratings into a common set of numerical rating categories (see Table 2). We did this by assigning numerical scores to qualitative descriptions of risk for each hazard reported in the collection of hazard mitigation plans. Hazards deemed *severe/extreme/very high* risk were given a score of five, *high/catastrophic* risk were given a score of four, hazards deemed *moderate/medium/critical/substantial* were given a score of three, *low/limited* risk hazards were given a score of two, *possible/minor/very low* risk hazards a score of one, and *mentioned* risk hazards a score of zero. We summed up these quantitative values to determine which hazards – per investor-owned utility – were of the most concern to hazard mitigation planners.

Table 2. Mapping of hazard risk ratings into a common rating system

Numerical Risk Rating	Rating Description
5	severe, extreme or very high
4	high or catastrophic
3	moderate, medium, critical, substantial
2	low or limited
1	possible, minor or very low
0	mentioned

2.3 Naming conventions describing critical county or tribal infrastructure

The hazard mitigation plans included chapters or technical appendices describing critical infrastructure that may be exposed to hazard risk. We compiled details on the critical infrastructure-at-risk and identified examples when plans referred to a particular type of facility using similar terminology. This process resulted in identifying the types of infrastructure most-commonly described in hazard mitigation plans. Finally, we collected the name of the lead agency responsible for preparing the plan, the hazard mitigation plan point of contact, and, if available, the name of the GIS expert.

[1] Some of the county hazard mitigation plans are multi-jurisdictional plans. In these cases, the county's consolidated hazard risk rating or the hazards risk rating of the most densely populated city was selected for analysis.

3. Hazards, Terminology, and Availability of GIS Information

This section describes our analysis of the hazard ratings, critical community infrastructure terminology used in the hazard mitigation plans, and public availability of GIS data for hazard zones and critical community infrastructure.

3.1 Hazards identification and rating across all service areas

Table 3, below, details the top 28 hazards across all utility jurisdictions. Some jurisdictions had slightly different wording or a handful of additional hazards specific to their geographic context. See Appendices A - C for tables with specific hazard risk ratings by jurisdiction and service area. Wildfires, earthquakes, flooding, dam or levee failure, extreme heat/cold, and heavy rains are the most commonly referenced hazards across all jurisdictions.

Table 3. Range of hazards identified across all hazard mitigation plans; total number of plans referencing each hazard is reported in parentheses

Climate change (13)	Subsidence (8)	Avalanche (8)	Lightning (11)
Wildfire (33)	Floods (32)	Fog (7)	Tornado (15)
Drought (32)	Dam or levee failure (31)	Dust storm (2)	Air quality (2)
Earthquake (34)	Tsunami (9)	Monsoon (1)	Power outage (7)
Landslide (28)	Extreme heat (23)	Heavy rains (23)	Hazardous material incident (17)
Erosion (8)	Extreme cold/winter storm (23)	High wind (20)	Road/bridge failure (1)
Volcano (17)	Tree mortality (3)	Agricultural pests and diseases (18)	Epidemic/pandemic (13)

3.2 Hazards risk ranking in selected jurisdictions and IOU service areas

The next step in our analysis involved recording the hazard risk ratings for each jurisdiction and then creating a composite hazard risk score by summing the quantitative hazard risk ratings of all jurisdictions by hazard type. That composite score was then used to rank the hazards across all jurisdictions. This ranking identified themes in frequency of hazard types, severity of risk rating, and hazard distribution across all service areas. Our composite hazard risk score also demonstrates the collective hazards of most concern to planners throughout California.

Across all nine electricity service areas studied, the top hazards of concerns to planners were wildfire, earthquake, localized flood, drought, and dam failure (see Figure 2).

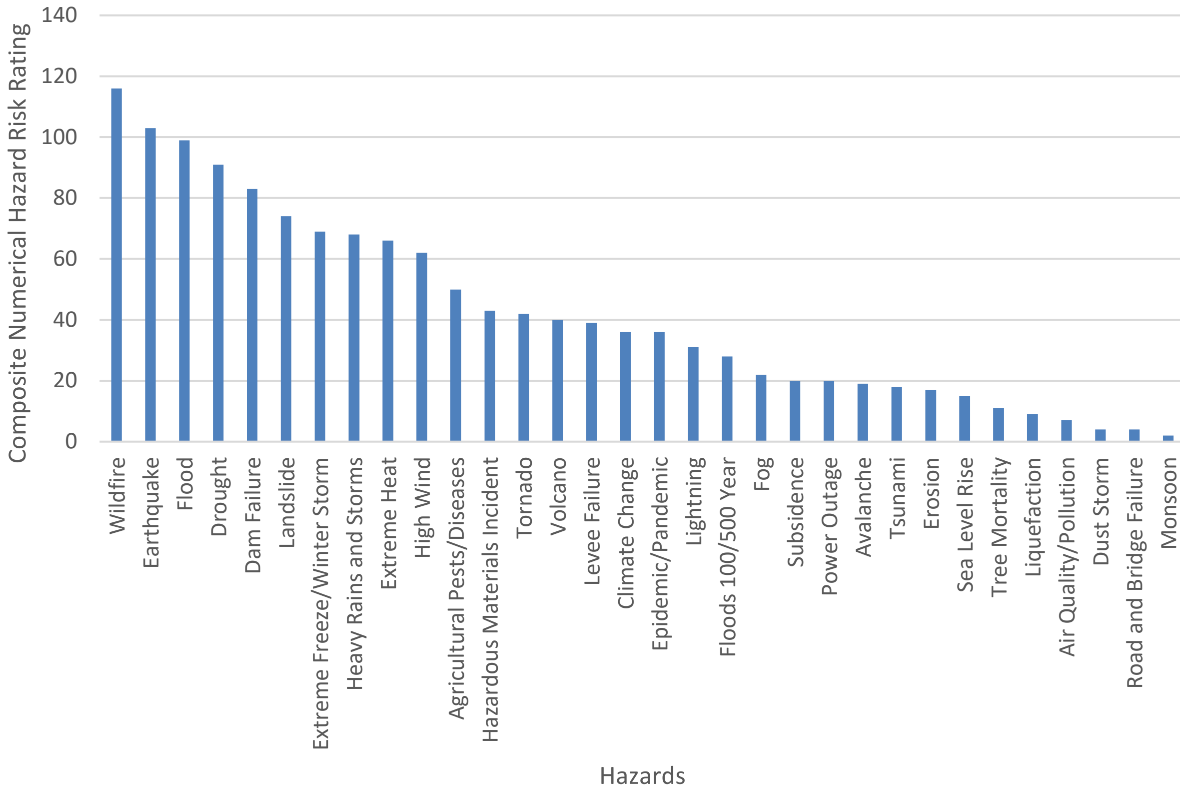

Figure 2. Hazard risk ranking composite across all 34 selected hazard mitigation plans

This method also allowed us to evaluate risk by individual utility. The top hazards identified in plans served by PG&E are wildfire, earthquake, localized flood, drought, and dam failure (Figure 3). These hazard ranks mirror the hazard ranks of the 34 consolidated jurisdictions shown in Figure 2.

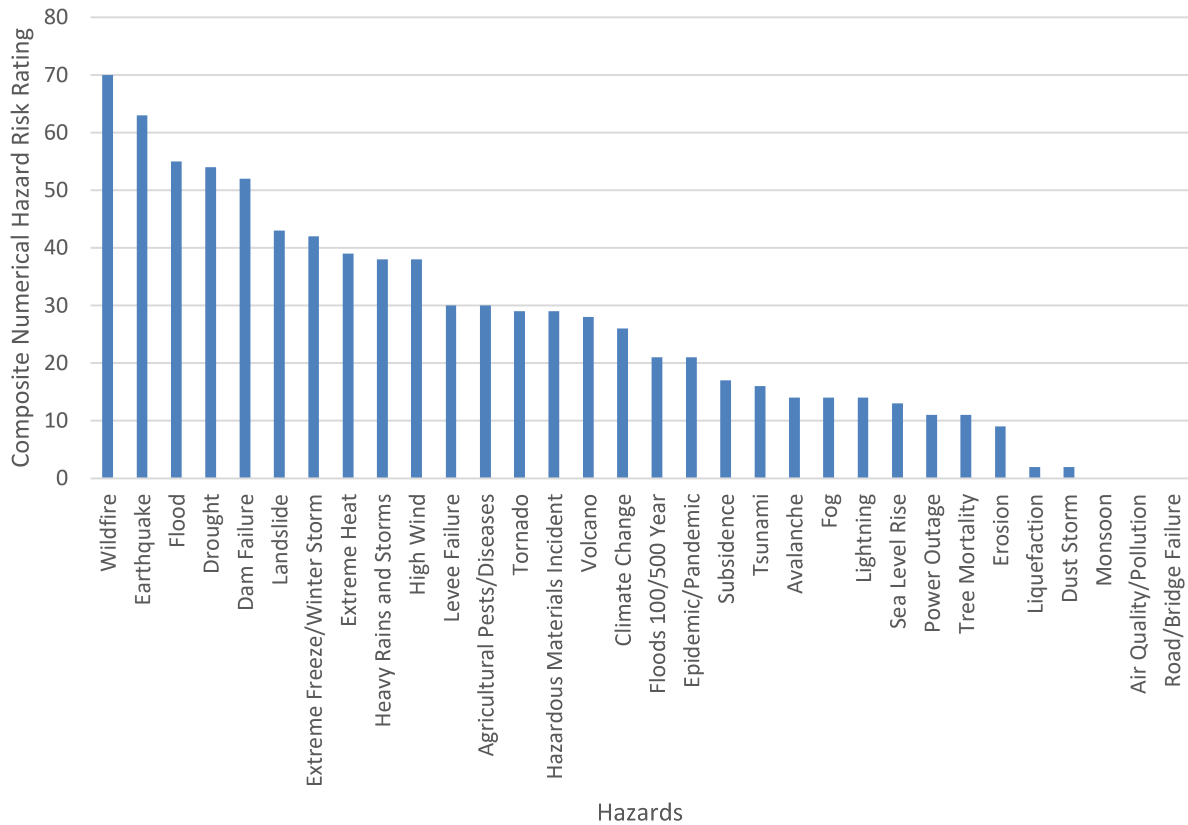

Figure 3. Hazard risk ranking composite of jurisdictions served by PG&E

Leading hazard risks in the SCE service area were wildfire, localized flood, earthquake, landslide, and drought (Figure 4).

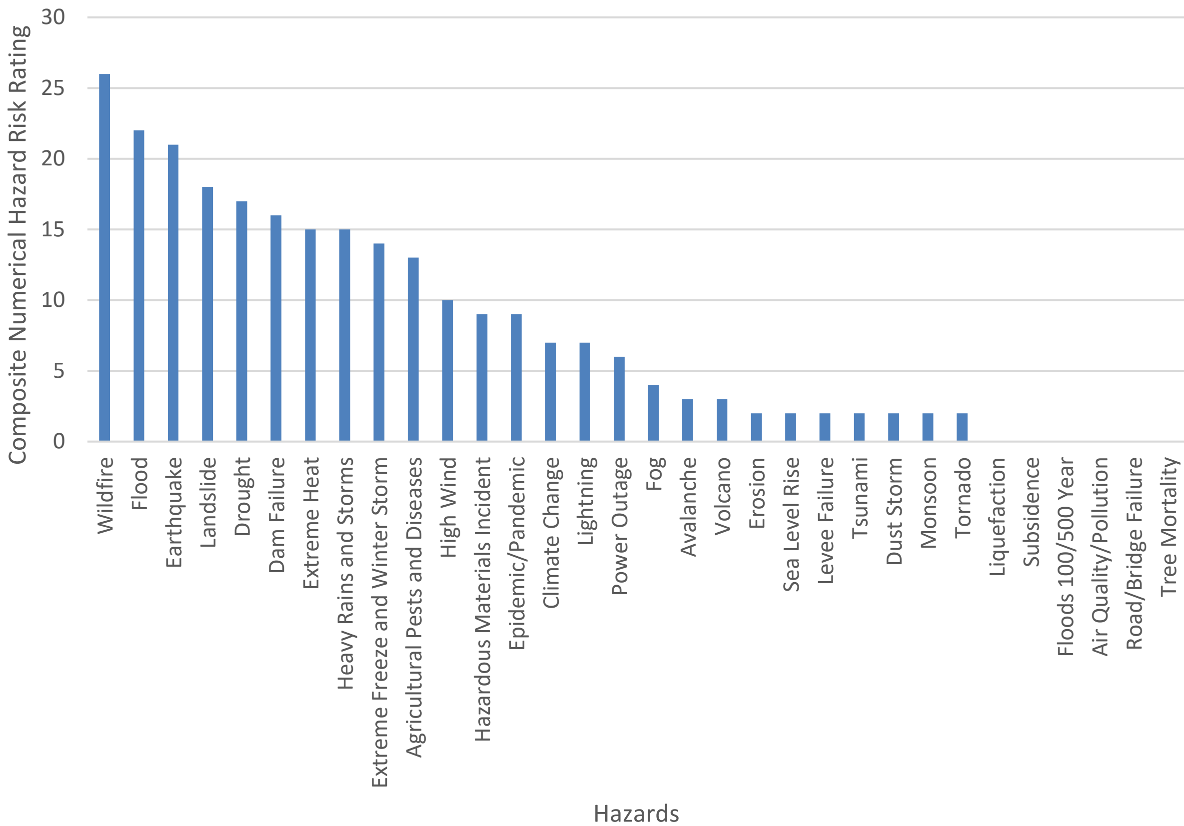

Figure 4. Hazard risk ranking composite of selected jurisdictions served by SCE

The top hazard risks in the PacifiCorp service area were wildfire, localized flood, drought, landslide, and earthquake (Figure 5).

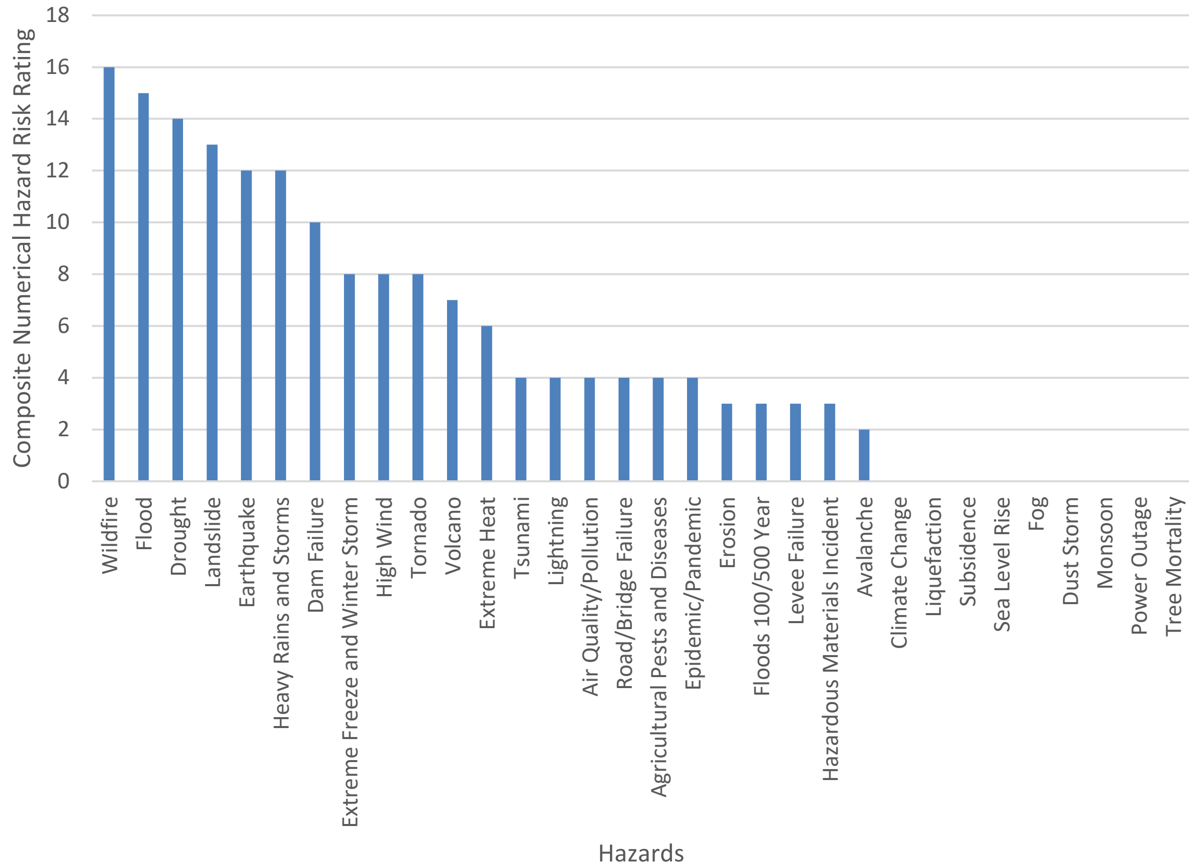

Figure 5. Hazard risk ranking composite of selected jurisdictions served by PacificCorp

3.3 Types of critical community infrastructure reported in plans

We reviewed the hazard mitigation plans to assess the types of critical infrastructure that may be at risk to one or more hazards. There were 15 general types of critical infrastructure consistently mentioned across the selected jurisdictions (see Table 4). However, we found significant variability in the specific terminology used to describe critical infrastructure. Local context appears to be key in the identification of critical community infrastructure.

Table 4. General types of community infrastructure identified in hazard mitigation plans

Hospital	Elder or adult residential care facility	Emergency services headquarters
Pharmacy	Community shelter/cooling center	Telecommunications
Police station	Grocery store	Power generation, transmission, and distribution
Fire station	Transportation	Water and wastewater treatment
School	Jail	Hazardous waste storage

Next, we counted if the above types of critical infrastructure were mentioned in the 34 hazard mitigation plans (see Appendix D). The total count of reported critical infrastructure types at risk to hazards are depicted in Figure 6, below. Across all jurisdictions, fire stations, hospitals, water treatment facilities, police stations, and telecommunications were the most commonly-reported type of infrastructure referenced in hazard mitigation plans.

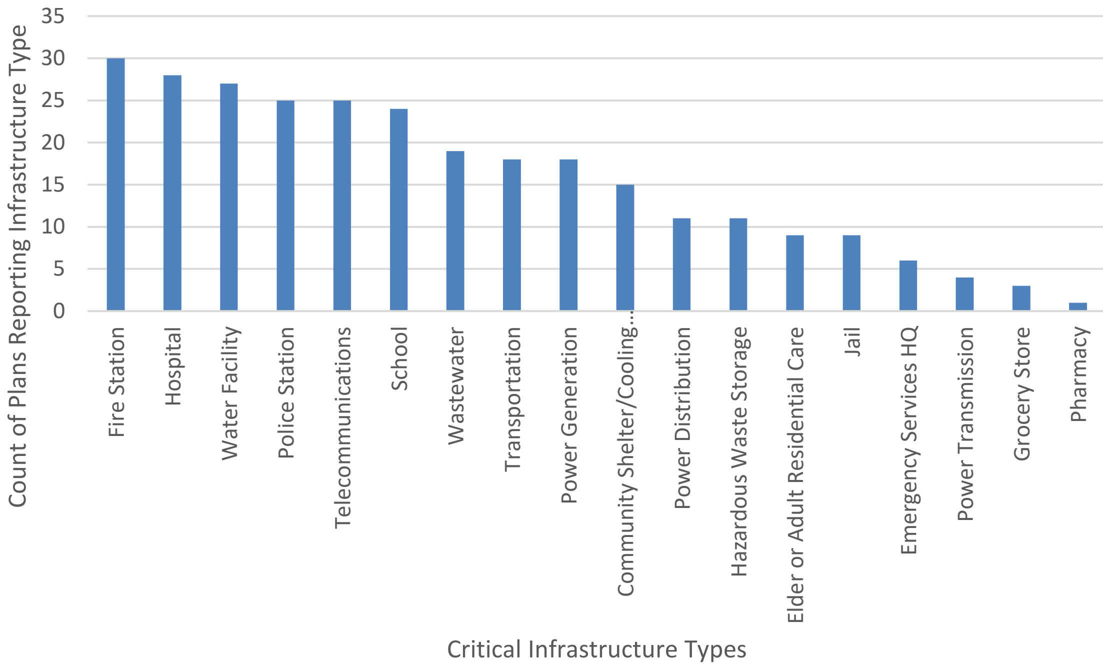

Figure 6. Count of reported critical infrastructure types across all 34 selected jurisdictions

3.4 Other useful information about critical community infrastructure

Although not explicitly noted in the hazard mitigation plans, information about the resilience posture[2] of community facilities could be incredibly useful for hazard mitigation practices and planning. More specifically, information about the presence of backup generation, solar plus storage, and stand-alone storage capabilities could help planners prioritize both short and long-term strategies to mitigate the impact of PSPS or power interruptions caused by a range of natural hazards. Facility-level information that could be immediately useful is described in Table 5, below, as well as the data schema shown in the next section. For example, it is possible to evaluate the resilience of a critical facility using the run time for a backup generator with a full fuel tank, the daily peak load of the facility, the percentage of that load served by the generator, and the likelihood that the generator will fail. This information gives

[2] We define resilience posture as the ability of community infrastructure to continue to provide critical services in the event of a power interruption affecting the community or broader region. Community infrastructure that has technologies including backup generation, solar plus storage capabilities, or stand-alone storage may be able to provide critical services if there is an outage affecting the bulk power system.

decision-makers the ability to assess how much critical demand is unserved by the backup generator and for how long.

Table 5. Useful critical facility-level information to assess resilience posture

Technology	Characteristic	Units
Onsite backup generation (emergency only)	Nameplate capacity	kW
	Fuel type	Gasoline, diesel, propane, natural gas
	Fuel tank size	Gallons, therms
	Efficiency	MMBtu/kWh, gallons/kWh
	Run time on full tank	Hours
	Average daily peak demand of facility	kW
	Average daily energy usage of facility	kWh
	Facility peak load served during emergency	%
	Failure rate to operate	%
Photovoltaic solar with storage (continuous use, but available for emergencies)	Nameplate capacity of PV-solar (AC-rated)	kW
	Average daily production of PV-solar	kWh
	Average daily storage roundtrip efficiency	%
	Rated power capacity of storage	kW
	Energy capacity of storage	kWh
	Average daily peak demand of facility	kW
	Average daily energy usage of facility	kWh
	Facility peak load served during emergency	%
	Expected state of charge during power interruption	%
Stand-alone storage (emergency only; assumes 100% charge state)	Rated power capacity of storage	kW
	Energy capacity of storage	kWh
	Facility peak load served during emergency	%
	Average daily peak demand of facility	kW
	Average daily energy usage of facility	kWh

3.5 Geographic Information System (GIS) data availability

It is important to note that only one jurisdiction out of the 34–Santa Barbara County—shared contact information for their GIS analyst in an accessible location on a county website[3]. This finding along with several conversations that we have had confirm that many local governments in California do not have the resources to support full-time staff specializing in GIS. Furthermore, local government staff often take on multiple roles within a department thus preventing them from dedicating resources to ongoing hazard and community infrastructure mapping capabilities. In addition, the webpages hosting the hazard mitigation plans do not include access to any data sets for the hazard mitigation plans. In many cases, specific hazard data and critical infrastructure locations are considered "sensitive" and are not available to the public. It is clear that accessing this sensitive data will likely require conversations with each local government and a lengthy approval process.

[3] As part of this project, we did collect contact information for local government staff listed as leading the hazard mitigation planning effort.

4. Data Taxonomy for Consolidating and Sharing of Information

We prepared a basic data schema (i.e., database structure) that demonstrates how disparate data sources including hazard areas, electricity infrastructure, and critical community infrastructure could be combined to inform long-term electric system and hazard mitigation planning efforts (see Figure 7). In addition, we recommend collecting information about critical facility peak electricity demand and consumption as well as information about the facility's existing resilience posture. Resilience posture refers to any technologies already installed at a facility (e.g., fossil-fueled backup generation, solar with storage, stand-alone storage) with the goal of delivering critical electricity service when a power interruption is affecting the community or broader region. A centralized repository of GIS data could support efforts to reduce hazard-induced electricity outages, including strategies to mitigate the potential for wildfires (e.g., PSPS). This information could help identify locations where microgrids, backup generation, undergrounding, or other electricity system upgrades would provide the most value for community resilience.

The data taxonomy described in Figure 7 suggests a basic structure—which could be expanded upon—to consolidate the GIS data detailing hazards zones, critical community infrastructure, and electricity infrastructure for each jurisdiction.

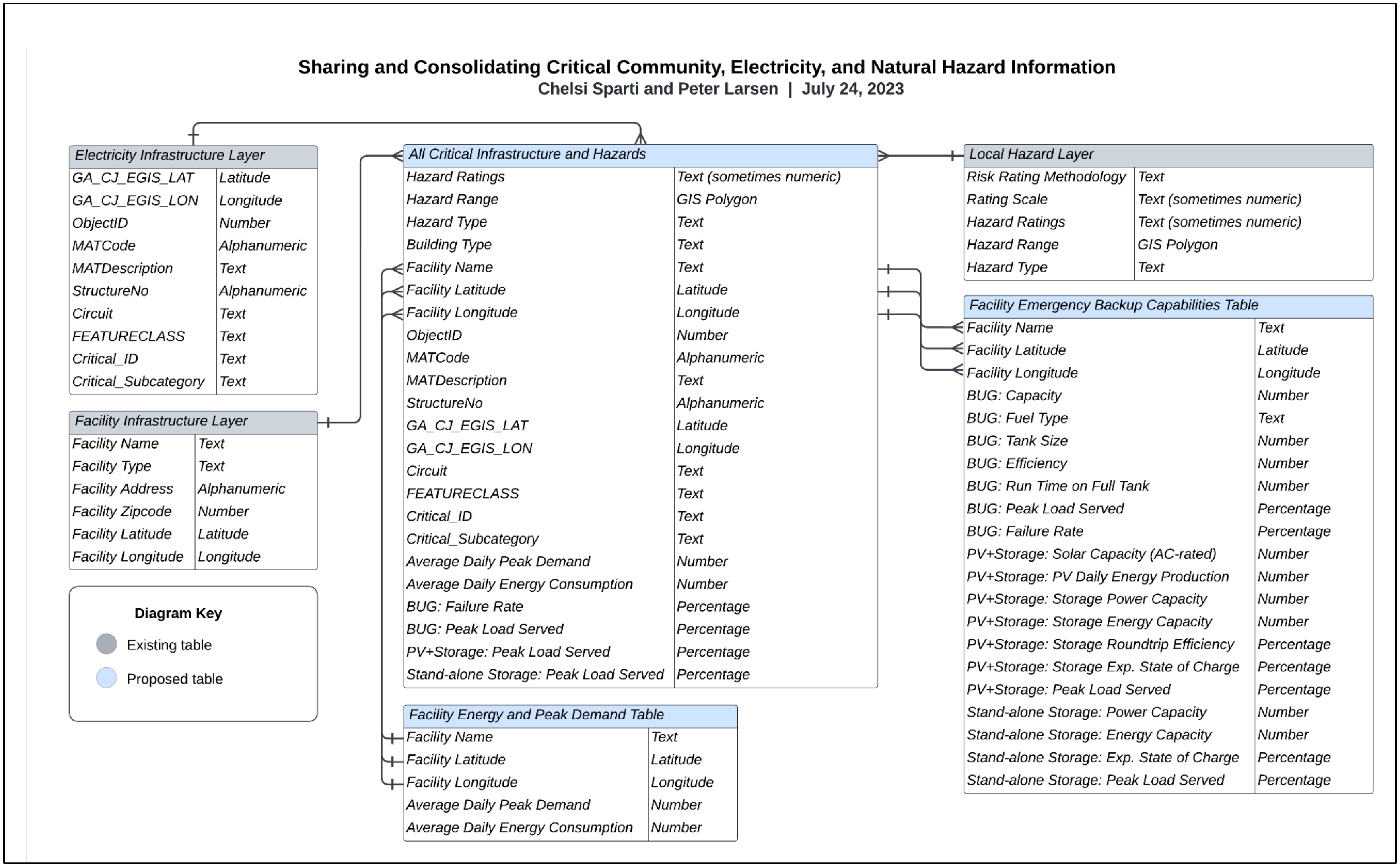

Figure 7. Example of data schema combining electricity infrastructure, critical community infrastructure, and natural hazard information

5. Example of Overlaying Electricity, Community, and Hazard Information in a Single Map

5.1 Tribal government

We partnered with the Environmental Management Office of the Bishop Paiute Tribe to demonstrate the value of combining electricity infrastructure, critical community infrastructure, and natural hazard locations into a single map. The Bishop Paiute Tribal land encompasses 879 acres (roughly 1.17 square miles) and is located in the Owens Valley at the base of the Sierra Nevada Mountain range. We collaborated with tribal staff to produce three maps that demonstrate the usefulness of combining critical community facilities, electricity infrastructure, and hazard zones into a single set of images[4].

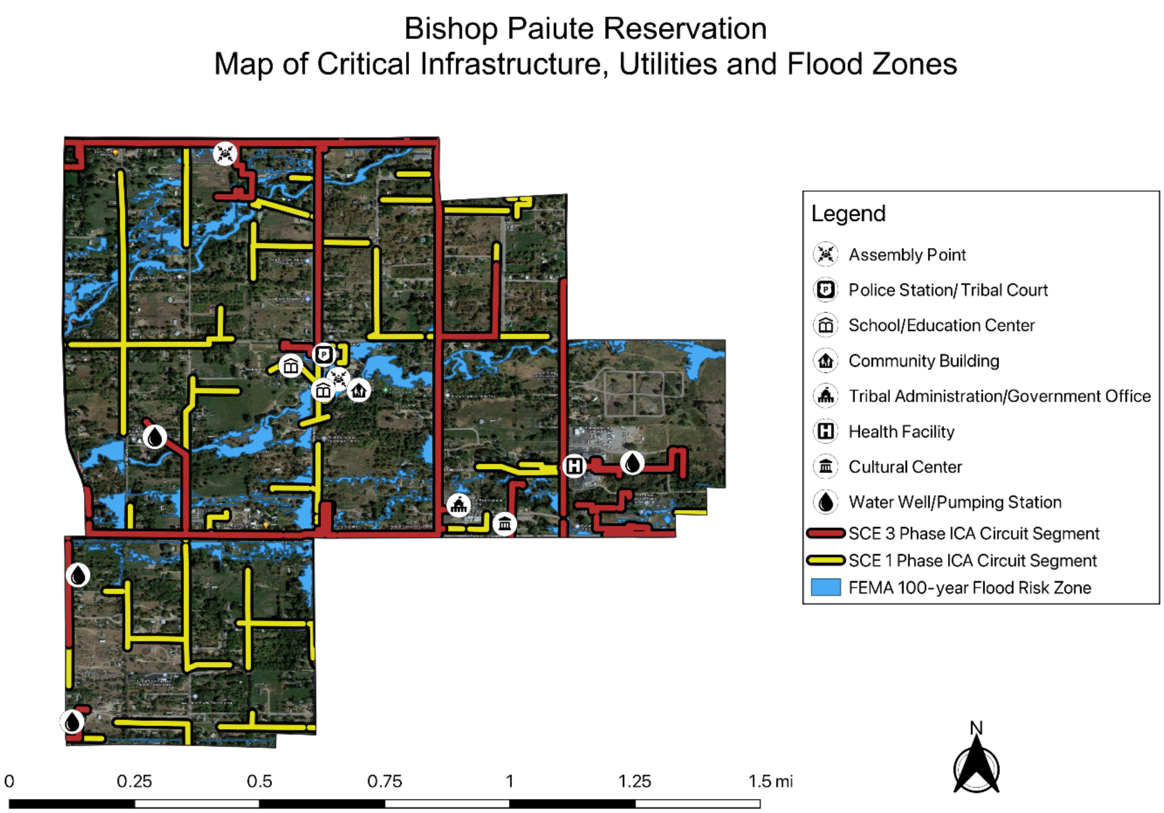

Figure 8. Critical facilities, electricity infrastructure, and flood zones on the Bishop Paiute Reservation

The information displayed in Figure 8 includes the location of Bishop Paiute critical facilities (e.g., police station), segments of SCE 3-phase and 1-phase interconnection capacity analysis (ICA) power line circuits, and an overlay of 100-year FEMA flood zones. Floods are rated as a moderate hazard for the

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[4] Note that we did not ask for—or include—information about the resilience posture of Bishop Paiute's critical community infrastructure as detailed in the data schema.

Bishop Paiute reservation, and the data is from FEMA via the Bishop Paiute Tribe (Bishop Paiute, 2023). As shown in the above map, the risk of a 1 in a 100 year flood is limited to the far northwestern part of the reservation. It is likely that the overall rating of moderate flood risk is due to the potential of widespread inundation from a dam failure (see Figure 9).

The information presented in Figure 9 includes the location of Bishop Paiute critical facilities, segments of SCE 3-phase and 1-phase ICA circuits, and an overlay of hydroelectric dam inundation zones from the nearby Hillside dam. Dam inundation is rated as a moderate hazard and a dam breach would likely lead to inundation across large portions of the reservation. The data is from the California Department of Water Resources (California Department of Water Resources, 2020).

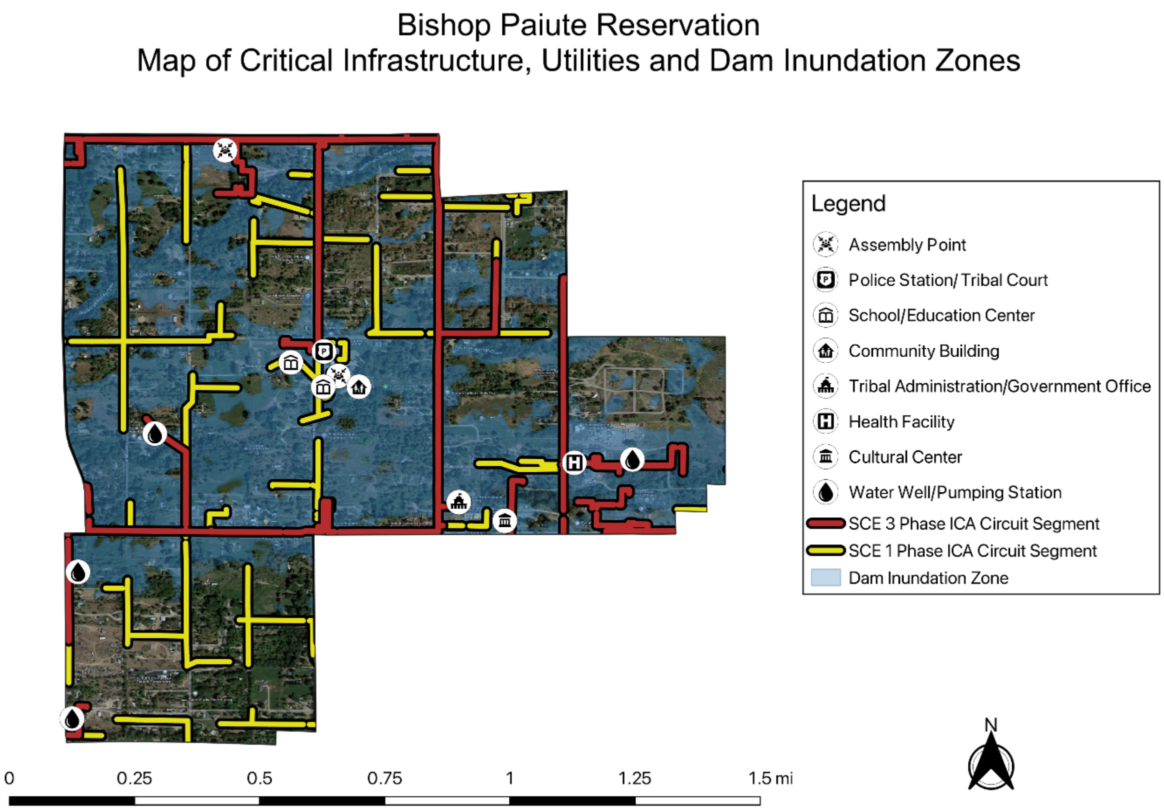

Figure 9. Critical facilities, electricity infrastructure, and dam breach inundation zones on the Bishop Paiute Reservation

The information presented in Figure 10, below, includes the location of Bishop Paiute critical facilities, segments of SCE 3-phase and 1-phase ICA circuits, and an overlay of wildfire hazard zones identified by the County of Inyo (County of Inyo, 2023) in their preliminary risk assessment. Wildfires are rated as a high risk hazard in Inyo County.

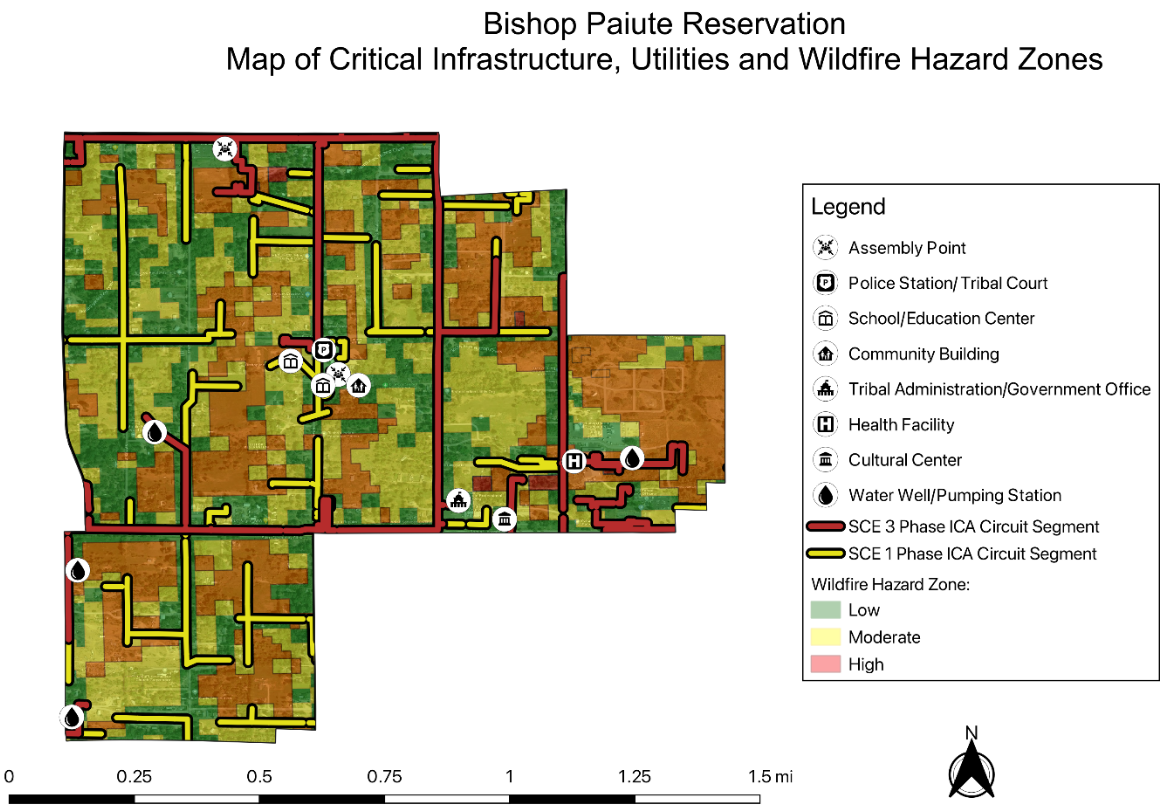

Figure 10. Critical facilities, electricity infrastructure, and wildfire hazard zones on the Bishop Paiute Reservation

6. Summary, Observations, and Conclusion

This project involved Berkeley Lab staff reviewing nearly three dozen hazard mitigation plans from across the State of California. This review resulted in a number of important findings. First, we identified the hazards that were most frequently mentioned in the plans. Wildfires, earthquakes, flooding, drought, and the failure of dams were the most common hazards described across the state. We also collected information on the types of infrastructure that were at-risk to a range of hazards. Fire stations, hospitals, water treatment facilities, police stations, and telecommunications facilities were frequently identified as being exposed to some level of risk within the hazard mitigation plans. We discussed the benefits of consolidating and making available disparate sources of geospatial information including the location of electricity and critical community infrastructure. And we recommended the collection and sharing of information about critical facilities to allow decision-makers to assess the resilience posture of these important facilities. Finally, we demonstrated the usefulness of sharing this type of information by attaining GIS-based information detailing critical infrastructure on the Bishop Paiute Reservation and overlaying it with local electricity infrastructure locations and natural hazard exposure.

Throughout this process, we gained a number of important insights that should be taken into consideration if/when the State of California mandates the consolidation of these data sources into a single online portal. First, most communities did not assign explicit risk levels to each of the critical infrastructure types identified in their hazard mitigation plans. A suggested improvement to future hazard mitigation plans could include assigning a risk rating to each class of facilities to demonstrate which infrastructure types are most at risk to the range of hazards identified in each plan. Next, we learned that every plan was unique in its comprehensiveness, depth, and vintage. Some hazard mitigation plans contained comprehensive and detailed risk analyses while others had very little information. Some plans were prepared “in-house” by government agency staff while others were prepared by third-parties under contract. We also acknowledge the fact that many communities, including the tribes, have a limited number of staff dedicated to conducting hazard analyses and planning—and there are even fewer staff who whose job exclusively focuses on the spatial mapping of infrastructure. Finally, and perhaps most importantly, there are significant concerns about data security—the location and characteristics of critical energy infrastructure and community infrastructure is often restricted from being shared with the general public. A number of these issues will need to be addressed before the State of California considers mandating the consolidation and sharing of critical electricity and community infrastructure information. Nonetheless, it is clear that having this type of information in a consolidated location—and available statewide—would ultimately result in significant progress towards making California communities more resilient to hazards.

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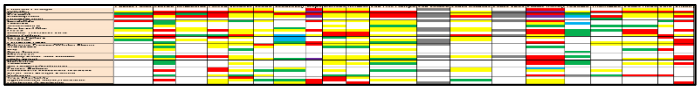
Appendix A. Technical Appendix

A. Hazard ratings in selected jurisdictions served by PG&E

Legend of Natural Hazards in Local Communities					
Severe	High	Medium	Low	Very Low	Mentioned

	Contra Costa	Fresno	Humboldt	Lassen	Madera	Mono	Monterey	Napa	Nevada	Plumas	San Luis Obispo	San Mateo	Santa Barbara	Santa Ynez	Scotts Valley	Tehama	Tuolumne	Yocha Dehe	Yolo	Yurok
Climate Change					Medium	Medium		High	Medium	Medium		Mentioned			High			Medium	Medium	
Wildfire	Medium	High	High	High	High	High	Medium	Severe	High	High	High		Medium	Mentioned	Severe	Medium	High	High	High	High
Drought	Low	High	Low	High	Medium	Medium	High	High	Medium	Medium	High	Mentioned	Medium	Mentioned	High	Low		Medium	Medium	Medium
Earthquake	High	Medium	High	High	Medium	Medium	Medium	Severe	Medium	Medium	High	Mentioned	High	Mentioned	Severe	Very Low	High	Medium	Medium	High
Liquefaction																	Low			
Landslide	High	Low	Medium	Medium	Low	Medium		High	Medium	Medium	Medium	Mentioned	Medium	Mentioned	High				Low	High
Erosion		Low									Medium				Medium	Very Low				
Subsidence		Medium							Medium		Low				Low		Low	Low	Medium	
Sea Level Rise	Low		Medium				Low				Medium	Mentioned	Medium							
Flood	Medium	High	Medium	High	Medium	Medium	Medium	High	Medium	Medium	Medium	Mentioned	Medium	Mentioned	High	Low	Low	High		High
Floods 100/500 Year					Medium				High	High					High	Low		High		
Dam Failure	Medium	High	Low	Low	High	Medium	Very Low	Medium	High	High	Medium	Mentioned	High	Mentioned	Medium	Low		Medium	High	Medium
Levee Failure	Medium	High		High	Medium		Very Low		Low	Medium			Medium		Medium				High	
Tsunami	Low		Medium				Very Low				Medium	Mentioned	Medium							High
Extreme Heat		Low		Medium	Medium		Low	High	Medium	Medium	Low	Mentioned			High		Medium	Medium	Medium	High
Extreme Freeze/Winter Storm		Medium		Medium	Medium	High	Medium	High	Medium	Medium	Medium	Mentioned					Medium	Medium	Medium	High
Avalanche		Low		Medium		Medium			Low	Low					Low					
Fog		Medium			Low						Medium							Low	High	
Dust Storm																Low				
Monsoon																				
Heavy Rains and Storms	Medium	Low	High	High	Medium				Medium	Medium	Medium	Mentioned	Medium	Mentioned	High	Low				High
High Wind		Medium			Medium	Medium	Low	Severe	Medium	Medium	Low				High			Medium	Medium	High
Lightning		Low							Medium		Medium				High	Low				
Tornado		Low			Medium				Medium	Medium	Low				High	Low		Medium	Medium	High
Air Quality/Pollution																				
Power Outage				High			Medium						Medium		Very Low					
Hazardous Materials Incident		High		High	Medium	Low	Low		Medium		Low	Mentioned	Medium		Medium		Medium			
Road and Bridge Failure																				
Volcano		Low		Medium	Low	Medium			Low	Low					High	Mentioned	Low	High	High	
Tree Mortality					High				High	Medium										
Agricultural Pests/Diseases		High		Medium	Medium	Low	Low	High	High		Medium		Low		Medium					
Epidemic/Pandemic				Medium			Medium	High		High		Mentioned			Medium					High

B. Hazard ratings in selected jurisdictions served by SCE



	Bishop Paiute	Inyo	Los Angeles	Morongo	Riverside	San Bernardino	Tulare	Ventura
Climate Change			Gray			Yellow	Red	
Wildfire	Red	Red	Gray	Red	Yellow	Red	Red	Yellow
Drought	Green	Red	Gray	Yellow		Yellow	Yellow	Green
Earthquake	Yellow	Red	Gray	Yellow	Blue	Red	Yellow	Yellow
Liquefaction			Gray					
Landslide	Green	Yellow	Gray	Green		Red	Yellow	Red
Erosion			Gray					Green
Subsidence								
Sea Level Rise								Green
Flood	Yellow	Red		Red		Red	Red	Yellow
Floods 100/500 Year			Gray					
Dam Failure	Yellow	Yellow	Gray			Yellow	Yellow	Red
Levee Failure							Green	
Tsunami			Gray					Green
Extreme Heat	Green			Yellow		Yellow	Red	Yellow
Extreme Freeze/Winter Storm	Green	Red				Green	Yellow	Yellow
Avalanche		Yellow						
Fog							Red	
Dust Storm	Green							
Monsoon	Green							
Heavy Rains and Storms	Green	Red		Red		Green		Yellow
High Wind	Green					Green	Yellow	Yellow
Lightning	Green					Green		Yellow
Tornado						Green		
Air Quality/Pollution								
Power Outage					Red		Green	
Hazardous Materials Incident		Yellow		Yellow			Yellow	
Road and Bridge Failure								
Volcano	Yellow							
Tree Mortality								
Agricultural Pests/Diseases	Green	Yellow			Purple	Yellow		Gray
Epidemic/Pandemic				Red	Green		Yellow	Gray

C. Hazard ratings in selected jurisdictions served by Pacificorp

	Karuk	Modoc	Siskiyou	Yurok
Climate Change				
Wildfire				
Drought				
Earthquake				
Liquefaction				
Landslide				
Erosion				
Subsidence				
Sea Level Rise				
Flood				
Floods 100/500 Year				
Dam Failure				
Levee Failure				
Tsunami				
Extreme Heat				
Extreme Freeze/Winter Storm				
Avalanche				
Fog				
Dust Storm				
Monsoon				
Heavy Rains and Storms				
High Wind				
Lightning				
Tornado				
Air Quality/Pollution				
Power Outage				
Hazardous Materials Incident				
Road and Bridge Failure				
Volcano				
Tree Mortality				
Agricultural Pests/Diseases				
Epidemic/Pandemic				

D. References to critical community infrastructure type by hazard mitigation plan jurisdiction

Jurisdiction	Hospital	Pharmacy	Police Station	Fire Station	School	Elder or Adult Residential Care	Community Shelter/Cooling Center	Grocery Store	Transportation	Jail	Emergency Services HQ	Telecommunications	Power Transmission	Power Distribution	Power Generation	Water Facility	Wastewater	Hazardous Waste Storage
Bishop Paiute Tribe	✓		✓	✓	✓		✓					✓	✓				✓	
Contra Costa County	✓		✓	✓	✓							✓	✓			✓	✓	
Fresno County	✓		✓	✓	✓	✓	✓		✓	✓		✓			✓	✓	✓	✓
Humboldt County	✓	✓	✓	✓	✓	✓		✓				✓			✓	✓	✓	✓
Imperial County Multi-Jurisdictional			✓	✓	✓		✓		✓			✓			✓	✓	✓	✓
Inyo County Multi-Jurisdictional	✓		✓	✓					✓	✓		✓		✓		✓	✓	
Karuk Tribe	✓			✓							✓	✓				✓		
Lassen County, City of Susanville & Susanville Indian Rancheria	✓			✓	✓		✓		✓	✓		✓				✓		
Los Angeles County All-Hazards	✓		✓	✓	✓										✓	✓	✓	
Madera County	✓		✓	✓	✓		✓			✓		✓					✓	
Modoc County	✓		✓	✓	✓				✓	✓	✓	✓	✓			✓	✓	
Mono County Multi-Jurisdictional	✓		✓	✓	✓	✓			✓		✓	✓			✓			✓
Monterey County Multi-Jurisdictional	✓		✓	✓	✓				✓			✓		✓	✓	✓	✓	✓
Morongo Tribe	✓		✓	✓					✓			✓		✓	✓	✓	✓	
Napa County Multi-Jurisdictional	✓		✓	✓	✓	✓	✓		✓		✓	✓		✓	✓	✓		✓
Nevada County	✓			✓	✓		✓		✓	✓				✓		✓		
Pala Tribe			✓	✓								✓				✓	✓	
Plumas County	✓			✓	✓							✓	✓		✓	✓		
Riverside County Multi-Jurisdictional	✓		✓	✓	✓		✓								✓	✓		
Sacramento County Multi-Jurisdictional																		
San Bernardino County Multi-Jurisdictional	✓		✓	✓	✓	✓			✓			✓			✓	✓	✓	✓
San Luis Obispo County Multi-Jurisdictional	✓		✓	✓	✓	✓	✓		✓		✓	✓		✓	✓	✓	✓	
San Mateo County	✓		✓				✓	✓	✓			✓			✓	✓		✓
Santa Barbara County Multi-Jurisdictional	✓			✓						✓		✓						
Santa Ynez Band of Chumash Indians																		
Scotts Valley Band of Pomo Indians																		
Siskiyou County	✓		✓	✓	✓	✓	✓		✓			✓				✓	✓	✓
Tehama County Multi-Jurisdictional	✓		✓	✓	✓	✓			✓			✓		✓	✓	✓		
Tulare County Multi-Jurisdictional	✓		✓	✓	✓		✓		✓	✓		✓		✓		✓	✓	
Tuolumne County Multi-Jurisdictional	✓		✓	✓	✓	✓	✓			✓	✓	✓			✓	✓	✓	✓
Ventura County Multi-Jurisdictional	✓		✓	✓	✓		✓	✓	✓			✓		✓	✓	✓		✓
Yocha Dehe Wintun Nation	✓			✓	✓		✓								✓	✓	✓	
Yolo County			✓	✓										✓	✓	✓	✓	
Yurok Tribe	✓		✓	✓	✓				✓					✓		✓		
Total Number of References to Facility Type in Hazard Mitigation Plans	**28**	**1**	**25**	**30**	**24**	**9**	**15**	**3**	**18**	**9**	**6**	**25**	**4**	**11**	**18**	**27**	**19**	**11**