Hetch Hetchy
Regional Water System
Services of the San Francisco Public Utilities Commission

2022
San Francisco Public Utilities Commission
Wildfire Mitigation Plan

"To provide our customers with high quality, efficient, and reliable water, power, and wastewater services in a manner that values environmental and community interests and sustains the resources entrusted to our care."

ACRONYMS

AVMWP	Annual Vegetation Management Work Plan
BLM	Bureau of Land Management
CAL FIRE	California Department of Forestry and Fire Protection
CCSF	City and County of San Francisco
Commission	SFPUC Commission
CM	Corrective Maintenance
CMMS	Computerized Maintenance Management System
CPUC	California Public Utilities Commission
ESF	Emergency Support Functions
ESO	Electrical Safety Orders, State of California
FAC-003-4	NERC Reliability Standard: Transmission Vegetation Management
GO	CPUC General Order
HFT / HFTD	High Fire Threat / High Fire Threat District
HHWP	Hetch Hetchy Water and Power
HHWPP	Hetchy Hetchy Water and Power Project, or HHWP Project
HHW	Hetch Hetchy Water. The Division of Hetch Hetchy Water and Power that is managed by the Water Enterprise, which also includes Natural Resources Lands Management, and Water Supply & Treatment. Commonly referred to as Hetch Hetchy Water and Power.
HRRR	NOAA's High-Resolution Rapid Refresh Model
IAP	Incident Action Plan
IC	Incident Commander
ICS	Incident Command System
ISA	International Society of Arboriculture
kV	Kilovolt (1,000 volts)

LiDAR	Light Detection and Ranging - Survey technology for the evaluation of existing overhead electrical lines
Maximo	SFPUC's CMMS
MID	Modesto Irrigation District
NEC	National Electric Code
NERC	North American Electric Reliability Corporation
NESC	National Electrical Safety Code
NIMS	National Incident Management System
NOAA	National Oceanic and Atmospheric Administration
NRF	National Response Framework
NRLM	Natural Resources and Lands Management – A division of the San Francisco Public Utilities Commission that is managed by the Water Enterprise.
NWS	National Weather Service
OEIS	Office of Energy Infrastructure Safety (or Energy Safety) - Energy Safety was established on July 1, 2021, to ensure electrical utilities are taking effective actions to reduce utility-related wildfire risk[1].
PG&E	Pacific Gas & Electric
PIO	Public Information Officer
Plan	Wildfire Mitigation Plan
PM	Preventative Maintenance
PRC	Public Resources Code
RAWS	Remote Automatic Weather Station – RAWS provides timely local weather data used primarily in fire management
RFW	Red Flag Warning – Issued by the National Weather Service when warm temperatures, very low humidity, and stronger winds are forecasted and combined are expected to produce an increased risk of fire danger

[1] https://energysafety.ca.gov/who-we-are/about-energy-safety/ (last visited on May 19, 2022)

SEMS	Standardized Emergency Management System
SFPUC	San Francisco Public Utilities Commission
SRA	State Responsibility Area
SVWTP	Sunol Valley Water Treatment Plant
SWIFT	Southwest Interface Team
TRAQ	ISA Tree Risk Assessment Qualified
TVMP	Transmission Vegetation Management Program
UC	Unified Command
USFS	United States Forest Service
WMP	Wildfire Mitigation Plan
WST	Water Supply & Treatment – A division of the San Francisco Public Utilities Commission that is managed by the Water Enterprise.

INTRODUCTION

A. Purpose of the Wildfire Mitigation Plan

Over the past several years, California has experienced numerous catastrophic wildfires resulting in loss of human life, destruction, or damage to personal property, and a significant impact on the local and regional economies. The 2021 Dixie Fire is reported to be the largest single (non-complex) wildfire in recorded history, totaling 963,309 acres burned. In 2021, the California Department of Forestry and Fire Protection (CAL FIRE) and the United States Forest Service (USFS) reported 8,786 fires that burned 2,568,941 acres in California. The effects of climate change, such as hotter temperatures, multi-year drought conditions, more intense winds, and drier fuels/vegetation, continue to be contributing factors that fuel these fast-moving and destructive fires. Though there are many different ignition sources for these catastrophic fires, it has been determined that electric utility infrastructure has been the cause of some of the most destructive and deadly fires in the state.

California Senate Bill (SB) 901 (2018), amended Public Utilities Code (PUC) § 8387, Chapter 6, Wildfire Mitigation. PUC section 8387 (b)(1) requires "the local publicly owned electric utility or electrical cooperative shall, before January 1, 2020, prepare a wildfire mitigation plan. After January 1, 2020, a local publicly owned electric utility or electrical cooperative shall annually prepare a wildfire mitigation plan. It shall submit the plan to the California Wildfire Safety Advisory Board (WSAB) on or before July 1 of that calendar year. Each local publicly owned electric utility and electrical cooperative shall update its plan annually and submit the update to the WSAB by July 1 of each year. At least once every three years, the submission shall be a comprehensive revision of the plan."

The San Francisco Public Utilities Commission (SFPUC) has, each year, complied with its statutory obligations regarding the submission of its WMP. The SFPUC now submits its 2022 Wildfire Mitigation Plan (WMP or Plan) update to the WSAB, as required by PUC § 8387(b)(1). This 2022 WMP includes updates and revisions to the SFPUC initiatives and programs to construct, maintain, and operate its electrical facilities in a way that minimizes the risk that the equipment could be the origin or contributing source for a catastrophic wildfire; and to provide for a more resilient and reliable grid. This Plan is subject to public review and comment prior to final Plan approval by the SFPUC Commission.

B. SFPUC Commission Approval of the WMP and Wildfire Mitigation Budget

This Plan, at minimum, meets the requirements of PUC § 8387 for publicly owned electric utilities (POUs). The public can comment on the WMP during a scheduled SFPUC Commission meeting, in which the Commission will review the WMP. The SFPUC Commission Secretary publishes all upcoming Commission agendas to the sfpuc.org website a week before the Commission meeting date. Additionally, each agenda item has time set aside for public comment. The SFPUC Commission and staff will consider all public comments for inclusion in the final version of the Plan. Due to COVID-19 in-person meeting restrictions, Commission meetings are held virtually. The meeting agenda includes a link to watch the meetings live, and

a public comment call-in number to ensure the public has an opportunity to comment on agenda items. The final approved WMP will be submitted to the WSAB and posted to the SFPUC website, which also includes prior years' WMPs and the independent evaluator (IE) report(s).[2]

Hetch Hetchy Water (HHW) has developed a budget for wildfire mitigation initiatives in the biennial SFPUC operating budget cycle. SFPUC management will review the Fiscal Year 22/23 and 23/24 budgets and submit a final proposal. The City and County of San Francisco Board of Supervisors will approve the budgets by July 2022.

The SFPUC had its initial WMP reviewed by an IE in 2020 and is planning the subsequent IE evaluation of the Plan in 2023. WMP updates and IE reports will be posted to the SFPUC external-facing website and accessible to the public.

The specific elements of PUC § 8387 are listed in Table 1, with the corresponding WMP sections listed. Each Plan section is linked to the section where the SFPUC describes its processes or programs to comply with the relevant requirements of PUC § 8387.

Table 1 – PUC § 8387 Compliance Requirements

PUC 8387 Code	Compliance Requirements and Corresponding Plan Sections	Plan Section
(a)	Each local publicly owned electric utility and electrical cooperative shall construct, maintain, and operate its electrical lines and equipment in a manner that will minimize the risk of wildfire posed by those electrical lines and equipment.	All
(b) (1)	The local publicly owned electric utility or electrical cooperative shall, before January 1, 2020, and annually thereafter, prepare a wildfire mitigation plan. After January 1, 2020, a local publicly owned electric utility or electrical cooperative shall prepare a wildfire mitigation plan annually and shall submit the plan to the California Wildfire Safety Advisory Board on or before July 1 of that calendar year. Each local publicly owned electric utility and electrical cooperative shall update its plan annually and submit the update to the California Wildfire Safety Advisory Board by July 1 of each year. At least once every three years, the submission shall be a comprehensive revision of the plan.	1.A
(2)	The wildfire mitigation plan shall consider as necessary, at minimum, all of the following:	
(2)(A)	An accounting of the responsibilities of persons responsible for executing the plan.	3
(2)(B)	The objectives of the wildfire mitigation plan.	2
(2)(C)	A description of the preventative strategies and programs to be adopted by the local publicly owned electric utility or electrical cooperative to minimize the risk of its electrical lines and equipment causing catastrophic wildfires, including consideration of dynamic climate change risks.	5
(2)(D)	A description of the metrics the local publicly owned electric utility or electrical cooperative plans to use to evaluate the wildfire mitigation plan's performance and the assumptions that underlie the use of those metrics.	6.A
(2)(E)	A discussion of how the application of previously identified metrics to previous wildfire mitigation plan performances has informed the wildfire mitigation plan.	6.B
(2)(F)	Protocols for disabling reclosers and deenergizing portions of the electrical distribution system that consider the associated impacts on public safety, as well as protocols related to mitigating the public safety impacts of those protocols, including impacts on critical first responders and on health and communication infrastructure.	5.I & 5.J

[2] https://sfpuc.org/about-us/policies-plans/wildfire-mitigation-plan (last visited May 19, 2022)

(2)(G)	Appropriate and feasible procedures for notifying a customer who may be impacted by the de-energizing of electrical lines. The procedures shall direct notification to all public safety offices, critical first responders, health care facilities, and operators of telecommunications infrastructure with premises within the footprint of potential de-energization for a given event.	5.H
(2)(H)	Plans for vegetation management.	5.A
(2)(I)	Plans for inspections of the local publicly owned electric utility's or electrical cooperative's electrical infrastructure.	5.B
(2)(J)	A list that identifies describes, and prioritizes all wildfire risks, and drivers for those risks, throughout the local publicly owned electric utility's or electrical cooperative's service territory. The list shall include, but not be limited, to both of the following:	4
(2)(J)(i)	Risks and risk drivers associated with design, construction, operation, and maintenance of the local publicly owned electric utility's or electrical cooperative's equipment and facilities.	4.D
(2)(J)(ii)	Particular risks and risk drivers associated with topographic and climatological risk factors throughout the different parts of the local publicly owned electric utility's or electrical cooperative's service territory.	4.C
(2)(K)	(K) Identification of any geographic area in the local publicly owned electric utility's or electrical cooperative's service territory that is a higher wildfire threat than is identified in a commission fire threat map, and identification of where the commission should expand a high-fire threat district based on new information or changes to the environment.	4.B
(2)(L)	A methodology for identifying and presenting enterprise wide safety risk and wildfire-related risk.	4.A
(2)(M)	A statement of how the local publicly owned electric utility or electrical cooperative will restore service after a wildfire.	5.K
(2)(N)	A description of the processes and procedures the local publicly owned electric utility or electrical cooperative shall use to do all of the following:	
(2)(N)(i)	Monitor and audit the implementation of the wildfire mitigation plan.	6.C
(2)(N)(ii)	Identify any deficiencies in the wildfire mitigation plan or its implementation and correct those deficiencies.	6.D
(2)(N)(iii)	Monitor and audit the effectiveness of electrical line and equipment inspections, including inspections performed by contractors, that are carried out under the plan, other applicable statutes, or commission rules.	6.E
(3)	The local publicly owned electric utility or electrical cooperative shall, on or before January 1, 2020, and not less than annually thereafter, present its wildfire mitigation plan in an appropriately noticed public meeting. The local publicly owned electric utility or electrical cooperative shall accept comments on its wildfire mitigation plan from the public, other local and state agencies, and interested parties, and shall verify that the wildfire mitigation plan complies will all applicable rules, regulations, and standards, as appropriate.	1.A
(3)(c)	(c) The local publicly owned electric utility or electrical cooperative shall contract with a qualified independent evaluator with experience in assessing the safe operation of electrical infrastructure to review and assess the comprehensiveness of its wildfire mitigation plan. The independent evaluator shall issue a report that shall be made available on the internet website of the local publicly owned electric utility or electrical cooperative and shall present the report at a public meeting of the local publicly owned electric utility's or electrical cooperative's governing board.	7

C. SFPUC Profile

The SFPUC, a department of the City and County of San Francisco (CCSF), provides power to the residents and businesses of San Francisco through the CleanPowerSF[3] (Community Choice Aggregation) program and serves CCSF municipal load through Hetch Hetchy power. Additionally, the SFPUC provides retail drinking water and wastewater services to the City of San Francisco and wholesale water to three Bay Area counties.

[3] https://www.cleanpowersf.org/ (last visited on May 19, 2022)

The SFPUC's mission is to provide its customers with high-quality, efficient, and reliable power, water, and sewer services in a manner that is inclusive of environmental and community interests and that sustains the resources entrusted to their care.

The SFPUC is comprised of six business functions or enterprises, including the Water Enterprise. The Water Enterprise has six divisions, including Hetch Hetchy Water (HHW), Water Supply & Treatment (WST), and Natural Resources and Lands Management (NRLM) (see Figure 2). Each of these departments has defined responsibilities for managing and maintaining the assets described in this Plan. The Water Enterprise is responsible for the development, execution, and oversight of the SFPUC WMP.

HHW is responsible for managing, operating, and maintaining the Hetch Hetchy Water and Power (HHWP) Project. The HHWP Project consists of power generation facilities, electric transmission and distribution assets, water storage and conveyance systems, roads, bridges, and ancillary facilities. These assets originate in the Sierra Nevada Mountains at the Hetch Hetchy Reservoir, located in Yosemite National Park, span to the East Bay communities of Sunol and Newark in Alameda County, and traverse the counties of Tuolumne, Mariposa, Stanislaus, San Joaquin, and San Mateo. The topography through these counties is described in Table 2 below.

The HHWP Project consists of four hydroelectric powerhouses with a total generating capacity of 385 megawatts (MW). The SFPUC transmits this power through SFPUC-owned and operated transmission lines to the California electric grid. WST and NRLM manage, operate, and maintain distribution lines that serve SFPUC water treatment plants and facilities within SFPUC watersheds.

The SFPUC owns, maintains, and operates 162.5 miles of transmission lines at 230 and 115kV. A portion of the transmission facilities are within Pacific Gas & Electric's (PG&E) and Modesto Irrigation District's (MID) service territory, and a small number of distribution facilities are within PG&E's service territory. A detailed breakdown of overhead lines in the HFTD is included in Table 2: Context-Setting Information and Table 3: Definition of HFTD Zones and SFPUC Electrical Facilities by Tier.

Table 2: Context-Setting Information

Utility Name	**San Francisco Public Utilities Commission**	
Service Territory Size	The SFPUC is primarily a generation (hydro) and transmission provider. The SFPUC has no defined "service territory" with boundaries like a traditional utility serving distribution load.	
Owned Assets	Transmission, Distribution, and Generation	
Number of Customers Served	One customer account served from a distribution line in the Tier 2 High Fire Threat District (HFTD).	
Population Within Service Territory	N/A	
	Number of Accounts	*Share of Total Load (MWh)*

Customer Class Makeup	0% Residential; 0% Government; 0% Agricultural; 100% Small/Medium Business;[4] 0% Commercial/Industrial	[__]% Residential; [__]% Government; [__]% Agricultural; [__]% Small/Medium Business; [__]% Commercial/Industrial
Service Territory Location/Topography[5]	4% Agriculture 27% Barren/Other 25% Conifer Forest 0% Conifer Woodland 0% Desert 3% Hardwood Forest 16% Hardwood Woodland 18% Herbaceous 0% Shrub 7% Urban 0% Water	
Service Territory Wildland Urban Interface[6] (based on total area)	1% Wildland Urban Interface; 1% Wildland Urban Intermix; The above percentages refer to overhead transmission and distribution line miles.	
Percent of Service Territory in CPUC High Fire Threat Districts (based on total area)	N/A SFPUC does not have a defined "service territory.	
Prevailing Wind Directions & Speeds by Season	Generally, the coast range has higher average wind speeds throughout the year, which are typically west, with strong east wind events in the winter. The Central Valley typically has lower average wind speeds, predominantly west direction. The mountain region has moderate average wind speeds, also typically west, with very strong east (Mono) wind events in the winter. In the table below, winter is considered from October-April and summer as May-September.	

[4] The SFPUC's one "customer" is served through the SFPUC distribution system.

[5] This data shall be based on the California Department of Forestry and Fire Protection, California Multi-Source Vegetation Layer Map, depicting WHR13 Types (Wildlife Habitat Relationship classes grouped into 13 major land cover types) *available at*: https://www.arcgis.com/home/item.html?id=b7ec5d68d8114b1fb2bfbf4665989eb3. (last visited on May 19, 2022)

[6] This data shall be based on the definitions and maps maintained by the United States Department of Agriculture, as most recently assembled in *The 2010 Wildland-Urban Interface of the Conterminous United States*, *available at* https://www.fs.fed.us/nrs/pubs/rmap/rmap_nrs8.pdf. (last visited on May 19, 2022)

		Average		Max	
Region	**Season**	**Wind Speed (mph)**	**Direction**	**Wind Speed (mph)**	**Direction**
Coast Range	Winter	30	W	60	E
	Summer	20	W	30	W
Central Valley	Winter	10	W	20	E
	Summer	5	W	10	W
Sierra Nevada Foothills	Winter	15	W	70	E
	Summer	15	W	20	W

Miles of Owned Lines Underground and/or Overhead	Overhead Dist.: 57.8 miles Overhead Trans.: 162.5 miles Underground Dist.: 4 miles Underground Trans.: 0 miles
	Explanatory Note 1 - *Methodology for Measuring "Miles":* e.g., circuit miles, line miles. Measured by line miles
	Explanatory Note 2 – *Description of Unique Ownership Circumstances:* Seven SFPUC-owned and operated distribution circuits are fed from a neighboring utility. Six are fed from lines owned and operated by Pacific Gas & Electric (PG&E) and one from a Modesto Irrigation District (MID).
Percent of Owned Lines in CPUC High Fire Threat Districts	*Overhead Distribution Lines as % of Total Distribution System (Inside and Outside Service Territory)*
	Tier 2 Distribution: 75% (43.5 miles) Tier 3 Distribution: 6% (3.6 miles)
	Overhead Transmission Lines as % of Total Transmission System (Inside and Outside Service Territory)
	Tier 2 Transmission: 26 % (42.6 miles) Tier 3 Transmission: 2 % (3.3 miles)

Customers have ever lost service due to an IOU PSPS event?	Yes, SFPUC-owned and operated facilities have been impacted by previous PG&E PSPS events However, PG&E PSPS events do not interrupt the SFPUC's ability to supply power and water services. The SFPUC has backup generators for its water treatment plants to maintain service during PSPS events. The SFPUC has backup power at both water treatment plants to maintain essential water services to the Bay Area.
Customers have ever been notified of a potential loss of service due to a forecasted IOU PSPS event?	Yes, the SFPUC is notified by PG&E prior to a PG&E-initiated PSPS event as outlined by their PSPS communication protocols. The SFPUC has been assigned a PG&E representative for PSPS communication. Both the SFPUC and PG&E have shared area contact representatives.
Has developed protocols to pre-emptively shut off electricity in response to elevated wildfire risks?	Yes These protocols are described in Section 5.J - Strategy – De-energization, of this WMP.
Has previously pre-emptively shut off electricity in response to elevated wildfire risk?	Yes If yes, then provide the following data for the 2021 calendar year: *Number of shut-off events in 2021*: 7 *Customer Accounts that lost service for >10 minutes:* 1 *For prior response, average duration before service restored:* 44 hrs.

The SFPUC transmission facilities carry energy from SFPUC-owned hydroelectric plants to the grid. Power is scheduled into the California Independent System Operator (CAISO) market by an SFPUC power scheduler. The SFPUC distribution facilities are supplied by SFPUC-owned transmission lines or from the PG&E grid to power SFPUC Water Enterprise operations. Table 3 below shows the breakdown of SFPUC facilities relative to the HFTDs.

Table 3: Definition of HFTD Zones and SFPUC Electrical Facilities by Tier

Zone	Description	SFPUC Facilities	Quantity
Tier 3	Tier 3 fire-threat areas depict areas where there is an **extreme** risk (including likelihood and potential impacts on people and property) from utility-associated wildfires.	Transmission lines:	3.3 miles
		Distribution lines:	3.6 miles
		Substations:	0
		Powerhouse (generator)	0
Tier 2	Tier 2 fire-threat areas depict areas where there is an **elevated** risk (including likelihood and potential impacts on people and property) from utility-associated wildfires.	Transmission lines:	42.6 miles
		Distribution lines:	43.5 miles
		Substations:	3
		Powerhouse (generator)	3

Tier 1	Tier 1 High Hazard Zones are zones in direct proximity to communities, roads, and utility lines, and are a direct threat to public safety.	Transmission lines:	0.5 miles
		Distribution lines:	0.0 miles
		Substations:	0
		Powerhouse (generator)	0
Non-HFTD	Facilities outside of CPUC HFTD	Transmission Lines	116.1 miles
		Distribution	10.7 miles
		Substations	2
		Powerhouse (generator)	0
Total Line Miles		Transmission Lines	162.5
		Distribution Lines	57.8
		Total System Line Miles	220.3

D. Organization of the Wildfire Mitigation Plan

This SFPUC WMP includes programs, processes, and procedures that have been undertaken to support the SFPUC's goal of minimizing the risk that its facilities could be the origin or contributing source of a catastrophic wildfire, and is organized as follows:

- Section 1: Introduction;
- Section 2: Objectives of the Wildfire Mitigation Plan;
- Section 3: Roles and Responsibilities;
- Section 4: Wildfire Risks and Risk Drivers;
- Section 5: Wildfire Prevention Strategies and Programs;
- Section 6: Evaluating the Plan; and
- Section 7: Independent Evaluator.

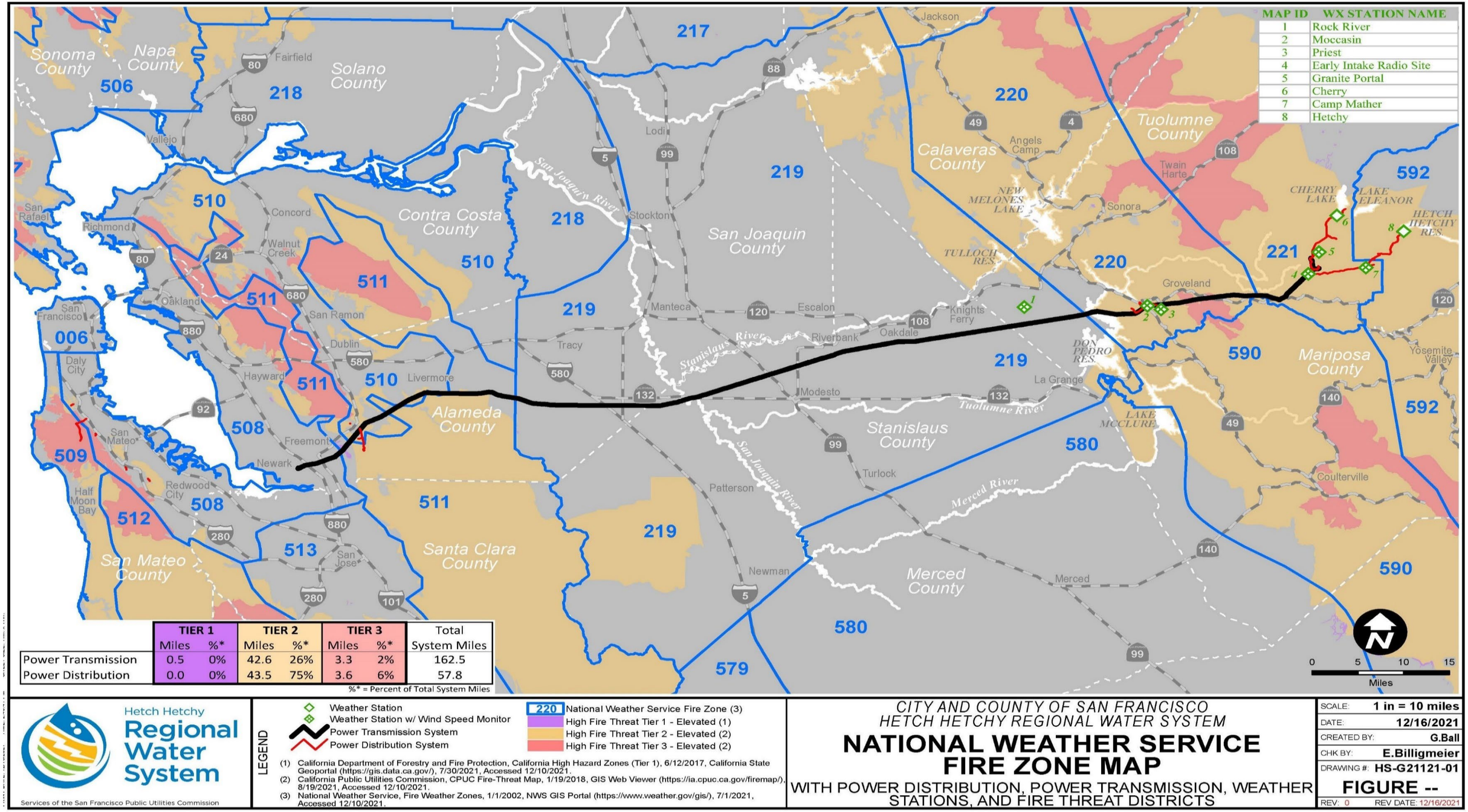


FIGURE 1: HIGH FIRE THREAT DISTRICT MAP

2. OBJECTIVES OF THE WILDFIRE MITIGATION PLAN

This Plan is built upon the following primary objectives:

A. Minimizing Sources of Ignition

The SFPUC continues to evaluate prudent and cost-effective improvements to its physical assets, operations, and training to minimize the risk of its facilities being the origin or contributing source of a catastrophic wildfire. These programs could include, but are not limited to, the implementation of fire risk analysis tools to assess the risk and consequence of a potential ignition, strategic system hardening, such as replacing wood poles with steel poles, and increased situational awareness capabilities by adding more strategically placed weather stations, enhanced vegetation management opportunities, and as a measure of last resort the proactive de-energization of lines during critical fire weather conditions. The SFPUC will continue to implement additional recommendations over time through Plan evaluation and continuous improvement.

B. Grid Reliability and Resiliency

The second objective is to improve the reliability and resiliency of the SFPUC-owned and operated electric grid. In addition to reducing wildfire ignition risks, programs such as grid hardening, and enhanced vegetation management provide additional benefits such as improved reliability and resiliency. The SFPUC will continue to assess industry best practices and new technologies that could help reduce the likelihood of a disruption in service due to planned or unplanned events and expedite grid recovery efforts following a significant event, such as a fire.

C. Measurement of Effectiveness and Performance

The third objective of this WMP is to measure the effectiveness and performance of the SFPUC's specific wildfire mitigation strategies described herein. The SFPUC will monitor the performance of its Plan, such as a continued decline in equipment failures or vegetation contacts, and make Plan modifications as necessary to continuously improve the safety, reliability, and resiliency of the SFPUC system. The Plan will also help determine if more cost-effective measures could produce the same or better results to reduce the risk of SFPUC infrastructure being the origin or contributing source of a catastrophic wildfire.

3. ROLES AND RESPONSIBILITIES

This section identifies the SFPUC management staff responsible for the development, approval, and implementation of this WMP and lists, in Table 3 below, the operating departments accountable for carrying out the various activities described in the Plan.

- The SFPUC Commission has the responsibility for approving this WMP.
- The SFPUC Assistant General Manager (AGM) of the Water Enterprise has overall accountability for developing and implementing the WMP.

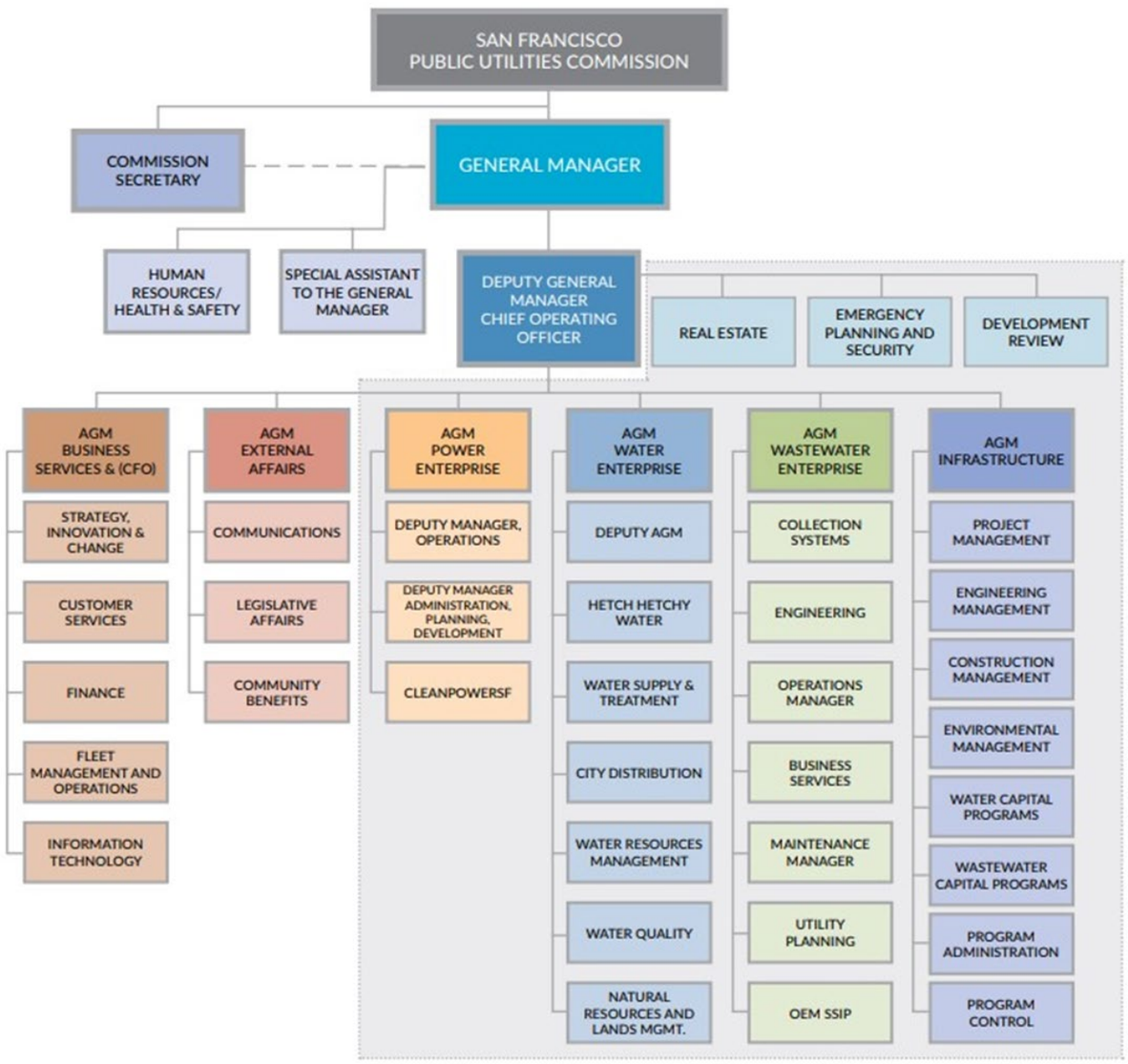


FIGURE 2 – SFPUC ORGANIZATIONAL STRUCTURE

Table 4: Roles and Responsibilities of WMP Activities

Activity	HHW Division: All SFPUC Transmission Facilities; and Distribution Facilities Located within Tuolumne, Stanislaus, Mariposa, and San Joaquin Counties	WST and NRLM Divisions: Distribution Facilities Located in Alameda and San Mateo Counties
Transmission Line Vegetation Clearance Inspections	HHW Right of Way Manager; and Vegetation Manager	N/A
Distribution Line Vegetation Clearance Inspections	HHW Right of Way Manager; and Vegetation Manager	NRLM and Peninsula Area Manager
Vegetation Management and Removal	HHW Operations and Maintenance Manager	NRLM Manager
Transmission Asset Inspections Transmission Line Maintenance	HHW Power Generation & Transmission Manager	N/A
Distribution Asset Inspections	HHW Power Generation & Transmission Manager	HHW Power Generation & Transmission Manager
Distribution Line Operations and Maintenance Inspections	HHW Power Generation & Transmission Manager	WST Maintenance Section Manager and HHW Power Generation & Transmission Manager
Substation Inspections Recloser Policy and De-energization	HHW Operations and Maintenance Manager	HHW Operations and Maintenance Manager
Plan Review	HHW Division Manager; CCSF City Attorney's Office; and SFPUC Assistant General Manager of Water	NRLM Division Manager, WST Division Manager, CCSF City Attorney's Office; and SFPUC Assistant General Manager of Water
Plan Approval	SFPUC Commission	SFPUC Commission

A. Staff Responsibility for Fire Prevention, Response, and Investigation

A primary goal of the SFPUC is to operate its overhead electrical lines in a safe and reliable manner. All SFPUC staff have the following responsibilities regarding fire prevention, response, and investigation:

- Conduct work in a manner that will minimize the risk of ignition for a catastrophic wildfire;
- Take all reasonable and practicable actions to mitigate the risk of wildfires resulting from electric facilities or work activities;
- Coordinate with federal, state, and local fire management agencies to ensure that appropriate preventative measures are in place;
- Immediately report fires to the Agency Having Jurisdiction (AHJ), and then notify the Moccasin Control Center (HHW), or Millbrae Dispatch (Counties of Alameda and San Mateo), depending on where the incident occurred;
- Take corrective action when observing or having been notified of improperly installed or maintained fire protection measures;
- Ensure compliance with relevant federal, state, local, regulatory, and industry-standard requirements;

- Ensure that all ignition and/or fire data involving SFPUC-owned and operated electrical assets are appropriately collected; and
- Maintain and administer adequate fire prevention training programs for all relevant employees and contractors.

B. SFPUC Roles During an Emergency

The SFPUC could experience a range of impacts to their system during critical fire weather events, such as a Red Flag Warning (RFW), wildfires, regional power system emergencies, or de-energizing of transmission or distribution lines for safety either by the SFPUC or other interconnecting IOUs or POUs. The SFPUC manages incidents or emergencies involving SFPUC facilities by on-shift staff in their control center who make notifications to SFPUC management. If the SFPUC de-energizes line(s) for safety, it will evaluate the impacts on its operations and/or the CAISO operations, estimate the duration of the incident, and establish the level of organizational response required to safely manage the incident. The SFPUC may activate the Incident Command System (ICS) in response to critical fire weather events when it is determined that de-energizing electrical facilities may be necessary to reduce the risk of SFPUC facilities being the source of ignition for a fire.

The SFPUC considers the de-energizing of lines a utility-specific emergency and will not require the Tuolumne County Emergency Operations Center (EOC) to be activated. Any communications by the SFPUC during an active emergency, such as a wildfire, will be in accordance with California's Standardized Emergency Management System (SEMS) and will be at the direction of the entity responsible for disseminating information about the emergency.

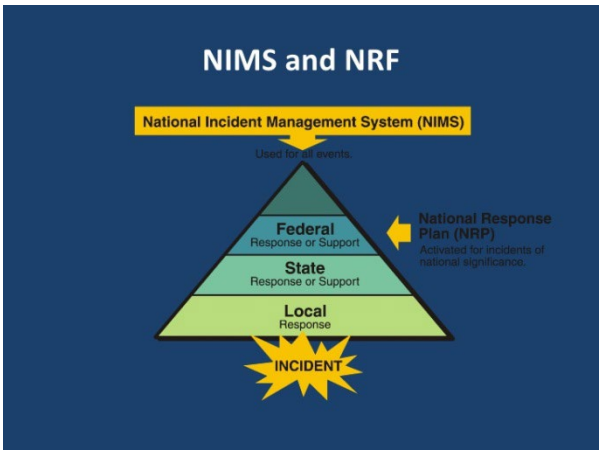


FIGURE 1 - NIMS AND NRF[7]

FIGURE 2 – EFFECTIVE EMERGENCY MANAGEMENT[8]

[7] "National Response Framework." LinkedIn SlideShare, 30 Mar. 2010, https://www.slideshare.net/bkoch/national-response-framework (last visited on May 19, 2022)
[8] "National Response Framework." LinkedIn SlideShare, 30 Mar. 2010, https://www.slideshare.net/bkoch/national-response-framework (last visited on May 19, 2022)

C. SFPUC Incident Command System

The SFPUC is Standardized Emergency Management System (SEMS) and National Incident Management System (NIMS) compliant and, if determined by SFPUC leadership, will utilize the ICS to respond to emergencies. By these requirements, the SFPUC has established a multi-tiered emergency organizational structure that utilizes the five following emergency response functions, activated as necessary:

- **Incident Command (IC):** Provides overall direction and establishes priorities and objectives. Command staff assignments include Public Information Officer (PIO), Liaison Officer, Safety Officer, and Security Officer, all in support of the IC.
- **Operations Section:** Manages tactical operations at the incident level directed toward reducing immediate hazards, saving lives and property, establishing situation control, and restoring normal conditions. This function implements priorities for operational activities established by the Command function.
- **Planning Section:** Gathers and assesses situational information and intelligence related to the incident and prepares Incident Action Plans (IAPs). IAPs set objectives for the operational period, as established by the Command function.
- **Logistics Section:** Obtains resources to support emergency response operations, including staff, supplies, equipment, communications equipment, medical support, food, transportation, and facilities support.
- **Finance Section:** Tracks costs related to emergency response and provides procurement and administrative support for incident management activities.

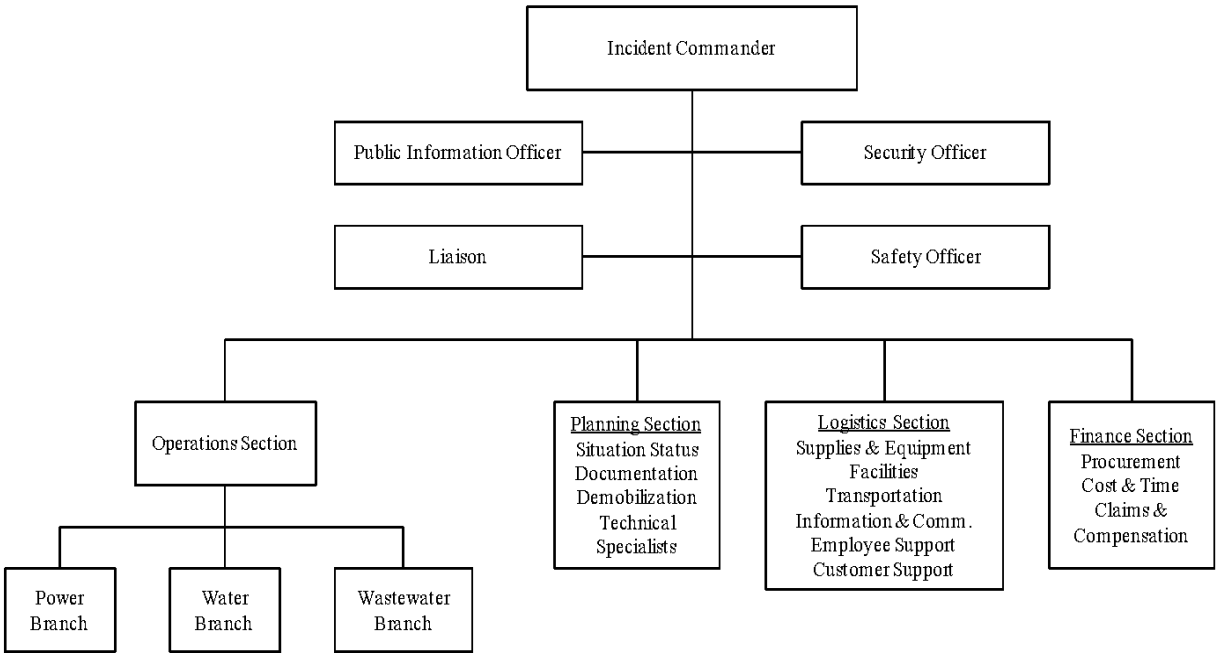
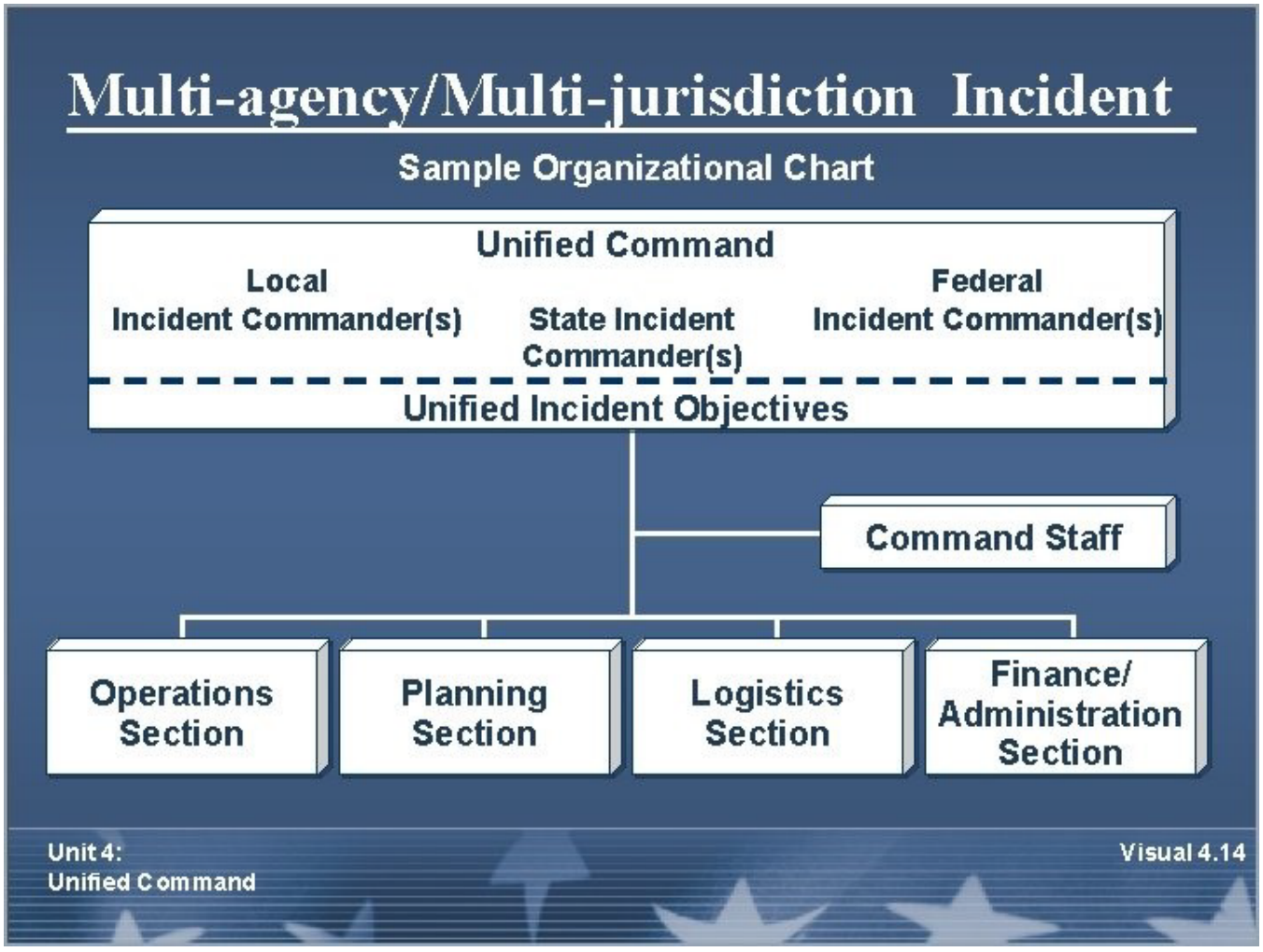


FIGURE 3 - SFPUC ICS STRUCTURE

D. Unified Command

In general, a single IC coordinates all aspects of an emergency response. However, a single IC may be expanded into a Unified Command (UC). The UC is a structure that brings together multiple ICs from more than one of the major organizations involved in the incident to coordinate an effective integrated response while concurrently carrying out jurisdictional responsibilities. The SFPUC uses UC whenever multiple jurisdictions are involved in a response effort and at any level of the response.

[9]



[9] Unified Command Sample Org Chart (Last visited on May 23, 2022)

4. WILDFIRE RISK ANALYSIS AND RISK DRIVERS

A. Enterprise Wildfire Risk Reduction Methodology

The SFPUC currently relies on staff with extensive system knowledge and experience to inform the SFPUC leadership of potential safety and reliability risks to the power grid. The SFPUC, at minimum, meets local, state, federal, regulatory, and industry standards applicable to the construction, inspection, and maintenance of the electric transmission and distribution systems. Staff will analyze service interruptions and equipment failures, determine the root cause, and develop a remediation plan to reduce or eliminate future occurrences. The SFPUC does not experience a high incident rate of system interruptions or equipment failures; however, SFPUC will continue to use the data collected by the metrics defined in this WMP to inform them of future system enhancements that are required to improve system safety, resiliency, reliability, and reduce the risk of their electrical facilities being the source of ignition for a wildfire. During critical fire weather events, the SFPUC will disable reclosers and, if necessary, de-energize lines for public safety.

The de-energization and recloser policies are defined in more detail in sections 5.I. and 5.J. of this Plan. The SFPUC continues to monitor industry best practices and emerging technologies and will evaluate and implement programs that support their continuous efforts to improve the safety and reliability of the SFPUC power grid. The wildfires of 2020-21, coupled with the COVID-19 pandemic, put a significant strain on SFPUC resources, which resulted in the delay in executing some of the listed wildfire mitigation initiatives, as described below.

B. Assessment of SFPUC's High Fire Threat District

The SFPUC utilizes the CPUC fire threat map and agrees with the CPUC that the fire-threat areas designated within the HFTD map appropriately identify the wildfire risks in proximity to SFPUC electrical facilities.[10] There has not been any noticeable change to the topography or fuel (vegetation) conditions within proximity to SFPUC electrical assets. The SFPUC does not currently recommend any changes to the current HFTD boundaries. The SFPUC will continue to monitor and evaluate risk factors near their facilities and, if required, recommend to the CPUC any revisions to the fire-threat areas.

C. Particular Risks and Risk Drivers Associated with Topographic and Climatological Risk Factors

California is experiencing the impacts of climate change, including extended drought conditions, hotter temperatures, and drier fuel sources, among others. The SFPUC's primary risk drivers associated with topographic and climatological risk factors for a catastrophic wildfire are:

[10] https://cpuc_firemap2.sig-gis.com/ (last visited on May 19, 2022)

- Extended drought conditions;
- Lack of early fall rains;
- High temperatures;
- High winds;
- Low relative humidity;
- Steep terrain;
- Vegetation type;
- High fuel loading as the result of decades of fire suppression in fire-adapted landscapes;
- Dry fuel sources;
- Dry fuel sources coupled with thunderstorms and lightning; and
- Tree mortality.

The SFPUC Climate Change Collaboration and Coordination Committee (C5) was established in 2018 to develop, coordinate, and communicate a comprehensive and consistent approach to mitigating and adapting to climate change. Membership includes representatives from most departments within the SFPUC. The committee meets bi-monthly[11] to develop a strategy to ensure climate change threats and impacts are considered and addressed in utility operations, capital programs, and long-term planning. C5 has created a climate change policy that establishes the following goals:

1. Reduce greenhouse gas emissions in alignment with City-wide climate change goals.
2. Assess vulnerability and adapt to ensure long-term resilience.
3. Evaluate climate change and its impact on the level of service goals.
4. Respond to the threats and impacts of climate change to address the disproportionate effects on environmental justice and low-income communities.
5. Protect and enhance the resilience and health of watershed ecosystems and lands affected by climate change and SFPUC activities.
6. Include climate adaptation and mitigation in capital planning and project selection criteria.
7. Communicate transparently and proactively with stakeholders on climate change and the SFPUC's adaptation and mitigation strategies.
8. Integrate climate change response across SFPUC divisions and City and County Programs and Policies.
9. Report annually and track implementation of this policy.

Additionally, the SFPUC regularly consults with local weather and fire agencies (i.e., National Weather Service, USFS, CAL FIRE, etc.) to evaluate fuel (vegetation) conditions and obtain long-range weather forecasts for areas where SFPUC has overhead electrical lines to help in the planning of wildfire mitigation programs.

[11] https://sfpuc.org/sites/default/files/about-us/commission/2021-10-29-Climate-Change-Workshop-v01.pdf (last visited on May 19, 2022)

D. Particular Risks and Risk Drivers Associated with Operational Risk Factors

The SFPUC continues to document initiating event (outages or equipment failures) information that could be an ignition risk. The SFPUC experiences very few initiating events. Consequently, it still has limited data to establish specific trends to inform them of potential fire risk drivers associated with their facilities. The SFPUC continues to closely monitor fire mitigation programs initiated by other utilities and evaluate if similar programs could benefit the SFPUC's wildfire risk reduction efforts. Additionally, the SPFUC closely monitors wildfire activity in California with interest in the identified ignition source of the incident. When a non-SFPUC-related incident occurs involving electrical facilities, the SFPUC staff will evaluate the incident and assess if they could experience a similar incident based on the root cause that is identified. Although the SFPUC has identified several programs to minimize their fire risk exposure, the following are two priority areas of focus:

1. Contact from objects
    - Vegetation contact
        - Mitigation – Refer to Section 5.A, Vegetation Management.

2. Equipment failure:
    - Blown or failed expulsion fuses
        - Mitigation – Refer to Section 5.E, Strategy – System Hardening.
    - Wire down.
        - Mitigation – Refer to Section 5.E, Strategy – System Hardening.
    - Overloaded transformers
        - Mitigation – Refer to Section 5.E, Strategy – System Hardening.

The SFPUC completed a load study and developed a project schedule to address equipment failure risks. The project is scheduled to begin in January 2023. Until the equipment has been replaced or remediated, the SFPUC will continue to employ mitigation strategies, including increasing vegetation clearances as described in Section 5.E. below. The SFPUC will provide an update in the 2023 WMP.

5. WILDFIRE PREVENTION PROGRAMS AND STRATEGIES

The SFPUC, at minimum, meets all local, state, federal, regulatory, and industry standards applicable to the construction, maintenance, and inspections of the electric transmission, distribution, and substation facilities. The following programs are designed to reduce the risk that SFPUC facilities could be the origin or contributing source for a catastrophic wildfire and additionally provide for a more reliable and resilient grid.

A. Program – Vegetation Management (VM)

The SFPUC meets the industry standard for VM practices for power utilities. For applicable transmission-level facilities, the SFPUC complies with the North American Electric Reliability Corporation (NERC) Standard FAC-003-4[12], the CPUC GO 95, Rule 35, and the Hetch Hetchy Water and Power Transmission Vegetation Management Program (TVMP Revision 5.2). For both transmission and distribution level facilities, the SFPUC is compliant with:

- CA Public Resources Code (PRC) §§ 4292[13] and 4293[14];
- CPUC GO 95, Rule 35[15] (Table 6a);
- CPUC GO 95, Appendix E Guidelines to Rule 35[16] (Table 6b);
- CAL FIRE's California Power Line Fire Prevention Field Guide, 2021 Edition[17].

Table 6a:

GO 95, RULE 35				
Case No.	**Type of Clearance**	**Trolley Contact, Feeder and Span Wires, 0-5kV**	**Supply Conductors and Supply Cables, 750-22,500 Volts**	**Supply Conductors and Supply Cables, 22.5 – 300kV**
13	Radial clearance of bare line conductors from tree branches or foliage	18 inches	18 inches	¼ pin spacing
14	Radial clearance of bare line conductors from vegetation in the Fire-Threat District	18 inches	48 inches	48 inches

[12] https://www.nerc.com/pa/Stand/Reliability%20Standards/FAC-003-4.pdf (last visited on May 19, 2022)
[13] https://codes.findlaw.com/ca/public-resources-code/prc-sect-4292.html (last visited on May 19, 2022)
[14] https://codes.findlaw.com/ca/public-resources-code/prc-sect-4293.html (last visited on May 19, 2022)
[15] https://ia.cpuc.ca.gov/gos/GO95/go_95_rule_35.html (last visited on May 19, 2022)
[16] https://ia.cpuc.ca.gov/gos/GO95/go_95_appendix_e-guidlines.html (last visited on May 19, 2022)
[17] https://osfm.fire.ca.gov/media/3vqj2sft/2021-power-line-fire-prevention-field-guide-ada-final_jf_20210125.pdf (last visited on May 19, 2022)

Table 6b:

GO 95 APPENDIX E GUIDELINES TO RULE 35		
The radial clearances shown below are recommended minimum clearances that should be established, at the time of trimming, between the vegetation and the energized conductors and associated live parts where practicable. Reasonable vegetation management practices may make it advantageous for the purposes of public safety or service reliability to obtain greater clearances than those listed below to ensure compliance until the next scheduled maintenance. Each utility may determine and apply additional appropriate clearances beyond clearances listed below, which take into consideration various factors, including line operating voltage, length of span, line sag, planned maintenance cycles, location of vegetation within the span, species type, experience with particular species, vegetation growth rate and characteristics, vegetation management standards and best practices, local climate, elevation, fire risks, and vegetation trimming requirements that are applicable to State Responsibility Area lands pursuant to Public Resources Code Sections 4102 and 4293.		
Voltage of Lines	**Case No. 13 (non-HFT Zones)**	**Case No. 14 (HFT Zones)**
Radial clearances for any conductor of a line operating at 2,400 or more volts, but less than 72,000 volts	4 feet	12 feet
Radial clearances for any conductor of a line operating at 72,000 or more volts, but less than 110,000 volts	6 feet	20 feet
Radial clearances for any conductor of a line operating at 110,000 or more volts, but less than 300,000 volts	10 feet	30 feet
Radial clearances for any conductor of a line operating at 300,000 or more volts	15 feet	30 feet

These VM standards significantly increase the vegetation clearances required within the HFTD (Table 6b, column Case No. 14 or HFT Zones). The recommended "time-of-trimming" guidelines in CPUC GO 95 do not establish a mandatory standard for vegetation clearances but provide helpful guidance to utilities. The SFPUC will use specific knowledge of tree species and growth rates to determine the appropriate time-of-trimming clearance in each circumstance.

The SFPUC performs VM with two groups: 1) the HHW group, which inspects and maintains vegetation in proximity to all SFPUC transmission facilities; and distribution facilities from the Central Valley east to the O'Shaughnessy Dam; and 2) the NRLM/WST group inspects and maintains vegetation in proximity to distribution facilities in and around the Bay Area region. The HHW right of way (ROW) VM labor crew is made up of one laborer supervisor, one operating engineer, one certified arborist, and five laborers.

A registered professional forester completes inspections with an arborist with the following certifications, International Society of Arboriculture (ISA) Certified Arborist, ISA Certified Utility Arborist, and ISA Tree Risk Assessment Qualified (TRAQ).

The NRLM/WST VM crew comprises three arborists and 3-to-5 seasonal watershed workers responsible for the Alameda and Peninsula Watershed. Two registered professional foresters support the work (one for the Alameda Watershed and one for the Peninsula Watershed).

A.1 Annual Vegetation Management Work Plan

Vegetation Management work across the ROW is planned and scheduled annually. All VM activities are listed and described in the Annual Vegetation Management Work Plan (AVMWP) to ensure VM work is conducted timely. The annual work plan is reviewed quarterly and is modified as needed in response to changing conditions or findings from vegetation inspections. The work plan identifies the facilities inspected the previous year, proposed work, and completed work. The SFPUC uses Maximo to generate VM work orders. Maximo is a computerized maintenance management system (CMMS) used to schedule and track work order completion and project costs.

The vegetation inspection dashboard was built for SFPUC VM staff to visualize crew workload (work orders), track and document inspection progress across the 230kV and 115kV transmission, 22kV and 2.4kV distribution systems, and monitor trends in required vegetation work. The dashboard displays the tree types and trims or removal prescriptions on trees that require work and inspection progress across the SFPUC electrical system. The vegetation inspectors use this data to plan their quarterly inspections and identify vegetation trends. The SFPUC ROW management reviews this data to assist in budgeting, staffing requests, and prioritizing the current workload. In the future, the SFPUC will make the dashboard more robust, adding a link to each data point, allowing navigation to the data on a map more quickly. The dashboard will also track more data (yet to be defined) to help improve the SFPUC's trend monitoring and tracking mechanisms.

A.2 Vegetation Management Dashboard

A.3 Light Detection and Ranging (LiDAR) Flights

In the fiscal year 2022-23 and 2023-24, the SFPUC budgeted for LiDAR flights to be performed on an alternating schedule with transmission lines flown one year and distribution lines the following year. In 2020, the SFPUC contracted with NV5 Geospatial, Inc. to collect, process, and analyze 48.24 miles of select distribution and transmission lines in the SFPUC, providing LiDAR and ortho imagery. SPFUC will use the LiDAR data to classify transmission and distribution line features, vegetation, ground features, and non-vegetation features within a 300-foot right of way. The consultant has provided the data to SFPUC, and it is currently being transferred to ArcGIS map layers. The data will be analyzed for potential threats to select SFPUC overhead transmission and distribution system areas.

A.4 Public Resources Code (PRC) 4291 Defensible Space Inspections

HHW performs annual preventative maintenance defensible space inspections that conform with PRC 4291 around its buildings and structures. These inspections also include areas around substations, switchyards, and powerhouses. Vegetation is removed around facilities to maintain, at minimum, a 100 ft. radius of defensible space. The 4291-inspection schedule described below forecasts that inspections are completed before the peak critical fire weather season.

POWERHOUSES	
LOCATION LABEL	INSPECTION QUARTER
Holm Powerhouse	Q2
Kirkwood Powerhouse	Q2
Moccasin Low-Head Powerhouse	Q2
Moccasin Powerhouse	Q2
TOTAL	4
SWITCHYARDS	
LOCATION LABEL	INSPECTION QUARTER
Intake Switchyard	Q2
Moccasin Switchyard	Q2
TOTAL	2
SUBSTATIONS	
LOCATION LABEL	INSPECTION QUARTER
Calaveras Sub	Q2
Oakdale Sub	Q2
Warnerville Sub	Q2
TOTAL	3

The following section addresses the work the SFPUC conducts on its transmission lines.

A.5 230kV Vegetation Inspection Cycle

A detailed ground inspection (patrol) of all vegetation near 230kV transmission lines, both in the HFTD and non-HFTD, is performed annually. Inspection details, including the name of the inspector and date and line section, are documented in ArcGIS Field Maps and noted on the HHW AVWP. These ground inspections identify all conditions where vegetation may encroach within the Minimum Vegetation Clearance Distance (MVCD)[18] for energized facilities before the next scheduled predictive control treatment. Attention is given to visual assessments of trees within the strike zone of energized facilities to identify tree defects that could cause a tree, or parts of a tree, to fall directly onto overhead high voltage conductors. Individual trees shall undergo additional inspections of a detailed 360-degree visual evaluation to determine the presence, significance, and severity of tree defects and risks.

HHWP 230kV SCHEDULE			
VEGETATION UNIT	DESCRIPTION	MILES	INSPECTION QUARTER
Holm PH	Holm-Intake Line No. 1 to tower 13-W	1.6	ANNUAL
	Holm-Intake Line No. 2 to tower 13-W		
Kirkwood PH	Kirkwood-Intake Line No. 9, to tower 06-AE	0.7	ANNUAL
	Kirkwood-Intake Line No. 10, to tower 06-AE		
	Kirkwood-Intake Line No. 11, to tower 06-AE		
Intake/Cherry Rd.	Holm-Intake Line No. 1 tower 13-W to Cherry Rd.	0.1	ANNUAL
	Holm-Intake Line No. 2 tower 13-W to Cherry Rd.		
Intake Hill	Intake-Warnerville Line No. 5 ISY to tower 05-S	0.5	ANNUAL
	Intake-Warnerville Line No. 6 ISY to tower 05-S		
Mather /South Fork	Intake-Warnerville Line No. 5 tower 05-S to tower 42-S	3.5	ANNUAL
	Intake-Warnerville Line No. 6 tower 05-S to tower 42-S		
Rim of the World	Intake-Warnerville Line No. 5 South Fork to tower 59-S	2.7	ANNUAL
	Intake-Warnerville Line No. 6 South Fork to tower 59-S		
South Fork /Ferretti Road	Intake-Warnerville Line No. 5 tower 57 to tower 101-S	8.8	ANNUAL
	Intake-Warnerville Line No. 6 tower 57 to tower 101-S		
Ferretti Rd. /Merrill Rd	Intake-Warnerville Line No. 5 tower 101-S to tower 164-S	6.3	ANNUAL
	Intake-Warnerville Line No. 6 tower 101-S to tower 164-S		
Merrell Rd. /Moccasin Switchyard	Intake-Warnerville Line No. 5 tower 164S to Moccasin Switchyard	4.4	ANNUAL
	Intake-Warnerville Line No. 6 tower 164S to Moccasin Switchyard		
Moccasin Switchyard /Red Mtn. Bar East	Intake-Warnerville Line No. 5 Moccasin Switchyard to tower 258-S.	5.8	ANNUAL
	Intake-Warnerville Line No. 6 Moccasin Switchyard to tower 258-S.		
Lake Don Pedro West	Intake-Warnerville Line No. 5 tower 264-S to tower 296-S	3.3	ANNUAL
	Intake-Warnerville Line No. 6 tower 264-S to tower 296-S		
Ranch	Intake-Warnerville Line No. 5 tower 296-S to tower 367-S	7.3	ANNUAL
	Intake-Warnerville Line No. 6 tower 296-S to tower 367-S		
Grassland	Intake-Warnerville Line No. 5 tower 367-S to Warnerville Switchyard	10.4	ANNUAL
	Intake-Warnerville Line No. 6 tower 367-S to Warnerville Switchyard		
	TOTAL	55.4	

[18] Minimum Vegetation Clearance Distance

Nominall System Voltage (kV)	Elevation (ft.)	MVCD (ft.)
230	0 ft. up to 5,000 ft.	4.4 ft.

Herbicide treatments for the 230kV ROW follow the SFPUC Right of Way Integrated Vegetation Management Policy, supported by the San Francisco Planning Department's Preliminary Mitigated Negative Declaration for Rights of Way, where the 230kV ROW intersects with Stanislaus, Mariposa, and Tuolumne counties. The use of herbicides on SFPUC property and ROW is strictly controlled by the City and County of San Francisco and San Francisco's Integrated Pest Management Ordinance (Chapter 3 of the San Francisco Environment Code).

A.6 115kV Vegetation Inspection Cycle

Similar to the 230kV, the 115kV TVMP follows the AVWP. The HHW ROW Manager creates the AVWP and identifies the facilities managed and any proposed work forecasted, with start and completion dates.

HHWP 115kV SCHEDULE				
TOWER #'S	LOCATION LABEL	Towers	Miles	INSPECTION QUARTER
284N-408N	Warnerville Substation to Modesto Substation	69	12.4	Q1
410N-614N	Modesto Substation to Tesla Portal	111	20.4	Q2
615N-897N	Tesla Portal to Sunol Substation	138	28.1	Q3 after heliflights
899N-986N	Sunol to Newark Substation	51	8.7	Q3 after heliflights
	TOTAL	369		

The SFPUC has a ROW Integrated Vegetation Management (IVM) Policy that applies to the entire SFPUC 230/115kV transmission ROW and distribution ROW. The IVM is considered the utility industry's best management practice (BMP) by federal and state land management agencies.

SFPUC will inspect the 115kV transmission system annually for vegetation clearances. Inspection details, including the name of the inspector and date and line section, are documented in ArcGIS Field Maps and noted on the HHW AVWP. Additional corrective maintenance observed during the daily course of work by the Line Crew, Vegetation Management Crew, and Watershed Keepers will be submitted to Asset Management for a corrective maintenance work order.

Table 5 (below) notes that 22 vegetation corrective maintenance work orders were issued in 2021, and all have been completed. The most common corrective maintenance identified in 2021 was the trimming or removal of trees near transmission lines and towers. The HHW ROW group has been working to increase communication and permitting requirements for orchard owners near the transmission ROW.

In 2021, SFPUC staff worked to separate the 230kV, 115kV, and distribution lines vegetation corrective maintenance work orders into Tier 2 and 3 HFTD to report on a more granular level to help determine where recurring vegetation maintenance is taking place. This will help develop the SFPUC work plans to target areas for increased communication to orchard owners and ensure appropriate permitting has been received. Staff is currently investigating how to integrate the HFTDs into Maximo. The SFPUC transmission

and distribution vegetation clearance inspectors have begun including the HFTD into their inspection reports to be entered into Maximo when corrective maintenance work orders are issued.

Table 5

Year	Vegetation Corrective Work Orders for 230kV/115kV	
	Number of Work Orders	Total Completed
2019	41	41
2020	16	16
2021	22	22
2022		
2023		

A.7 Distribution Vegetation Inspection Cycle

All vegetation patrols in proximity to distribution lines within the HFTD, at minimum, meet the requirements of CPUC GO 95. The HHW distribution lines are patrolled and inspected on the ground and aerially annually for vegetation clearances. The HHW forester and arborist perform the ground inspections. The aerial inspections include the line crew (Qualified Electrical Worker – QEW) and the ROW Vegetation Management crew. The inspections serve dual purposes: 1) to allow the line crew to inspect the distribution lines and equipment for any corrective line maintenance required, and 2) to allow the forester and arborist to inspect for vegetation that may be encroaching within the MVCD which may require corrective maintenance work.

HHWP DISTRIBUTION SCHEDULE				
LOCATION SHORT	LOCATION LABEL	Poles	Miles	INSPECTION QUARTER
CD-CV	Cherry Dam to Cherry Valvehouse	24	1.5	Q3
HP-CH	HPH to Cherry	207	10.9	
	HPH to HP-CH 041.00			Q2
	HP-CH 041.00 to Cherry			Q3
KP-OS	KPH to OSH	504	18.3	
	KPH to KP-OS 216.00			Q2
	KP_OS 216.00 to OSH			Q3-Q4
MA-CA	Mather to Cafeteria	41	6	Q3
MA-EV	Mather to Evergreen	40	1	Q3
MP-LH	MPH to Lowhead	275	8.9	Q2
MP-ST	MPH to Sewer Treatment	101	2.7	Q2
OS-OC	OSH to Cottage 1	27	0.9	Q4
PG-SJ	PGE to San Joaquin Valve House	7	0.1	Q2 during 115 patrol
PG-TE	Tesla Portal Line	6	0.1	Q3 during 115 patrol
	TOTAL	1232	50.4	

The NRLM/WST certified arborist performs annual inspections of vegetation in proximity to distribution lines under their jurisdiction. The arborist submits any corrective maintenance work order prescriptions for the NRLM/WST tree crews in the Alameda and Peninsula Watersheds.

In 2020, the SFPUC updated the HHW Power Distribution Vegetation Management Plan (Power DVMP) to mitigate further the potential of SFPUC equipment being the source of ignition for a catastrophic wildfire. This DVMP update provides detailed program objectives with clearly assigned roles and responsibilities for HHW staff. In 2021, the Power DVMP review was completed and planned to be officially adopted and given an internal policy and procedure number in late 2022.

The Power DVMP further establishes the protocols for the AWP. The AWP is created by the ROW Manager and identifies the facilities to be managed and any proposed work, with start and completion dates. When work is identified, a work order is created in Maximo and assigned to the appropriate crew.

Inspection details, including the inspector's name and the date and line section, are documented using Maximo and noted on the HHW Vegetation Management AWP. The HHW Line Crew, Vegetation Management Crew, and Watershed Keepers submit additional corrective maintenance observed during daily work to Asset Management to generate a corrective maintenance work order.

Table 6 (below) shows that in 2021, 26 corrective maintenance work orders were issued, and 23 have been completed. The remaining three work orders are in progress and will be completed in early 2022. The most common VM corrective maintenance along the distribution lines were tree trimming and removals to ensure compliance with GO 95 Rule 35.

Table 6

Year	**Vegetation Corrective Work Orders for Distribution**	
	Number of Work Orders	Total Completed
2019	45	45
2020	43	43
2021	26	24[19]
2022		

[19] The two remaining work orders will be completed by summer 2022. A line drop clearance needs to be obtained by HHWP before the remaining trees can be safely removed.

A.8 Supplemental Vegetation Management Projects

The following projects highlight where the SFPUC goes above and beyond GO 95 requirements.

- US Forest Service (USFS) Settlement Sale, Phase 1.
    - In February 2019, a healthy green tree that had been previously inspected and found to be sound uprooted and damaged an HHW 230kV transmission line and tower. The HHW forester recommended removing additional hazard trees to increase safety and prevent further damage following additional inspections. The land adjacent to the HHW 230kV transmission right-of-way is located within USFS land in the Stanislaus National Forest. In March 2021, HHW entered a US Department of Agriculture Forest Service Timber Sale Contract to remove approximately 816 trees outside the HHW transmission ROW in Tier 2 and 3 HFTD. HHW contracted with a Licensed Timber Operator (LTO) to remove the trees. Work commenced in the summer of 2021 and was completed in the fall of 2021. The Settlement Sale agreement terminates in December 2023, and HHW is working on Phase 2 of the project, which will remove an additional 396 hazard trees identified on private property.
- Master As-Needed Tree Services contract
    - In 2021, the SFPUC awarded Master As-Needed Tree Service contracts to five firms to remove hazardous trees and vegetation on SFPUC lands. This contract includes projects in the Central Valley going east to O'Shaughnessy Dam and projects in the Bay Area and Peninsula areas. The firms under contract hold D49 Tree Service Contractor Licenses and are LTOs or have an LTO as a subcontractor. Both contracts were awarded in February 2022 and are going through the certification process. The SFPUC is developing hazard tree removal projects to begin utilizing the agreement to remove trees in the summer or fall of 2022. The SFPUC will provide a project update in their 2023 WMP filing.

B. Program – Asset Inspections

Under applicable industry standards, the SFPUC performs the following asset inspections and maintenance of transmission, distribution, and substation facilities. Preventative maintenance work orders for detailed inspections and corrective work are managed through Maximo.

B.1 Transmission System Maintenance

The SFPUC owns and maintains a total of 834 transmission structures. Detailed ground inspections are performed on a five-year cycle. Detailed ground inspections consist of checking the condition of access roads and gates, tower numbers, tower danger signs, tower concrete footings, grounding condition, vegetation surrounding the tower, steel tower members (checking for rust and condition of metal), and powerline tree and limb encroachments. Table 7 (below) notes that 114 inspections were scheduled in

2021, and all are complete. The transmission system's most common corrective maintenance work orders were replacing clevis insulators and replacing worn tower steel (see pictures below). See Table 7 below for a count of "Transmission Inspections Scheduled/Completed" and "Transmission Corrective Maintenance Work Orders Issued/Completed."
Aerial patrols of all 834 structures are performed annually by the HHW Line Crew and consist of a visual inspection of tower members and related hardware, dampers, conductors, and insulators.

In 2021, the SFPUC line crew identified and documented all splices and bolted connections on the SFPUC transmission lines. Recurring preventative maintenance work orders were created with a job plan to thermal scan (infrared) transmission line splices, jumpers, insulators, and dead ends. Equipment that is found to be operating at 100 degrees Fahrenheit above ambient temperature is documented and sent to the SFPUC electrical engineering group for analysis. Transmission lines were broken down into eight segments, with multiple towers in each segment. Each segment has its own recurring preventative maintenance work order, and the findings are documented in the work order log in Maximo. In 2021, the line crew completed all infrared scans on each splice and connection.

In 2019, the SFPUC completed 105 of the 214 corrective maintenance work orders generated during transmission tower inspections. As a follow-up, in this 2022 WMP, the remaining 88 work orders from 2019 have been completed. The most common corrective maintenance work consisted of replacing tower danger signs, repainting tower numbers[20], and replacing clevis insulators.

Hot / Cold Wash: The SFPUC conducts annual preventative maintenance by conducting hot or cold wash of overhead line towers, insulators, switches, and equipment in substations/switchyards. The purpose of hot or cold washing is to remove contaminants from the insulators and other associated hardware, which reduces the likelihood of tracking and arcing, which could degrade the equipment and ultimately lead to failure (fault) and could cause sparks to fall to the ground which could be the source of ignition. The CMMS (Maximo) tracks the assignment and completion of these work orders, and the line crew supervisor verifies completion.

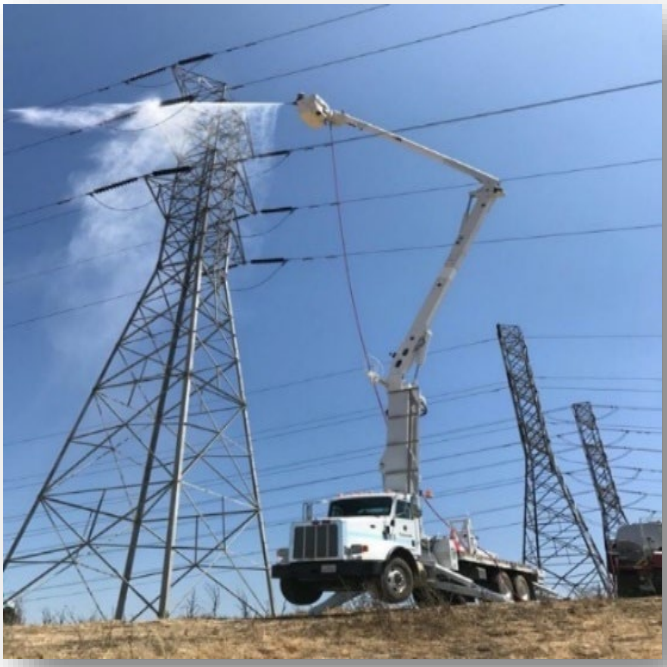


PHOTO 1 HHW HOT/COLD WASH TRUCK

[20] The SFPUC issues corrective maintenance work orders for replacing tower danger signs and repainting tower numbers; however, these types of follow-ups do not pose a wildfire risk.

Table 7

Transmission Tower Inspections		
Year	Detailed Inspections Scheduled/ Completed	Corrective Maintenance Work Orders/Completed
2019	180/180	49/27[21]
2020	180/180	28/28
2021	114/114	40/28
2022		
Total	526 (out of 834 Towers)	

Clevis insulator

Transmission tower steel

B.2 Distribution System Maintenance

The SFPUC owns, operates, and maintains 1,744 distribution poles and, at minimum, meets the inspection requirements of CPUC GO 165. GO 165 establishes minimum requirements for electrical distribution facilities regarding inspections (patrols, detailed, and intrusive inspections), condition ratings, schedule, the performance of corrective actions, and record-keeping and reporting to ensure safe and reliable electrical service. The SFPUC contracts with a helicopter vendor to patrol distribution lines annually with the SFPUC line crew (Qualified Electrical Worker – QEW). During the aerial patrols, the QEW looks at the tops of the

[21] While preparing this WMP update, SFPUC reviewed all corrective maintenance (CM) work orders in Maximo and were able to refine our tracking and reporting process. This resulted in a decrease in wildfire mitigation CM's for 2019

poles for rot and damage. Intrusive pole inspections are performed on a 10-year cycle. The SFPUC has four total miles of underground distribution lines located in the Tier 2 HFTD. Corrective maintenance work orders are created during the inspection and assigned a priority. The SFPUC has inventoried all its 1,744 distribution poles in Maximo.

In the fiscal year 2022, the SFPUC submitted a purchase request for a commercial-grade drone with an optical zoom camera up to 30x, which will allow for safety inspections of SFPUC electrical lines and equipment from a distance. The purchase is currently going through the procurement process. The details of the drone and equipment are provided below in the Strategy – Fire Mitigation/Suppression Equipment section. The SFPUC intends to provide more information in future WMPs as the drone program is developed and implemented.

Table 8

Year	Corrective Maintenance Work Orders for Distribution System	
	Number of Work Orders	Total Completed
2019	4	4
2020	37	37
2021	30	26
2022		

B.3 Substations/Switchyards Maintenance

The SFPUC, at minimum, meets the requirements of CPUC GO 174 for inspections of their substations/switchyards. The SFPUC performs annual infrared inspections on transformers, switches, and circuit breakers in switchyards/substations.

C. Program – Situational Awareness

C.1 Cameras

To improve the SFPUC's situational awareness and increase the visibility of their overhead electrical facilities, the SFPUC partnered with PG&E, which has facilities in proximity to SFPUC assets, and a communications provider to install two high-definition cameras on SFPUC towers located within the HFTD. PG&E purchased the cameras, and the communications company provides the communications infrastructure for viewing imagery on the ALERTWildfire website (https://www.alertwildfire.org/).
In December 2020, the SFPUC submitted a ROW Project Review Application to SFPUC Real Estate to install additional cameras near SFPUC assets. The locations will include Poopenaut Peak near the O'Shaughnessy Dam site in Yosemite National Park, Burnout Ridge near Cherry Lake, and Intake Ridge near Kirkwood Powerhouse. These areas are in Tier 2 or 3 HFTDs, where increased monitoring of the area where the SFPUC

operates overhead lines will enhance the SFPUC's situational awareness. The applications for these three additional cameras have been reviewed by HHWP Stakeholders and are with SFPUC Real Estate for permitting.

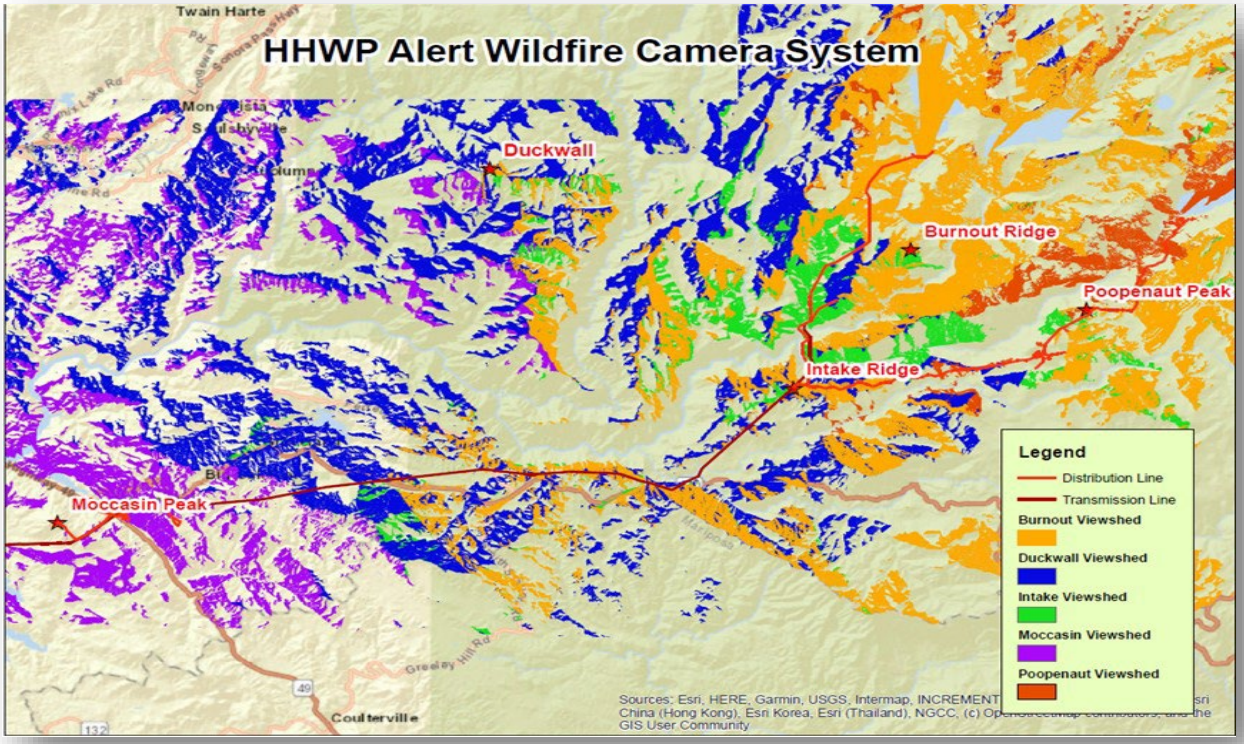


FIGURE 4 - ALERTWILDFIRE CAMERAS[22]

C.2 Weather Monitoring

In addition to publicly available weather data, the SFPUC monitors real-time weather conditions by utilizing weather stations owned, operated, and maintained by PG&E. A number of these PG&E-owned weather stations are near SFPUC facilities and provide the real-time data needed to monitor conditions that could directly impact the SFPUC infrastructure. The SFPUC owns six additional weather stations with wind speed sensors strategically located and used for forecast validation and real-time weather condition monitoring. The SFPUC continuously evaluates the need for additional weather stations that could be of benefit to the SFPUC operations and maintenance departments to support the safe and reliable operation of the grid.

The SFPUC staff obtains wind speed conditions using forecast models from NOAA's High-Resolution Rapid Refresh (HRRR), generating average and peak wind forecasts for the next 24-hour operating period. The automated process generates an hourly email with the forecast and sent to SFPUC operations managers. Wind and weather data is reviewed daily and used to support operational strategies for the SFPUC overhead

[22] Note that the Poopenaut, Intake, and Burnout viewsheds are conceptual until these cameras are installed.

electrical lines to determine if the SFPUC should implement any operational restrictions or if lines should be de-energized for public safety.

The SFPUC does not employ professional meteorologists, nor do they contract meteorology services. In-house staff use publicly available weather forecasts and monitor fuel (vegetation) conditions by accessing publicly available information provided by the National Weather Service (NWS), USFS, Bureau of Land Management, NOAA, and CAL FIRE. SFPUC staff monitor the NWS for Red Flag Warnings.

C.3 Technosylva Wildfire Tactical Analyst (In development pending purchase approval)

Technosylva[23], a wildland fire solutions company based in La Jolla, California, develops wildfire risk analysis software. They provide wildfire risk analysis and modeling software to other California IOUs, CAL FIRE, and the CPUC. The risk models forecast (predict) daily fuel conditions and wind speeds and create advanced modeling simulations to predict the spread of a wildfire should ignition occur. The SFPUC began working with Technosylva in early 2021 to develop a product that was tailored to a smaller POU but could still provide daily live and dead fuel moisture levels, wind speed forecasts, a daily fire potential index (FPI), current fire incidents, and forecast how quickly a fire could spread and impact nearby SFPUC lands, assets, and nearby communities.

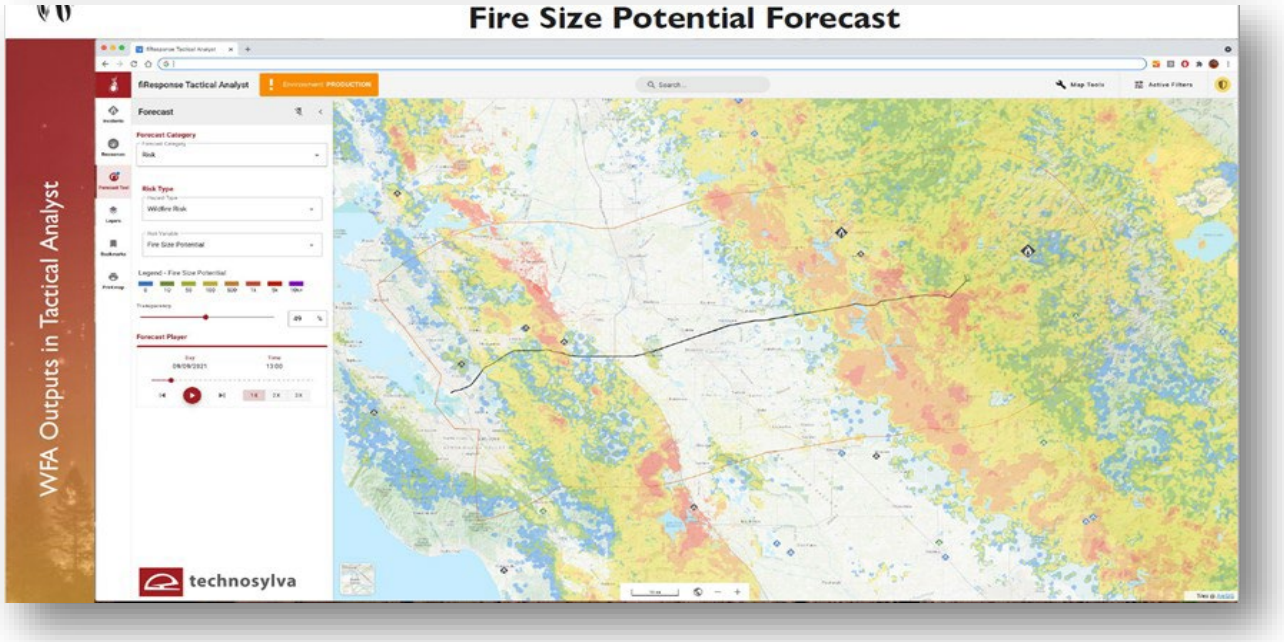
The application also integrates current wildfire alert camera information into one interface. Technosylva developed a Wildfire Tactical Analyst program with the SFPUC as the pilot customer. The SFPUC plans to deploy and test the Technosylva Tactical Analyst product in fall 2022. Initially, SFPUC staff will need to be trained on the application, and internal processes and procedures will need to be developed and updated to reflect the data that the application produces. The Tactical Analyst program is being developed to include the following features:

- Daily weather forecasts for a 100-hour horizon (4 days) at 1 hour/2 km resolution. These are refreshed daily so SFPUC will always have a 100-hour prediction.
- Dead and Live Fuel Moisture level data refreshed daily.
- Provides uniform risk levels of fire ignition risks for all areas within proximity to SFPUC facilities.
- Daily wildfire risk forecasts for 100-hour horizon at 3-hour intervals. These are refreshed daily. Risk metrics shall include Fire Size Potential (Acres Burned), buildings impacted, population impacted, and fire behavior index. Technosylva will also create a new Fire Potential Index metric specifically for the SFPUC.
- Supports a uniform Fire Potential Index, weather, and risk metrics across all SFPUC organizations.

[23] https://technosylva.com/ (last visited on May 19, 2022)

- Integration of HHWP/SFPUC electrical assets as a data reference map layer.
- Will clearly show fire weather forecast and risk forecast relative to all SFPUC facilities.
- Query tool to select HHWP/SFPUC assets and retrieve information including risk values for any asset location at the given time selected.
- Very easily identify specific SFPUC assets that could be at risk by identifying the conditions around that asset.
- Print map tool to create PDF maps for sharing.
- Display and query weather station data including all PG&E published weather stations and the 6 stations currently used by the SFPUC.
- Integration of ALERTWildfire cameras (real-time).
- Integration of CAL FIRE and federal agency wildfire incident data (real-time).
- Display additional weather, fire danger (NFRDRS WFAS), and VIIRS/MODIS detection data.

Below is a product demonstration screenshot of the Tactical Analyst program with SFPUC transmission and distribution systems overlaid for reference. The screenshot is for illustrative purposes only and may not reflect the actual look once production is completed.



D. Program – Operating Conditions

In addition to the SFPUC's various wildfire mitigation programs, utility staff closely monitors critical fire weather conditions impacting the area where SFPUC-owned and operated overhead electrical lines are located within the HFTD. Dry fuel sources, high winds, low relative humidity, and dry lightning conditions can contribute to elevated or extreme fire risk conditions. When critical fire weather conditions are forecasted or observed, SFPUC staff will implement additional operating restrictions, including executing a Public Safety Power Shutoff (PSPS). The SFPUC consults with multiple internal and external stakeholders to:

- Leverage situational awareness;
- Provide real-time monitoring data from local weather stations;
- Produce wind forecast models; and
- Monitor fire condition warning systems that gauge fire threat conditions, as described in the Situational Awareness: Weather Monitoring section.

Based on this information, the SFPUC will mobilize staff and take other specific actions, including de-energizing lines, to mitigate a potential fire threat and reduce the risk of SFPUC electrical facilities being the source of ignition for a catastrophic wildfire. Daily assessment of weather conditions is performed by SFPUC staff and provided to field operations personnel and used to develop operational strategies to reduce the risk of an ignition. The SFPUC operates under the following operating conditions:

- Normal Operating Condition (no operating restrictions),
- Elevated Operating Condition (restricted operations), and
- Red Flag Warning Condition as defined in SFPUC Work Order Fire Mitigation Procedure OPS-1002.
    - Operational restrictions are described in sections 5.J and 5.K, including operating conditions for disabling circuit reclosers.

- All counties: (Tuolumne, Stanislaus, Mariposa, San Joaquin, San Mateo, Alameda)

    - A Red Flag Warning (RFW) is issued by the NWS for weather events that may result in extreme fire behavior that will occur within 24 hours.
    - SFPUC electrical assets are located within eight different NWS California Fire Weather Zones (CAZ). They are CAZs 219, 220, 221, 508, 510, 511, 590, and 592.
        - Operating restrictions require all at-risk work on SFPUC assets within the right of way and SFPUC lands to cease.

- Tuolumne County (Zone 1): Some portions of Tuolumne County are within the HFTD Tier 2 and Tier 3 areas where SFPUC transmission and distribution facilities are located.

    - Normal and Elevated conditions are determined from information provided by the US Forest Service (USFS). The USFS issues a daily Project Activity Level (PAL) designation for areas where

SFPUC facilities are located in Tuolumne County (High South). The PAL is based on data collected at the Mount Elizabeth Remote Automatic Weather Station (RAWS)[24]. The PAL is either "permissive wood cutting day" or "restricted activities" as defined by levels A-E and Ev. Information is obtained by the crew leader daily and used to determine any operating restrictions within the areas where work is to be performed.

- Normal Operating Condition "Permissive wood cutting day."
  - No operating restrictions apply.
- Elevated Operating Condition.
  - Operating restrictions apply per the USFS PAL A-E or Ev; as stipulated in the USFS Fire Plan for Construction and Service Contracts document.

- San Joaquin and Stanislaus County (Zone 2): San Joaquin County consists of primarily flat farmland that is frequently irrigated. The SFPUC does not impose operating restrictions in these counties because they are in a non-HFTD with little to no catastrophic wildfire risk.

- Alameda and San Mateo counties (Zone 3): Some portions of Alameda and San Mateo County consist of HFTD Tier 2 and Tier 3 areas where SFPUC transmission and distribution facilities are located.

  - Operating conditions are determined when operating conditions meet or exceed the below triggers and are communicated to staff performing work in these counties.
    - Normal Operating Condition (no operational restrictions):
      - Average sustained wind < 10 mph
      - Relative humidity > 20%
      - Temperature < 80 F
    - Elevated Operating Condition (restricted operations):
      - Average sustained wind > 10 mph
      - Relative humidity < 20%
      - Temperature > 80 F

E. Strategy – System Hardening

The SFPUC's electric facilities are designed, constructed, and maintained to, at minimum, meet the requirements of CPUC GO 95 and other relevant federal, state, regulatory, and industry standards. The SFPUC developed and submitted a 10-year capital plan. The plan is currently moving through the SFPUC review process and will need to be approved by the Mayor and the CCSF Board of Supervisors. The 10-year capital plan proposes the following programs to reduce the risk that SFPUC facilities could be the origin or contributing source of a catastrophic wildfire.

[24] https://raws.dri.edu/cgi-bin/rawMAIN.pl?caCELI (last visited on May 19, 2022)

E.1 Replacement of CAL FIRE Non-Exempt Equipment

Approximately 15 percent of SFPUC distribution poles, including those located in non-HFTD areas, support non-exempt equipment defined by PRC § 4292 and CAL FIRE's California Power Line Fire Prevention Field Guide. These poles support electrical equipment protecting distribution lines from damage and allowing isolation during outages.

Examples of non-exempt equipment are expulsion fuses, inline switches, lightning arrestors, hot tap (hotline) clamps, and split bolt connectors. The SFPUC will continue maintaining a firebreak around structures that have non-exempt equipment in both the HFTD and non-HFTD. This firebreak consists of clearing not less than a 10-foot radius from the outer circumference of the pole or tower pending the replacement of non-exempt equipment with exempt equipment.

HHW engineering contracted with a firm to complete a load study on distribution assets to identify at-risk facilities, such as overloaded transformers, undersized fuses, etc. It developed a project schedule to replace at-risk equipment. Engineering is currently reviewing the study and providing comments to the firm. This project will also identify all PRC 4292 non-exempt equipment, and an inventory will be developed to prioritize replacement with exempt equipment. Construction and procurement are tentatively scheduled to begin in January of 2023. The SPFUC will provide a work schedule update in the 2023 Plan.

E.2 Replace Copper Conductor

Consistent with utility best practices, the SFPUC considers copper conductors at higher risk for failure and a potential ignition source for a catastrophic wildfire. The SFPUC is evaluating the replacement of all copper conductors with an aluminum-based conductor. The SFPUC has inventoried all the copper conductors on its system and is mapping them within its ArcGIS program. The SFPUC Engineering staff is analyzing the cost-benefit of replacing the copper conductor, and a report will be presented to SFPUC management for funding considerations.

E.3 Overhead to Underground Conversion

In September 2020, the SFPUC commissioned a consultant to perform three studies to assess the construction costs to underground three existing overhead electrical distribution lines located in the HFTD. Over the next 19 months, the SFPUC staff will analyze the most recent LiDAR data to determine areas where vegetation risk(s) cannot be mitigated with the use of labor and machinery and determine if it is cost-effective to place the lines underground based on the feasibility of undergrounding in that particular area(s).

E.4 Overhead Line Removal

The SFPUC continues to evaluate the feasibility and economic benefit of reducing its overhead distribution line footprint. The SFPUC is evaluating projects such as adding small hydro generation at remote facilities

near the load. Providing a power source closer to the load will allow the removal of the current overhead facilities. The SFPUC expects to provide a program update in the 2023 WMP.

F. Strategy – Workforce Training

The SFPUC has implemented complementary training programs for its workforce to support a safer work environment, ensure continuous improvement, and help reduce the risk that SFPUC facilities could be the origin or contributing source for the ignition of a catastrophic wildfire.

Basic Fire Training: The 2021 training was canceled due to COVID-19 gathering restrictions. The training is scheduled to resume after July 2022 for SFPUC staff, including right-of-way crews, electric line crews, and other field staff. The training will consist of basic fire training regarding minimizing potential fire dangers, practicable actions to suppress fires, the importance of reporting fires, basic fire safety, and the use of fire mitigation and suppression equipment, including hand tools and water pumps. This training will support the increased fire preparedness and response capabilities of the SFPUC field staff and other support staff.

In 2021, COVID-19 disrupted the annual refresher training for the HHW ROW Vegetation Management crew. A makeup training schedule is currently being determined. The training is reviewed and updated to discuss all current vegetation clearance regulations (GO 95, Rule 35; PRC §§4292 & 4293, and NERC FAC-003-4).

G. Strategy – Coordination with Other Agencies and Stakeholders

The SFPUC collaborates with multiple stakeholders to assess areas where there is or could be a risk for a catastrophic wildfire. This work supports the SFPUC's continuous effort to improve wildfire mitigation strategies and enhance fire safety throughout the region. The SFPUC participates as a partner on the Southwest Interface Team (SWIFT)[25], a partnership including the USFS, CAL FIRE, BLM, Tuolumne County, and private landowners. The SWIFT is a group comprised of a variety of government and external partners that work collaboratively to create fire-adapted communities. SWIFT meets every month and, since 1999, has planned and implemented wildfire protection activities within the 132,000-acre (~206 sq. mi.) area of southern Tuolumne County and western Mariposa County. Additionally, they cooperatively plan and implement strategic fire fuel break systems designed to reduce the threat of loss of life, property, and resources in the southern Tuolumne and northern Mariposa county wildland-urban interface. Due to COVID-19, the SWIFT meetings are virtual to help reduce the spread of COVID and comply with social distancing protocols.

In Alameda and San Mateo counties, the SFPUC organizes an annual first responder liaison meeting in coordination with CAL FIRE to supplement ongoing communication with all first responders, including the county sheriff's office and local fire departments. The SFPUC watershed lands in these two counties are

[25] https://www.fs.usda.gov/detail/stanislaus/home/?cid=stelprd3810191 (last visited on May 19, 2022)

State Responsibility Areas (SRA), and SFPUC staff are in regular communication with local CAL FIRE staff throughout the calendar year. Due to ongoing COVID-19 restrictions, the 2021 meetings were virtual.

In May 2021, the CAL FIRE Tuolumne-Calaveras Unit received a Firehawk helicopter to replace a Bell 212 helicopter. The primary benefit of the Firehawk is the increased water carrying capacity, up to 800 gallons. The Firehawk is stationed at the Columbia Airport, approximately 22 miles from the SFPUC Moccasin Powerhouse / Switchyard / Control Center. If a wildland fire ignites near SFPUC assets, the Firehawk could be deployed and arrive within minutes and conduct an initial attack to reduce fire spread potential.

CAL FIRE FIREHAWK

HHWP maintains a Fire Dipping Strategy procedure (O&M-1009) shared with CAL FIRE, Yosemite National Park, and the USFS. The purpose and scope of the plan are to provide a reservoir dipping strategy that considers both water quality and firefighting efforts. The SFPUC owns and operates drinking water reservoirs for the City of San Francisco and the Bay Area. Fire response agencies use these reservoirs to pull water during fire suppression activities. Because of water quality risks, the SFPUC has ensured that partner agencies understand the benefits and risks and can contact the appropriate HHWP staff before dipping from SFPUC reservoirs.

In 2021 the SFPUC established the SFPUC Wildfire Mitigation Planning Group consisting of managers and field staff from HHW, NRLM, and WST. The group's purpose is to coordinate wildfire mitigation projects, activities, and best practices across all SFPUC divisions. The group meets monthly, with an agenda prepared before each meeting and the opportunity for each member to provide discussion topics. The SFPUC divisions responsible for performing wildfire mitigation activities cover a significant geographical area. The coordination of work performed by this planning group has proven to be an efficient and effective way to share resources, provide project updates, and coordinate programs to ensure the SFPUC consistently complies with all local, state, federal, and regulatory requirements.

G.1 SFPUC Relationship with PG&E

The SFPUC owns and operates critical water, power, and sewer facilities across multiple counties in Northern California. The SFPUC transmission system has interconnections with the California transmission grid via PG&E's system, and they are also the source feed to some SFPUC distribution line segments. Although a rare occurrence, there could be an impact on SFPUC facilities due to a PG&E-initiated PSPS. The SFPUC has provided a list of SFPUC-owned critical facilities to PG&E with the associated contact person(s); conversely, PG&E has provided the SFPUC with a contact representative. Several SFPUC staff also have access to the PG&E PSPS Portal and can review pertinent information in real-time. SFPUC staff can also participate in coordination calls that occur during an active PG&E PSPS.

Communications with PG&E before and during a PG&E-initiated PSPS have continued to improve over time. The SFPUC is also very proactive and will often contact the PG&E representative before PG&E makes notifications regarding a potential PSPS. The SFPUC has a combination of permanent and mobile temporary backup generators for locations identified as having the potential for being impacted by a PG&E PSPS. The SFPUC communicates with PG&E before a PSPS event and can mobilize temporary generators to those facilities that do not have permanent standby generators.

H. Strategy – Customer Communication

The SFPUC is not a retail service provider and only has one retail customer served directly from its distribution system. The SFPUC is primarily a generation and transmission provider that transmits SFPUC-generated hydropower over its transmission network and into the CAISO market. Other than the one retail customer, the SFPUC distribution system serves all SFPUC-owned and operated load (facilities).

The one retail customer served by the SFPUC is a business facility located in the Stanislaus National Forest. This customer has a backup generator and experiences no impacts when utility power is interrupted. The SFPUC will use de-energization as a fire risk mitigation strategy, but it does not consider this a formal Public Safety Power Shutoff (PSPS) program. The SFPUC collaborates with the stakeholder(s) regarding potential power interruptions before de-energizing overhead lines.

The SFPUC staff meet with their one customer and Yosemite National Park staff and provide them with an overview of the SFPUC's protocols for disabling reclosers, potential de-energization of the circuit for safety, and service restoration procedures. Although the SFPUC does not provide power to USFS-owned facilities, the SFPUC staff meet with the Stanislaus National Forest staff and provide them with the same information as given to the Yosemite National Park staff.

I. Strategy – Circuit Reclosers

The SFPUC utilizes automatic reclosers for system reliability. Reclosers are used to attempt to restore service following a line tripping open automatically. The automatic operation introduces a higher degree of risk for ignition of a wildfire during elevated or extreme fire conditions. The SFPUC will disable all automatic

reclosers when the Stanislaus National Forest changes the fire danger condition to high. The SFPUC will not enable the reclosers until the fire danger condition is changed to less than high, usually following the onset of fall/winter precipitation, and the burn environment is no longer conducive to large wildfires.

If a fault occurs on a line during the period when reclosing is disabled, field personnel will perform an aerial or ground inspection of the entire line before restoring service to the line. If a fault (failure) is identified, it will be repaired or made safe before restoring service to the line. In 2021, the reclosers were disabled on April 21 and remained disabled until December 14, after rains and snowpack were recorded to lower the fire risk in the area.

J. Strategy – De-energization

During critical fire weather conditions, the SFPUC will, as a measure of last resort, de-energize transmission and/or distribution lines to reduce the risk that SFPUC facilities could be the source of ignition for a catastrophic wildfire. This strategy has minimal impacts on SFPUC customer(s), its water delivery operations to the Bay Area, its hydro generation operations, interconnected utilities, and the CAISO grid. The SFPUC continues to evaluate the de-energization criteria other utilities use in their decision-making process and leverage best practices most applicable to the fire risks associated with SFPUC facilities. The SFPUC currently considers CAL FIRE and USFS fire danger ratings, NWS weather forecasts including Red Flag Warnings, real-time wind speeds and wind gusts, temperature, and relative humidity. Additionally, the weather forecast, and fuel information described below, relating to potential fire risk conditions are automatically provided to SPFUC staff to support their decision to de-energize SFPUC facilities:

- Adjective Fire Danger Indices (e.g., 'Low' 'Moderate', 'High', 'Very High', and 'Extreme') at Mount Elizabeth.
    - Product of National Weather Service Weather Information Management System

- Average wind speed and maximum wind gust gridded forecasts
    - Obtained from High-Resolution Rapid Refresh Model
    - 3-km, hourly resolution, issued once per hour

When thresholds specified below are met, a warning email message is issued to the HHW Moccasin Control Center mailing list, and additional HHW staff. These thresholds are comprised of:

- Wind thresholds; either of two conditions:
    - Hourly sustained wind speeds greater than 25 mph
    - Wind gusts greater than 45 mph

- Adjective Fire Danger Rating of any severity greater than 'Low'
    - i.e., 'Moderate', 'High', 'Very High', or 'Extreme'

The SFPUC staff will evaluate all the above weather information and based on their operating experience and historical system performance, decide if de-energizing electrical facilities for public safety is warranted. If it is decided to de-energize transmission and/or distribution facilities, the SFPUC staff will direct the operations personnel to which facilities need to be de-energized. The SFPUC staff will continue monitoring the critical fire weather conditions. When fire risk conditions improve, they will direct operations personnel to begin the process to re-energize the facilities as outlined in section K – Strategy, Service Restoration.

In 2021, the SFPUC proactively de-energized one of its distribution lines multiple times when high winds and critical fire weather conditions were forecasted. All de-energization events occurred on the same portion of the 22kV line. This line section runs through a Tier 2 HFTD through canyons with steep slopes. The de-energizations proactively mitigated a wildfire risk starting in an inaccessible canyon area. This area is inspected annually for vegetation compliance around the lines; however, the lines remain surrounded by healthy trees outside the ROW that pose a potential risk during high wind events. Outage periods for 2021 were as follows:

- Tuolumne County 22kV lines:
  - 1/26/2021 – 1/31/2021. A winter storm with heavy snow and wind was forecasted. Due to previous months with no precipitation and the potential for dry vegetation, HHW management de-energized the 22kV line as a safety precaution. HHW line crew inspected the line for damage before re-energization.
  - 3/29/2021 –3/30/2021. Due to forecasted winds that exceeded thresholds. A portion of the 22kV line was de-energized for safety. HHW line crew patrolled the line for damage before re-energization following the wind event.
  - 4/27/2021-4/28/2021. Due to forecasted winds that exceeded thresholds, a portion of the 22kV line was de-energized for safety. HHW line crew patrolled the line for damage before re-energization following the wind event.
  - 7/29/2021 – 7/30/2021. Due to forecasted high winds that exceeded thresholds, a portion of the 22kV line was de-energized for safety. HHW line crew patrolled the line for damage before re-energization following the wind event.
  - 7/30/2021-7/31/2021. Due to forecasted high winds that exceeded thresholds, a portion of the 22kV line was de-energized for safety. HHW line crew patrolled the line for damage before re-energization following the wind event.
  - 9/9/2021 – 9/11/2021. Due to forecasted high winds that exceeded thresholds, a portion of the 22kV line was de-energized for safety. HHW line crew patrolled the line for damage before re-energization following the wind event.
  - 10/12/2021 – 10/13/2021. Due to forecasted high winds that exceeded thresholds, two (2) portions of the 22kV line were de-energized for safety. HHW line crew patrolled the line for damage before re-energization following the wind event.

K. Strategy – Service Restoration

During a PSPS or de-energization event, the SFPUC leadership will continue to monitor critical fire weather conditions throughout the region. When critical fire weather conditions improve (subside), the SFPUC leadership will give an "all clear" to begin the process of returning the lines to service. SFPUC staff must conduct an entire line patrol to ensure the line is intact before re-energizing. SFPUC field personnel will conduct the line patrols via helicopter, vehicle, or foot, depending on weather conditions and access to facilities. Priority for patrols and restoration will be given to the transmission system first, followed by the distribution system, or as determined by SFPUC Operations.

The SFPUC maintains a contract task order with a helicopter service and can call on them to conduct aerial patrols. Using a helicopter for patrols significantly reduces the time required to complete an entire patrol, provided weather conditions have improved enough for safe flight operations. Following a wildfire, the SFPUC will restore service when it is safe for staff to access the damaged areas. The SFPUC will not access burn areas until the AHJ (i.e., CAL FIRE, USFS, local fire agency.) grants permission to enter the burn area to conduct a damage assessment. Following a full damage assessment, if required, the SFPUC will perform repairs, and restoration will proceed following established priority and restoration procedures.

L. Strategy – Fire Mitigation/Suppression Equipment

The SFPUC Fiscal Year 2020-21 & 2021-22 Adopted Budget included funding to purchase fire mitigation/suppression equipment needing replacement or new equipment where a gap had been identified in the SFPUC fleet. Purchase requisitions have been submitted for the following equipment, one (1) Kubota L6060HSTC 4X4 tractor, one (1) DJI Matrice 300 RTK Combo Plus drone, one (1) LiAIR V70 LiDAR mapping system with LiGeoreference software to be attached to the Matrice 300 RTK drone, and one (1) Ford 550 Altec bucket truck. This equipment will enhance the SFPUC's wildfire mitigation, preparedness, and response capabilities. This equipment is scheduled to be received following this 2022 WMP updated filing.

The HHWP Project area is within California's HFTD. HHWP crews maintain roadways, access paths, fire breaks, and lands to prevent or protect facilities and infrastructure from wildfire. The Kubota L6060HSTC enclosed cab tractor will be used to clear debris and create fire breaks near SFPUC facilities. It will replace a 1995 tractor which has reached its functional life and requires replacement. The enclosed cab is safer and healthier for operators, reducing exposure to diesel

PHOTO 2 KUBOTA L6060HSTC TRACTOR

The DJI Matrice 300 RTK Combo Plus drone will be used for visual inspections, mapping, land surveying, and emergency response assessments. Sensors include a hi-resolution camera. All drone flights will align with SFPUC Drone Policy approved use cases and be routed to SFPUC Emergency Planning for upload into the open data portal 24 hours prior to flight, per CCSF and SFPUC Drone Policy

PHOTO 3 DJI MATRICE 300RTK DRONE

A LiAIR V70 LiDAR mapping system with LiGeoreference software will attach to the DJI Matrice 300 RTK drone for survey and mapping, verification of vegetation clearance around electrical assets, equipment inspections in inaccessible areas, and aerial imagery of SFPUC owned lands.

PHOTO 4 LIAIR V70 LIDAR MAPPING SYSTEM

The procurement of a Lift Truck will ensure that HHWP crews can safely perform maintenance activities along the Right of Way, including power distribution line maintenance, power line equipment replacement, and vegetation management. This equipment will help maintain regulatory compliance and to

PHOTO 5 LIFT TRUCK

6. EVALUATING THE PLAN

A. Metrics and Evaluation

The SFPUC continues to track the following primary transmission and distribution system metrics to measure the performance and effectiveness of their WMP in reducing the risk that SFPUC facilities could be the origin or contributing source for the ignition of a catastrophic wildfire. The SFPUC updated the 2021 metrics to include wire down in the HFTD and non-HFTD areas. The 2021 metrics are provided below in Table 6, followed by our evaluation of the events.

Table 6: 2019 - 2021 Metrics

Metric	Metric Description	2019	2020	2021
1	Reportable ignitions[26] in the HFTD associated with SFPUC electric facilities	0	1	1
2	Vegetation inspections were completed in an HFTD (Through a combination of aerial and ground inspections).	Completed	Completed	Completed
3	Transmission Line Inspections – aerial	Completed	Completed	Completed
4	Distribution Line Inspections – aerial	Completed	Completed	Completed
5	Number of times a circuit or circuit segment is de-energized within the HFTD	1	4	7
6	Wire down in HFTD	1[27]	2	1
7	Wire down outside HFTD	0	0	0

As illustrated in Table 6, there was one reportable ignition in the Tier 2 HFTD (Metric 1) and one wire-down event in the Tier 2 HFTD (Metric 6). The wire down event caused the reportable ignition, which is described below:

In 2021, a reportable ignition occurred in a Tier 2 HFTD caused by a downed wire. This ignition resulted in a fire named the Abernathy Fire. Based on lessons learned from this event, the SFPUC staff have re-evaluated weather monitoring protocols and updated them to remove “fire season” as a monitoring metric. Instead, fire risk levels and wind conditions are monitored year-round to evaluate de-energization triggers. The Abernathy Fire is described below:

[26] Fire ignition is defined as follows: 1) An SFPUC facility was associated with the fire; 2) The fire was self-propagating and of a material other than electrical and/or communication facilities; 3) The resulting fire traveled greater than one linear meter from the ignition point; or 4) SFPUC has knowledge that the fire occurred.
[27] Line was de-energized for construction at a SFPUC substation at time of incident (February 2019).

Abernathy Fire[28] - Mather, CA: On January 19, 2021, there was a significant wind event with recorded gusts of 53 mph through the Sierra Nevada mountain range. A Red Flag Warning was not in effect for this region during this event. The severe wind gusts caused the failure of a codominant stem on a mature ponderosa pine to contact the 22kV KP-OS distribution line, causing the conductors to fail. The failed conductors contacted dry grass and timber litter on the ground, which resulted in a fire that spread to a total of 347 acres. The failed tree complied with SFPUC vegetation management standards. The fire was in an uninhabited area of Tuolumne County and did not pose an immediate threat to structures and human life. The fire was suppressed by USFS fire crews. When it was safe to do so, SFPUC crews began an inspection of the right of way within the fire scar. Crews found an additional 23 trees that were damaged by a combination of the fire and the wind event. Those 23 trees have been removed. Following the event, the SFPUC evaluated its weather monitoring system and determined that although the system does monitor for wind speeds and fire weather, it does not consider fuel moisture levels.

B. Impact of Metrics on Plan

The SFPUC continues to track metrics to measure the performance of this WMP to reduce the risk that SFPUC facilities will not be the origin or contributing source of a catastrophic wildfire. The SFPUC will continue to evaluate its system performance and identify additional metrics to measure the fire risk reduction gained year after year.

Due to favorable system reliability and a low number of initiating events (failures) on the SFPUC system, the SFPUC still has limited data to draw meaningful conclusions regarding outage and equipment failure trends. Over time, as more data is collected, the SFPUC will identify areas of its operations that could be more at risk and inform the SFPUC of potential improvements to its plan. However, the SFPUC currently monitors initiating events at other utilities to determine the root cause and put measures in place to minimize the risk of similar events occurring throughout the SFPUC grid.

C. Monitoring and Auditing the Plan

The SFPUC staff continuously monitors projects and metrics outlined in this WMP to identify areas of improvement in their continuous goal to reduce the risk that SFPUC facilities will not be the origin or contributing source of a catastrophic wildfire. Execution of hardening projects, proactive inspection programs, preventative maintenance programs, and data collected will inform the SFPUC staff of system improvements and areas that need additional attention. The SFPUC staff are committed to operating a safe and reliable power grid while reducing the risk that the SFPUC facilities could be the source of ignition for a catastrophic wildfire.

[28] Since this event occurred in early 2021, it is not included in Table 6: 2020 Metrics and Evaluation. It will be included in the 2022 Metrics and Evaluation Table. SFPUC included a description of the event in this update to explain how the event steered evaluation of operations procedures.

The SFPUC staff will review and update this Plan annually. The Plan will be submitted to the SFPUC (Commission) for final approval and then submitted to the WSAB on or before July 1 of each year. Additionally, a qualified Independent Evaluator (IE) will be contracted to review and issue a report on this Plan to the SFPUC Commission and the WSAB every three years. The next scheduled comprehensive review, which includes the report by the IE, will be in 2023.

D. Identifying and Correcting Deficiencies in the Plan

The SFPUC is committed to making this Plan effective and robust. The SFPUC is also aware that identifying gaps and deficiencies in the Plan is a continuous process, learned through experience and monitoring industry best practices. Once identified, the SPFUC will correct any gaps or deficiencies in a timely manner.

Since 2020, the SFPUC has made several changes to the Plan due to new policies, strategies, changes in technology, or identifying previously unknown risks. As gaps in this Plan are identified, the SFPUC will initiate corrective measures to address any known deficiencies and report them within the annual WMP update. Changes will be incorporated into the Plan and submitted to the SFPUC Commission for review and consideration as a part of the yearly review.

E. Monitoring the Effectiveness of the Plan

The SFPUC strives for continuous improvement to reduce the risk of the SFPUC facilities being the origin or contributing source of a catastrophic wildfire. The SFPUC will continuously monitor and evaluate the wildfire mitigation efforts described in this WMP and pursue improvements in their ongoing goal of providing safe and reliable water and power to the region.

7. INDEPENDENT EVALUATOR

PUC § 8387(c) requires the SFPUC to contract with a qualified IE with experience in assessing the safe operation of electrical infrastructure to review and evaluate the comprehensiveness of this WMP. The IE will review the SFPUC's WMP and must write and issue a report on the comprehensiveness of the Plan. An overview of the IE report will be presented to the SFPUC Commission at a public meeting and before the final approval of the Plan. The Commission-approved Plan and the IE report (every third year) will be submitted to the WSAB and posted on the SFPUC's website. In 2020, the SFPUC contracted an IE, a former California Investor-Owned Utility executive with extensive experience in developing wildfire mitigation plans, to evaluate and write a report on its WMP.

The IE presented the information to the SFPUC Commission on June 9, 2020, and SFPUC posted this report on its website. The SFPUC reviewed and incorporated the IE's recommendations into its 2020 WMP to improve the outcomes of its overall wildfire mitigation programs and initiatives.

During the Plan update, to be completed in 2023, the SFPUC will engage an IE to evaluate the Plan and provide a report to the SFPUC Commission. SFPUC staff will submit the Plan to the WSAB and post the Plan and IE report on the SFPUC website and make it accessible to the public.

Appendix A – Table of Updates

This table identifies where the SFPUC made updates to its WMP. In the WSAB 2022 Guidance Advisory Opinion review of the 2021 SFPUC WMP, WSAB expressed interest in reviewing SFPUC's updates.

WSAB Comment	2022 SFPUC WMP Plan Section
The Board appreciates the exemplary job that SFPUC's 2021 WMP does of describing wildfire prevention plans and strategies, including vegetation management practices, inspection protocols, and situational awareness and system hardening status and projects. The Board looks forward to learning of progress made on a variety of projects in the 2022 WMP, as promised in the 2021 WMP.	B. SFPUC Commission Approval of the WMP and Wildfire Mitigation Budget A.1 Annual Vegetation Management Work Plan A.6 115kV Vegetation Inspection Cycle A.7 Distribution Vegetation Inspection Cycle A.8 Supplemental Vegetation Management Projects C.1 Cameras C.3 Technosylva Wildfire Tactical Analyst E.1 Replacement of CAL FIRE Non-Exempt Equipment E.2 Replace Copper Conductor E.3 Overhead to Underground Conversion E.4 Overhead Line Removal G.1 SFPUC Relationship with PG&E L. Strategy – Fire Mitigation/Suppression Equipment

WSAB Comment	2022 SFPUC WMP Plan Section
The Board appreciates SFPUC's description of wildfire risk factors in their service territory and around their assets outside the service territory. The 2021 WMP promises an update in 2022, and the Board looks forward to additional information and detail in this area.	A. Metrics and Evaluation B. Assessment of SFPUC's High Fire Threat District C. Particular Risks and Risk Drivers Associated with Topographical and Climatological Risk Factors D. Particular Risks and Risk Drivers Associated with Operational Risk Factors