



Hetch Hetchy
Regional Water System

Services of the San Francisco Public Utilities Commission

2021

**SAN FRANCISCO PUBLIC
UTILITIES COMMISSION
WILDFIRE MITIGATION
PLAN**

Version 3.0

(1/1/2020 – 12/31/2020)

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ACRONYMS

BLM	Bureau of Land Management
CAL FIRE	California Department of Forestry and Fire Protection
CCSF	City and County of San Francisco
Commission	SFPUC Commission
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 the Hetch Hetchy Water and Power 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.
HHZ	High Hazard Zone
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

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
NWS	National Weather Service
PG&E	Pacific Gas & Electric
PIO	Public Information Officer
Plan	Wildfire Mitigation Plan
RFW	Red Flag Warning
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	US Forest Service
WMP	Wildfire Mitigation Plan
WS&T	Water Supply & Treatment

1. 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 and destruction or damage to personal property. In 2020, the California Department of Forestry and Fire Protection (CAL FIRE) reported a combined total of 9,917 fires that burned 4,257,863 acres¹. A number of these fires, including the 2020 Moc Fire (Tuolumne County), and the SCU Lightning Complex Fire (Santa Clara, Alameda, Contra Costa, San Joaquin, and Stanislaus counties) threatened San Francisco Public Utilities Commission (SFPUC) electrical infrastructure and required inspections prior to returning the facilities to service. The Moc Fire and the SCU Complex Fire were included in the Presidential Disaster Proclamation (FEMA-4558-DR-CA). The fires required significant staff support to document and capture emergency response and emergency protective measure costs for FEMA reimbursement. The effects of climate change, such as hotter temperatures, more intense winds, and drier fuels/vegetation continue to be some of the contributing factors that fuel these fast moving and destructive fires. Though there are many different sources of ignition 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 prepare a wildfire mitigation plan annually and 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.”

¹ <https://www.fire.ca.gov/stats-events/>

The SFPUC hereby submits its updated 2021 Wildfire Mitigation Plan (WMP or Plan), to the Wildfire Safety Advisory Board (WSAB), as required by PUC § 8387. This WMP provides updates and/or revisions to the numerous programs that SFPUC has in place to construct, maintain and operate their electrical facilities in order to minimize the risk that their equipment could be the origin or contributing source for a catastrophic wildfire. This Plan is subject to approval by the SFPUC Commission and is implemented by the SFPUC's Assistant General Manager of Water.

This plan meets or exceeds the requirements of PUC § 8387 for publicly owned electric utilities (POUs). As required, the SFPUC made its draft WMP available for public review and comment and presented its 2021 WMP update to the SFPUC Commission in a public meeting on June 8, 2021. The presentation was concluded by the Commission adopting a resolution (Resolution No. 21-0094) to accept the SFPUC 2021 WMP and authorize the Assistant General Manager of the Water Enterprise to submit the Plan to the WSAB on or before July 1, 2021. Additionally, pursuant to PUC § 8387(b)(1), the Plan requires a comprehensive revision with a review by an Independent Evaluator (IE) every three years. The SFPUC had their initial WMP reviewed by an IE in 2020 and is planning the next comprehensive revision to their WMP in 2023 along with the next IE evaluation.

The specific elements of PUC § 8387 are listed in Table 1 with the corresponding WMP sections listed and are linked to where the SFPUC describes their 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)(G)	Appropriate and feasible procedures for notifying a customer who may be impacted by the deenergizing 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 deenergization 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

PUC 8387 Code	Compliance Requirements and Corresponding Plan Sections	Plan Section
(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 with 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

B. SFPUC Profile

The San Francisco Public Utilities Commission (SFPUC), a department of the City and County of San Francisco (CCSF) provides retail drinking water & wastewater services to the City of San Francisco, wholesale water to three Bay Area counties, CCSF Municipal Load², and power to the residents & businesses of San Francisco through the CleanPowerSF³ (Community Choice Aggregation) program.

The SFPUC's mission is to provide its customers with high quality, efficient and reliable water, power, and sewer services in a manner that is inclusive of environmental and community interests, and that sustains the resources entrusted to their care⁴.

SFPUC business functions are supported by six enterprises, including the Water Enterprise. The Water Enterprise is responsible for developing, executing, and oversight of this Wildfire Mitigation Plan. The Water Enterprise is comprised of six divisions, including Hetch Hetchy Water (HHW), Water Supply & Treatment (WS&T), and Natural Resources and Lands Management (NRLM) (see Figure 2), which manage the assets described in this Plan.

² Powering municipal services and infrastructure such as MUNI and San Francisco General Hospital.

³ <https://www.cleanpowersf.org/>

⁴ <https://www.sfpuc.org/about-us/who-we-are/our-mission>

Hetch Hetchy Water is responsible for managing, operating, and maintaining the Hetch Hetchy Water and Power (HHWP) Project. The HHWP Project is comprised of assets including water storage and conveyance systems, power generation facilities, power transmission and distribution systems, roads, bridges, and other ancillary facilities. These assets start at the Hetch Hetchy Reservoir located in Yosemite National Park and span all the way to the communities of Sunol and Newark in Alameda County, including the counties of Tuolumne, Mariposa, Stanislaus, San Joaquin, and San Mateo. These facilities traverse from the Sierra Nevada Mountains, which has densely forested areas at higher elevations, to flat dry irrigated lands in the San Joaquin Valley, and west into the Southern Coast Mountain range, consisting mainly of conifer forest with some shrub and urban land. The HHWP Project produces hydroelectric generation and transmits the power over SFPUC transmission lines and to the California electric grid. WS&T and NRLM are responsible for managing, operating, and maintaining distribution lines that serve SFPUC water treatment plants and facilities within our watersheds.

The SFPUC owns, maintains, and operates 162.5 miles of transmission lines comprised of both 230 and 115 kV, and distributes electricity at 22 and 2.4 kV through 57.8 miles of overhead distribution lines (see Figure 1). The transmission facilities are within Pacific Gas & Electric's (PG&E) and Modesto Irrigation District's (MID) service territory. The distribution facilities are within PG&E's service territory, where PG&E operates the distribution system.

The SFPUC transmission facilities are designed to carry energy from SFPUC-owned hydroelectric plants to the grid. Power is scheduled into the California Independent System Operator (CAISO) market by a SFPUC power scheduler. The SFPUC distribution facilities are designed to take energy from either SFPUC-owned transmission, or from the PG&E grid, to power SFPUC Water Enterprise operations. There are 46.4 miles of SFPUC's transmission facilities, and 47.1 miles of the distribution facilities are located within the CPUC designated HFTD Tier 2, Tier 3, or Tier 1 High Hazard Zone (HHZ). In 2020, the SFPUC completed a more comprehensive analysis of GIS data, which resulted in an update to the line miles in the HFTD's, from what was reported in the 2020 WMP. The HFTD is comprised of a Tier 1, HHZ, and two high fire-threat areas where there is an increased risk for utility associated wildfires. The three areas are:

Table 2: Definition of HFTD Zones and 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
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:	5
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
Non-HFTD	Facilities outside of CPUC HFTD	Transmission Lines	116.1 miles
		Distribution	10.7 miles
		Substations	0

C. Organization of the Wildfire Mitigation Plan

This SFPUC Plan 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 for 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.

2. OBJECTIVES OF THE WILDFIRE MITIGATION PLAN

This Plan is built upon the following three principles:

A. Minimizing Sources of Ignition

The primary objective of this Plan is to minimize the probability that the SFPUC's electrical facilities may be the origin or contributing source for the ignition of a catastrophic wildfire. The SFPUC continues to evaluate prudent and cost-effective improvements to its physical assets, operations, and training to meet this objective. The SFPUC will continue to implement additional recommendations over time through a process of reevaluation and continuous improvement.

B. Resiliency of the Electric Grid

The second objective of this Plan is to improve the reliability and resiliency of SFPUC owned and operated electric grid. The SFPUC will continue to assess industry best practices and technologies that could reduce the likelihood of a disruption in service due to planned or unplanned events, and expedite grid recovery efforts following a major event, such as a fire.

C. Measure Plan Effectiveness and Performance

The final objective is to measure the effectiveness and performance of the SFPUC's specific wildfire mitigation strategies described in this Plan. The SFPUC will monitor the performance of their Plan and make improvements as necessary to improve safety, reliability, and resiliency of their system. The Plan will also help determine if more cost-effective measures would produce the same or better results.

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 responsible for carrying out the various activities described in the Plan.

- The SFPUC has responsibility for approving this WMP.
- The SFPUC Assistant General Manager of Water has overall accountability for the development and implementation of the WMP.

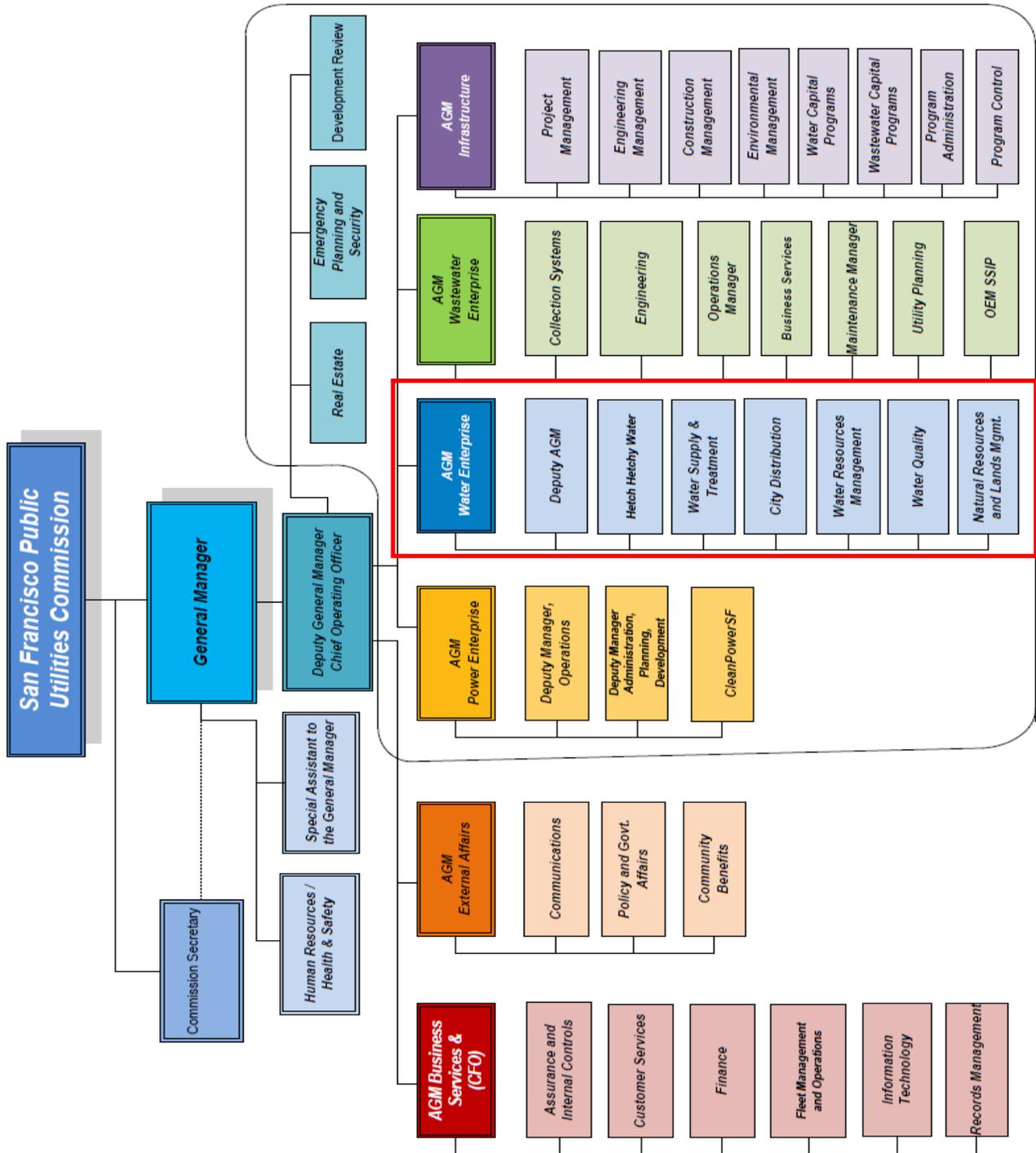


Figure 2 - SFPUC Organizational Structure

Table 3: 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	WS&T Division: Distribution Facilities Located in Alameda and San Mateo Counties
Vegetation Management	HHW Operations and Maintenance Manager	NRLM Manager
Recloser Policy and De-energization	HHW Operations and Maintenance Manager	HHW Operations and Maintenance Manager
Transmission Line Vegetation Clearance Inspections	HHW Right of Way Manager; and Vegetation Manager	N/A
Transmission Line Maintenance	HHW Power Generation & Transmission Manager	N/A
Distribution Line Operations and Maintenance Inspections	HHW Power Generation & Transmission Manager	WS&T Distribution and Maintenance Section Manager
Distribution Line Vegetation Clearance Inspections	HHW Right of Way Manager; and Vegetation Manager	NRLM and Peninsula Area Manager
Substation Inspections	HHW Power Generation & Transmission Manager	WS&T Distribution and Maintenance Section Manager
Plan Review	HHW Division Manager; CCSF City Attorney’s Office; and SFPUC Assistant General Manager of Water	NRLM Division Manager, WS&T 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

Operation of its overhead electrical lines in a safe and reliable manner is a primary goal for the SFPUC. 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 notify the Moccasin Control Center (HHW), or Millbrae Dispatch (Counties of Alameda and San Mateo);
- Take corrective action when observing, or having been notified that fire protection measures have not been properly installed or maintained;
- Ensure compliance with relevant federal, state, local, regulatory, and industry standard requirements;
- Ensure that wildfire data are appropriately collected; and
- Maintain 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) or other power system emergencies, including deenergizing of transmission or distribution lines for safety. Typically, incidents or emergencies involving SFPUC facilities can be managed by on shift staff in their control center with notification to SFPUC management. If the SFPUC de-energizes line(s) for safety, they evaluate the impacts and the anticipated time period to establish the level of organizational response. The SFPUC may activate ICS in response to critical fire weather events when deenergizing electrical facilities is determined to be a fire risk mitigation strategy but will not request the Tuolumne County Emergency Operations Center (EOC) be activated.

For County wide emergencies the CCSF has adopted the concept of Emergency Support Functions (ESF) from the Federal National Response Framework (NRF). ESFs represent function-specific groupings of activities needed during local emergency response. Under this framework for the CCSF, the SFPUC represents the Coordinating Department for the following: “Water and Utilities” (ESF #12). In addition, SFPUC is the supporting department for “Public Works and Engineering” (ESF #3), “Emergency Management” (ESF #5), and “Mass Care, Emergency Assistance, Housing and Human Services” (ESF #6).

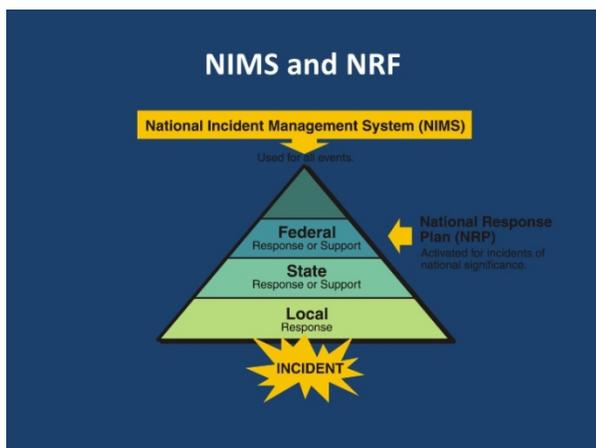


Figure 3 - NIMS and NRF⁵



Figure 4 – Effective Emergency Management⁶

C. SFPUC Incident Command System

The SFPUC is Standardized Emergency Management System (SEMS) and National Incident Management System (NIMS) compliant and utilizes the Incident Command System (ICS) to respond to emergencies. In accordance with these requirements, the SFPUC has established a multi-tiered emergency organizational structure that utilizes the five following emergency response functions, activated as necessary:

⁵ “National Response Framework.” LinkedIn SlideShare, 30 Mar. 2010, www.slideshare.net/bkoch/national-response-framework.

⁶ “National Response Framework.” LinkedIn SlideShare, 30 Mar. 2010, www.slideshare.net/bkoch/national-response-framework.

- **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.

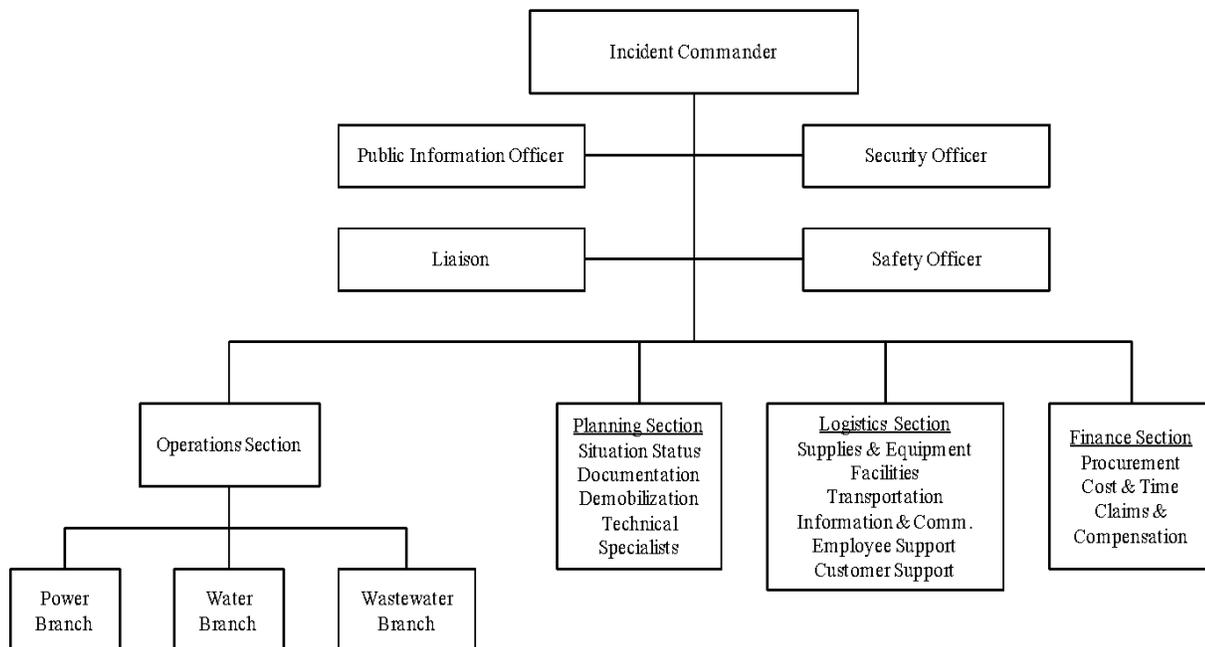


Figure 5 - SFPUC ICS Structure

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 UC concept may be used whenever multiple jurisdictions are involved in a response effort and at any level of the response.

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 them of potential safety and reliability risks to the power grid. The SFPUC meets or exceeds local, state, federal, regulatory, and industry standards applicable to construction, inspection, and maintenance of the electric transmission and distribution systems. Staff will analyze service interruptions and/or 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 may be 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. These processes are described in more detail in sections 5.I and 5.J. The SFPUC continues to monitor industry best practices and emerging technologies and will evaluate and/or implement programs that support their continuous efforts to improve safety and reliability of the SFPUC power grid. The wildfires of 2020, coupled with the COVID-19 pandemic, put a significant strain on SFPUC resources which resulted in the delay of executing some of the listed wildfire mitigation initiatives, as described below.

B. Assessment of SFPUC's High Fire Threat District

The SFPUC staff relied on 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 near SFPUC electrical facilities. The SFPUC will continue to monitor and evaluate risk factors near their facilities and, if required, recommend to the CPUC if revisions should be considered for 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 can be attributed to:

- Extended drought;
- 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 lightning conditions; and
- Tree mortality.

The SFPUC regularly consults with local weather and fire AHJ for fire response to evaluate fire and weather conditions within the area where SFPUC overhead electrical lines are located.

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

The SFPUC continues to document incident information; however, the SFPUC still has limited data available 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 supporting their risk reduction efforts. Additionally, the SFPUC closely monitors wildfire activity in California with interest in the identified ignition source of the incident. When a known incident occurs involving electrical facilities, the SFPUC staff will evaluate the incident and make an assessment if they could experience a similar incident based on the root cause found. Although the SFPUC has identified

several programs to minimize their fire risk exposure, they have identified the following two priority areas of focus:

1. Contact from objects

- Vegetation contact

2. Equipment / facility failure

- Replace non-exempt equipment on 4292 poles with exempt equipment. (See Sec. 5.E.);
and
- Wire down.

To address contact from objects, the SFPUC staff created a 115 kV and Power Distribution Vegetation Management Plan to be consistent with their 230 kV Transmission Vegetation Management Plan. Both are discussed in more detail in Section 5.A.

To address equipment / facility failure the SFPUC was able to complete a load study and developed a project schedule to replace at-risk equipment. The project is scheduled to begin in January of 2023. Until the equipment has been replaced, the SFPUC will continue to employ mitigation strategies (including increasing vegetation clearance as described in Section 5.E below). The SFPUC will provide an update in the 2022 WMP.

5. WILDFIRE PREVENTATION STRATEGIES AND PROGRAMS

The SFPUC meets or exceeds local, state, federal, regulatory, and industry standards applicable to construction, maintenance, and inspections of the electric transmission, distribution, and substation facilities. The following programs have been identified to reduce the risk that their facilities could be the origin or contributing source for a catastrophic wildfire.

A. Program – Vegetation Management

The SFPUC meets or exceeds the minimum industry standard vegetation management practices for power utilities. For applicable transmission-level facilities, the SFPUC complies with the North American Electric Reliability Corporation (NERC) Standard FAC-003-4, and the Hetch Hetchy Water and Power Transmission Vegetation Management Program (TVMP Revision 5.2). For both transmission and distribution level facilities, SFPUC is compliant with:

- CA Public Resources Code (PRC) §§ 4292 and 4293;
- CPUC GO 95, Rule 35 (Table 6a);
- CPUC GO 95, Appendix E Guidelines to Rule 35 (Table 6b); and
- CAL FIRE Power Line Fire Prevention Field Guide.

These standards significantly increase 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, but instead provide useful 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 vegetation management with two groups: 1) the HHW group, which inspects and maintains vegetation on all SFPUC transmission, and distribution systems from the Central Valley to the east, up to O’Shaughnessy Dam; and 2) the NRLM/WS&T group, which inspects and maintains vegetation on the distribution system around the Bay Area facilities. The HHW group is comprised of a right of way (ROW) Vegetation Management labor crew made up of one laborer supervisor, one operating engineer, two arborists, and five laborers.

Inspections are completed by a registered professional forester and an arborist who is an International Society of Arboriculture (ISA) Certified Arborist, ISA Certified Utility Arborist, and ISA Tree Risk Assessment Qualified (TRAQ).

The NRLM/WS&T vegetation management crew is comprised of three arborists and 3-5 seasonal watershed workers who are responsible for the Alameda and Peninsula Watershed. The work is supported by two registered professional foresters (one for the Alameda Watershed and one for the Peninsula Watershed).

Currently, LiDAR surveys are performed on a five-year cycle. HHW is evaluating if a more frequent LiDAR survey schedule will provide enhanced information on vegetation growth rates. An update will be provided in the 2022 WMP. From October to November 2020, the SFPUC contracted with NV5 Geospatial, Inc. to collect, process, and analyze 48.24 miles of LiDAR, and orthoimage for select distribution and transmission lines in the SFPUC. The LiDAR data are being used to classify transmission and distribution line features, vegetation, ground features, and non-vegetation features within a 300-foot right of way. The data from the flights are currently being analyzed. The SFPUC will use these data to assign priorities for vegetation removal based on grow-in and fall-in distances and will provide an update in the 2022 WMP.

The SFPUC applied for a 2020 CAL FIRE Fire Prevention Grant for a fuel's reduction fire break project in Moccasin, which is located within the Tier 2 HFTD. The project consisted of removing overgrown vegetation on approximately 56.5 acres. The project was identified as a need based upon coordination with local CAL FIRE representatives and input from the South West Interface Team (SWIFT) (described in section 5.G). Although the SFPUC grant application was not awarded funding, the SFPUC moved forward with the project using internal HHW crews, and it was completed in late March 2020. The SFPUC intends to submit an application for the CAL FIRE Fire Prevention 2021 grant cycle; projects are currently being developed.

The SFPUC views the fuel break project as a success. It played an important role in protecting SFPUC infrastructure from sustaining major damage in the 2020 Moc Fire, which started in August 2020 and burned for 10 days totaling 2,874 acres. The Moc Fire was included in a Presidential Disaster Proclamation, which included the SCU Lightning Complex Fire. While these fires caused

minimal damage to the SFPUC infrastructure, the Moc Fire caused some erosion concerns in the Priest Reservoir area, and the SCU Lightning Complex Fire burned SFPUC lands and destroyed fencing that separated SFPUC lands from private property. The SFPUC has preventative maintenance work orders scheduled for maintaining the fuel break to prevent re-growth of vegetation.

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

- **230 kV/115 kV Transmission Lines**

All 230 kV and 115 kV transmission lines are inspected by ground, annually. The lines are also patrolled aerially on an annual basis. The aerial patrol includes staff from the line crew and the forester. The inspections serve dual purposes: 1) to allow the line crew to inspect the transmission lines and equipment for any corrective maintenance that may be required; and 2) to allow the ROW vegetation management staff to aerially inspect for vegetation that may need corrective maintenance work orders. In 2020, SFPUC updated the HHW 115 kV Transmission Vegetation Management Plan (115 kV TVMP) to further mitigate the potential for SFPUC equipment causing a wildfire and compliment the SFPUC 230 kV Transmission Vegetation Management Program (230 kV TVMP). This TVMP update provides detailed program objectives with clearly assigns roles and responsibilities for HHW staff.

The 115 kV TVMP further establishes the protocols of the Annual Vegetation Work Plan (AWP). The AWP is created by the HHW ROW Manager and identifies the facilities to be managed, and any proposed work forecasted, with start and completion dates. When work is identified, a work order is created and assigned to the appropriate crew. The SFPUC uses Maximo to assign work orders. Maximo is a computerized maintenance management system (CMMS) that is used to scheduled and track work orders.

The SFPUC has a Right of Way Integrated Vegetation Management (IVM) Policy⁷ that applies to the entire SFPUC 230/115 kV transmission ROW and Distribution ROW. The

⁷ https://www.sfpuc.org/sites/default/files/construction-and-contracts/ROW-IntegratedVegetationMgmtPolicy_2015.pdf

IVM is considered the best management practice (BMP) within the utility industry and is endorsed by federal and state land management agencies.

The 115 kV transmission system will be inspected by ground, annually for vegetation clearances. Inspection details including the name of the inspector and date and line section are documented using Maximo and noted on the HHW Vegetation Management AWP.

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.

Herbicide treatments for the 230 kV ROW follow SFPUC Right of Way Integrated Vegetation Management Policy which is supported by the San Francisco Planning Department's Preliminary Mitigated Negative Declaration for Rights of Way⁸ in Stanislaus, Mariposa, and Tuolumne counties – where the 230 kV ROW intersects with these 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 Ordinance⁹ (Chapter 3 of the San Francisco Environment Code).

As noted in Table 4 (below), sixteen corrective maintenance work orders were issued in 2020 and all have been completed. The most common issues identified in the 2020 work orders were the removal of orchard trees from the transmission right of way. This has been an identified issue and the HHW ROW group has been working to increase communication and permitting requirements for orchard owners near the transmission ROW.

A goal for the 2022 WMP is to sectionalize the 230 kV, 115 kV, and distribution lines into Tier 2 and 3 HFTD's to be able to report corrective maintenance work orders on a more granular level to help determine where recurring issues are taking place. This will help further develop target areas for increased communication to orchard owners and ensure that appropriate permitting has been received.

⁸ https://sfmea.sfplanning.org/2016-006868ENV_NOA.pdf

⁹ <https://sfenvironment.org/policy/chapter-3-integrated-pest-management-program>

Table 4

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

In the 2020 WMP, the SFPUC set a goal to develop an improved work order tracking process for the distribution vegetation management inspections and ensure that corrective maintenance work orders are submitted and completed within the specified due date. Due to disruptions related to wildfires and COVID-19, the SFPUC was unable to begin working on this until spring of 2021, which delayed completion. An update will be provided in the 2022 Plan update. In 2020, the HHW ROW vegetation management crew expanded its capacity to perform inspections, update plans, and increase communication with local landowners along the ROW with the addition of an arborist and a ROW Permit Liaison.

In spring 2019, SFPUC initiated a Hazard Tree Settlement Sale contract with the USFS for the removal of 387 hazardous trees in the HFTD that are near SFPUC infrastructure. The project has been moving steadily forward and tree removal is scheduled to begin in spring 2021 and will be completed by December 31, 2023.

- **Distribution Lines**

HHW operates and maintains the electric distribution facilities in Tuolumne, Stanislaus, and San Joaquin counties. The WS&T Division operate the distribution lines in Alameda and San Mateo counties supported by the HHW Oakdale line crews who perform the maintenance. NRLM is responsible for distribution line corridor inspections in Alameda and

San Mateo counties and may request additional labor support from WS&T to perform vegetation work. All vegetation patrols in proximity to distribution lines, within the HFTD, meet or exceed the requirements of CPUC GO 165. The HHW distribution lines are patrolled and inspected by ground and aurally on an annual basis. The ground inspections are performed by the HHW forester and/or arborist. The aerial inspections include staff from 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 line corrective maintenance that may be required; and 2) to allow the forester and/or arborist to inspect for vegetation that may need corrective maintenance work.

The NRLM/WS&T certified arborist performs inspections of vegetation in proximity to distribution lines on an annual basis. The arborist submits any corrective maintenance work order prescriptions for the NRLM/WS&T tree crews in the Alameda and Peninsula Watersheds.

In 2020, the SFPUC updated the HHW Power Distribution Vegetation Management Plan (Power DVMP) to further mitigate the potential of SFPUC equipment causing a wildfire. This DVMP update provides detailed program objectives with clearly assigned roles and responsibilities for HHW staff.

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 forecasted, with start and completion dates. When work is identified, a work order is created in Maximo and assigned to the appropriate crew.

Vegetation clearance inspections in proximity to SFPUC distribution lines, are inspected by ground, annually by the forester and/or certified arborist. Inspection details including the name of the inspector and date and line section are documented using Maximo and noted on the HHW Vegetation Management AWP. Additional corrective maintenance observed during daily work by the Line Crew, Vegetation Management Crew, and Watershed Keepers are submitted to Asset Management for a corrective maintenance work order.

As noted in Table 5 (below), 43 corrective maintenance work orders were issued and 21 have been completed. The remaining 22 work orders pending completion were identified later in the year and are on track to be completed within the required timeframes. The most common corrective maintenance along the distribution lines were tree trimming and removals to ensure compliance with GO 95 Rule 35.

Table 5

Year	Vegetation Corrective Work Orders for Distribution	
	Number of Work Orders	Total Completed
2019	45	45
2020	43	21
2021		
2022		

Table 6a:

GO 95, RULE 35				
Case No.	Type of Clearance	Trolley Contact, Feeder and Span Wires, 0-5 kV	Supply Conductors and Supply Cables, 750-22,500 Volts	Supply Conductors and Supply Cables, 22.5 – 300 kV
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

Table 6b:

GO 95 APPENDIX E GUIDELINES TO RULE 35		
<p>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.</p>		
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

B. Program – Facility Inspections

The SFPUC performs the following inspections and maintenance of transmission, distribution, and substation facilities in accordance with applicable industry standards. Work orders for detailed inspections and corrective work are managed through Maximo.

- **Transmission System**

The SFPUC owns and maintains a total of 834 transmission structures. Detailed ground inspections are performed on a five-year cycle. As noted in Table 7 (below), a total of 180 inspections were scheduled and completed in 2020. During these inspections, 28 corrective maintenance work orders were generated during inspections and all have been completed. The most common corrective maintenance work orders for the transmission system were replacing clevis insulators and replacing worn tower steel (see pictures below for reference).

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. The HHW Line Crew is currently locating and documenting all splices and bolted connections on the transmission lines. When the audit is completed, an infrared inspection schedule will commence, and an update will be provided in the 2022 WMP.

In 2019, the SFPUC completed 105 of the 214 corrective maintenance work orders generated during transmission tower inspections. Currently, there are 88 work orders still in progress to be completed. An update on these remaining work orders will be provided in the 2022 WMP.

Table 7

Transmission Tower Inspection		
Year	Ground Inspections Scheduled/ Completed	Corrective Maintenance Work Orders/Completed
2019	258/258	214/105
2020	180/180	28/28
2021		
2022		
Total	438 (out of 834)	



Clevis insulator



Transmission tower steel

- **Distribution System**

The SFPUC owns, operates, and maintains a system total of 1,744 distribution poles and meets or exceeds CPUC GO 165 which establishes minimum requirements for electrical distribution facilities regarding inspections (patrols and detailed), condition ratings, schedule, performance of corrective actions, and record keeping and reporting to ensure safe and high-quality electrical service. The distribution lines are patrolled aerially on an annual basis by the line crew (Qualified Electrical Worker – QEW). Additionally, the SFPUC has four total miles of underground distribution line all located in the Tier 2 HFTD.

Corrective maintenance work orders are created during the inspection and assigned a priority. As noted in Table 8 (below), a total of 37 corrective maintenance work orders were generated through inspections and 35 were completed. The remaining work orders were issued in late December of 2020 and were completed in April 2021. The SFPUC has inventoried all its 1,744 distribution poles in Maximo.

SFPUC is considering a pilot program to evaluate the feasibility and cost effectiveness of using drones to conduct transmission and distribution line patrols. SFPUC will provide a program update in the 2022 WMP.

Table 8

Year	Corrective Work Orders for Distribution System	
	Number of Work Orders	Total Completed
2019	4	4
2020	37	34
2021		
2022		

- **Substations/Switchyards**

The SFPUC owns, operates, and maintains five substations/switchyards; four managed by HHW and one by WS&T. All five substations/switchyards are within the HFTD. HHW meets or exceeds the requirements of CPUC GO 174 inspections on the HHW substations/switchyards. HHW is working with WS&T to develop a program to meet these requirements at their substation. In addition, HHW performs infrared inspections at their substations/switchyards twice a year.

C. Program – Situational Awareness

- **Cameras**

To improve the SFPUC’s situational awareness and increase visibility of their overhead electrical facilities, SFPUC partnered with PG&E and Conifer Communications to install two cameras on SFPUC towers that are located within the HFTD. PG&E purchased the cameras and Conifer provides the telecommunication for viewing on the ALERTWildfire¹⁰ website. There are additional PG&E cameras in proximity to SFPUC assets. In summer 2020, SFPUC began working on permits to install additional cameras near SFPUC assets. The locations will include Poopenaut Ridge, near the O’Shaughnessy Dam site in Yosemite National Park; Burnout Ridge near Cherry Lake, and Intake Hill near Kirkwood Powerhouse. All these areas are in Tier 2 or 3 HFTDs and were identified as areas where increased monitoring of our overhead lines would increase situational awareness.



Figure 6 - ALERTWildfire Cameras¹¹

- **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 has 6 additional weather stations with wind speed sensors that are strategically located and used for forecast validation and real-time weather condition

¹⁰ <http://www.alertwildfire.org/sierra/index.html?camera=Axis-MoccasinPeak&v=7a7f1c3>

¹¹ “SFPUC Service Area Cameras.” ALERTWildfire, www.alertwildfire.org/sierra/?camera=Axis-MoccasinPeak.

monitoring. The SFPUC is evaluating the need for additional weather stations that could be of benefit and will provide a status update in the 2022 WMP.

The SFPUC staff obtains wind speed conditions using forecast models from NOAA's High-Resolution Rapid Refresh (HRRR)¹² which generates 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. Data are reviewed daily and is used to support operational strategies for the SFPUC overhead electrical lines to determine if any operational restrictions should be implemented or lines de-energized for public safety.

The process discussed above for assessing critical fire weather conditions and situational awareness will capture any adverse conditions caused by dynamic climate change risks, allowing the SFPUC's wildfire response to address changing climatological conditions.

D. Program – Operating Conditions

In addition to the SFPUC's various wildfire mitigation programs, utility staff also closely monitor critical fire weather conditions impacting the area where overhead electrical lines are located within the HFTD to inform staff if additional operating restrictions should be implemented. Dry fuel sources, high winds, low relative humidity, and dry lightning conditions can contribute to elevated and extreme fire risk conditions. 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.

¹² <https://rapidrefresh.noaa.gov/hrrr/>

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 to their electrical facilities. Daily assessment of weather conditions is performed and provided to field operations staff and used in operational strategies to reduce the risk of wildfire ignition.¹³ Operating Conditions are classified as Normal (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 included 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 which may result in extreme fire behavior that will occur within 24 hours. RFW days require all non-emergency activities on 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 information for SFPUC facilities in Tuolumne County (High South), which is based on data collected at Mount Elizabeth. 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 operating restrictions.
 - Normal Operating Condition “Permissive wood cutting day.”
 - No operating restrictions apply.
 - Elevated Operating Condition

¹³ It should be noted that restriction activities apply to SFPUC staff as well as SFPUC contractors, and others with access rights to SFPUC fee title watershed lands in Alameda, Santa Clara, and San Mateo counties.

- 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. This county is in a non HFTD.
 - Normal Operating Condition
 - No operating restrictions
 - Elevated Operating Condition
- 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 by NRLM daily and issued to staff performing work in these counties.
 - Normal Condition (no operational restrictions):
 - Average sustained wind < 10 mph
 - Relative humidity > 20%
 - Temperature < 80 F
 - Elevated 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 meet or exceed CPUC GO 95 and other relevant federal, state, regulatory and industry standards. The SFPUC continues to develop a 10-year capital plan that will consider some, or all, of the following to reduce the risk that SFPUC facilities could be the origin or contributing source for a catastrophic wildfire:

- **Replacement of high risk (non-exempt) equipment**

Approximately 15 percent of SFPUC distribution poles, including non-HFTD areas, support non-exempt equipment as defined by PRC § 4292. These poles support electrical equipment that protects distribution lines from damage and allow isolation during outages. Examples of non-exempt equipment, as defined in PRC § 4292 and the CAL FIRE Power Line Fire Prevention Field Guide, are expulsion fuses, inline switches, lightning arrestors, hot tap (hot line) clamps, and split bolt connectors. The SFPUC plans to continue maintaining a firebreak around structures that have non-exempt equipment. This firebreak consists of clearing of 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.

In 2020, the SFPUC inventoried and documented all its 4292 poles that have non-exempt equipment and are in the HFTD. HHW engineering was able to complete a load study and developed a project schedule to replace at-risk equipment. Construction and procurement are tentatively scheduled to begin in January of 2023. The SFPUC will provide a work schedule update in the 2022 Plan.

- **Replace copper conductor**

Though few miles of copper conductor remain, the SFPUC is evaluating the risk of failure and/or replacement of the remaining conductor with aluminum-based wire. The SFPUC had intended on providing an update on this initiative in this 2021 Plan; however, due to other priority projects, COVID-19 impacts, and SFPUC impacts due to 2020 wildfires, this evaluation on replacing copper wire with aluminum wire did not start until spring of 2021. The goal is to assess the total span length and location of remaining copper wire and determine if replacing with aluminum will reduce potential wildfire risks. The SFPUC will provide an update in the 2022 Plan update.

- **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 underground lines, based on the feasibility of undergrounding in that particular area(s).

The SFPUC will evaluate the feasibility and economic benefit of reducing our distribution line footprint, such as adding small hydro generation at remote 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 ensure continuous improvement and help reduce the risk that SFPUC facilities could be the origin or contributing source for ignition of a catastrophic wildfire.

- **Basic Fire Training:** In 2020, the SFPUC staff, including right-of-way crews, electric line crews, and other field staff received basic fire training regarding minimizing potential fire dangers, practicable actions to suppress fires, the importance of reporting fires, and basic fire safety. Crews were also provided training on how to use 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 2020, the annual refresher training for HHW ROW Vegetation Management crew was disrupted due to COVID-19. Training is scheduled to resume in spring of 2021 and will be completed no later than August 31, 2021. The training is currently being reviewed and updated to ensure that it meets all 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 in the SWIFT¹⁴; a partnership including the USFS, CAL FIRE, BLM, Tuolumne County, and private landowners. The SWIFT meets on a monthly basis and since 1999, the SWIFT 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 have been conducted virtually 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 county sheriff officers and local fire departments. The SFPUC watershed lands in these three counties are State Responsibility Areas (SRA) and SFPUC staff are in regular communication with local CAL FIRE staff throughout the calendar year. Due to COVID-19 restrictions, the 2020 meetings were held virtually.

In March 2020, the SFPUC staff toured the Hetch Hetchy Project facilities with a CAL FIRE Captain. This was a follow-up tour from 2019 where CAL FIRE was provided with the Moccasin facilities floor plans and generator shut off procedures.

H. Strategy – Customer Communication

Other than providing service to SFPUC owned and operated facilities the SFPUC provides service to only one retail customer that is served directly from a SFPUC distribution line. This customer, a business facility located in the Stanislaus National Forest, has a backup generator and experiences no impacts when utility power is interrupted. The SFPUC does use de-energization as a fire risk mitigation strategy, but it does not consider this a formal Public Safety Power Shutoff (PSPS)

¹⁴ <https://www.fs.usda.gov/detail/stanislaus/home/?cid=stelprd3810191>

program. The SFPUC collaborates with the stakeholder(s) regarding potential power interruptions, prior to 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.

I. Strategy – Circuit Reclosers

The SFPUC employs manual and automatic reclosers on its transmission and distribution circuits. A recloser could be a line device or relay that is programmed to reclose the line/circuit and attempt to automatically restore service following an interruption. If the circuit is equipped with a recloser and a fault on the line is detected the circuit breaker will open and de-energize the circuit. After a programmed time delay the protective relay is programmed to signal the circuit breaker to “reclose and test” the circuit. If the cause of the fault is still present the breaker will open and stay open; however, if the cause of the fault has cleared, the breaker will remain closed restoring service.

Due to minimal impacts to the SFPUC operations and customers, all automatic reclosers are disabled when the Stanislaus National Forest changes the fire danger condition to the Fire Precautionary Period, set by the State of California which is April 1 through December 1. The SFPUC will not enable the reclosers until the Stanislaus National Forest changes the Fire Precautionary Period, or when fire risk conditions warrant, usually following the onset of fall/winter precipitation and the burn environment is no longer conducive for large wildfires. If a fault is experienced on a line, an aerial and/or ground inspection will be performed before the lines are reenergized. In 2020, the reclosers were disabled by April 24, and remained disabled until November 19, when fuel (vegetation) conditions improved.

J. Strategy – De-energization

To develop the SFPUC's de-energization strategy, HHW staff evaluated the impact of power outages to: 1) water operations; and 2) power customers (internal and external) located within HFT zones. HHW staff must generate power to deliver water from the HHWP Project to the SFPUC water customers. In the event the generators in the powerhouse must be de-energized, the HHWP Project powerhouses have bypass systems to allow the SFPUC water supply to bypass the powerhouse generators during an emergency, such as fire. These bypass facilities were used during the 2013 Rim Fire. In addition, storage in local SFPUC reservoirs is available to meet the SFPUC water demands. The SFPUC maintains three months of storage in local reservoirs in the event deliveries cannot be made via the HHWP Project.

The purpose of the SFPUC's power transmission line system is to deliver generation produced by the HHWP Project to the electric grid. The SFPUC transmission lines also feed one of two SFPUC water treatment plants. In the event the SFPUC had to de-energize the transmission lines that feed this water treatment plant, the portion of the transmission system outside of the HFT zone would still be back fed from the electrical grid (PG&E). The SFPUC also has backup power at both water treatment plants.

The purpose of the power distribution system is to operate the SFPUC facilities, which either have backup power or can be de-energized temporarily and still allow for water delivery. The SFPUC has one retail power customer served from HHW's overhead electrical system which is located within the HFTD. The customer is a lodge with some backup power capability. Because of the minimal risk to power customers (one customer off SFPUC distribution lines in Tier 2 HFTD), the SFPUC's risk methodology is safety before reliability, choosing to disable reclosers and de-energize the system when necessary.

During critical fire weather conditions, it may be desirable to de-energize the SFPUC distribution and/or transmission circuits, within the HFTD, for public safety. HHW can remotely de-energize the transmission and distribution facilities. Circuit(s) could be de-energized if requested by a fire agency (CAL FIRE, USFS, other local fire agency), or if it is determined by the SFPUC staff that there is a significant risk for an uncontrollable fire if an ignition were to occur. Those risks could be

one or a combination of factors, such as, high winds, low relative humidity, low fuel moisture, hot temperatures, etc., or per request of field staff.

WS&T may request HHW staff to de-energize their distribution lines during an RFW, or other critical fire weather conditions. These distribution lines must be manually de-energized. The distribution line feeding Sunol Valley Water Treatment Plant (SVWTP) and adjacent facilities may not be de-energized due to the criticality of the asset.

Due to minimal impacts to the SFPUC operations and customer, de-energization of circuits for safety is a strategy that the SFPUC has elected to use. The HHW Water and Power Planning group provides decision support for de-energization, under the direction of the HHW Water Operations and Maintenance Manager. The SFPUC does not consider this a formal PSPS program; however, the SFPUC does collaborate with the impacted stakeholders regarding potential power interruptions.

The HHW Water and Power Planning group maintains an automated, hourly routine that retrieves two instances of weather forecast and fuel information relating to potential fire risk conditions.

These include:

- 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 than ‘Low’
 - i.e., ‘Moderate’, ‘High’, ‘Very High’, or ‘Extreme’

In 2020, the SFPUC de-energized their distribution lines proactively prior to multiple high winds and critical fire conditions. Outage periods were as follows:

- High Elevation Lines (above 2,500 ft.)
 - 22 kV line (Tuolumne County) – September 6 to September 9, September 27 to September 28, and October 25 to October 26.

When critical fire weather conditions subsided, the de-energized lines were fully inspected, and no damage was found prior to re-energizing.

K. Strategy – Service Restoration

If a transmission or distribution line is de-energized for safety during critical fire weather conditions, staff must conduct a full patrol of the line prior to re-energizing. When critical fire weather conditions improve (subside) and HHW leadership give approval to re-energize the line(s), field staff will conduct the line patrols via helicopter, vehicle, or on 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 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 a full patrol, provided weather conditions have improved enough for safe flight operations to take place.

Following a wildfire, the SFPUC will restore service when it is safe for staff to access the damage areas. The SFPUC will not access burn areas until the AHJ (i.e. CAL FIRE, USFS, local fire agency, etc.) gives permission to enter the burn area to conduct damage assessment. Following a full damage assessment, the SFPUC will conduct repairs, if required, 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 fire mitigation/suppression equipment that needed replacement or was identified as a gap in our fleet. In FY 2020-21, the SFPUC purchased and received a Wiley 300-gallon skid mount water trailer. This piece of equipment will be staged at key locations near HHW assets to allow the SFPUC crews and fire agency crews to have access to reliable water and pump systems in order to provide initial attack and/or suppress fires in remote locations. This equipment will primarily be used by the SFPUC staff to extinguish small fires or provide initial attack until the AHJ arrives. The following items have purchase orders completed and are in the process of being delivered:

Wylie 500-gallon water trailer with pump (Qty 3) – will be staged at key locations near HHW assets for access to water and pump to combat fire ignitions.



Cascade 75-gallon skid mount pump – will be used by the SFPUC crews when performing maintenance work in HFTD to increase initial fire suppression capabilities for small ignitions.



John Deere 160G LC FT4 Excavator with masticator – will be used to clear/masticate vegetation along the right-of-way, roadways, and distribution and transmission line corridors.



Peterbilt 337 2-axle 4X4 water truck – will be used to maintain ground moisture levels at worksites to prevent fire ignition and could also be used as a water source to combat fire ignitions.



In the 2022 WMP, the SFPUC will provide an update on equipment marked for purchase in FY 2021-22.

6. EVALUATING THE PLAN

A. Metrics and Evaluation

The SFPUC will track the following primary transmission and distribution system metrics to measure the performance and effectiveness of their WMP in reducing the risk of the SFPUC facilities being the origin or contributing source for the ignition of a catastrophic wildfire. The SFPUC updated the 2020 metrics to include wire down in the HFTD and wire down outside HFTD. The 2020 metrics are provided below in Table 6, followed by our evaluation of the events.

Table 6: 2020 Metrics

Metric	Metric Description	2019	2020	2021
1	Reportable ignitions ¹⁵ in the HFTD associated with electric facilities greater than 10 acres	0	1	
2	Vegetation inspections completed in a HFTD (Through a combination of aerial and ground inspections).	Completed	Completed	
3	Transmission Line Inspections – aerial	Completed	Completed	
4	Distribution Line Inspections – aerial	Completed	Completed	
5	Number of times a circuit is de-energized within the HFTD	1	4	
6	Wire down in HFTD	1 ¹⁶	2	
7	Wire down outside HFTD	0	0	

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

Calaveras Fire – Alameda County: On August 6, 2020, a 57-acre vegetation fire ignited when an oak tree fell into an overhead distribution line in Alameda County. The tree was in compliance with clearance standards and fell due to internal rotting of the root structure. The fire was 100% contained by CAL FIRE on August 7, 2020. Following the event, an HHW

¹⁵ 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.

¹⁶ Line was de-energized for construction at a SFPUC substation at time of incident (February 2019).

arborist assisted the WS&T and NRLM group with inspecting the vegetation along the distribution system for any additional corrective maintenance. Several trees were identified as needing either pruning or removal to mitigate future incident potential. No additional trees were found to be imminent threats. Since the fire, NRLM and WS&T have completed a review of their system to improve their inspection process.

In 2021, a reportable ignition in Tier 2 was caused by a wire down (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, and instead use fire risk levels and wind conditions year-round to evaluate de-energization triggers. The Abernathy Fire is described below:

Abernathy Fire¹⁷ - 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 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 vegetation management standards. The fire was in an uninhabited area of Tuolumne County and did not pose an immediate threat to structures and human lives. 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 take into account fuel moisture levels.

B. Impact of Metrics on Plan

In these initial years, the SFPUC anticipates that there will be relatively limited data gathered through these metrics; therefore, it will be difficult to draw meaningful conclusions based on this data. Over time, as more data are collected, the SFPUC will be able to identify areas of its operations that could be more at risk and inform the SFPUC on potential improvements to their plan.

¹⁷ 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.

C. Monitoring and Auditing the Plan

The SFPUC staff will continuously monitor projects and metrics outlined in this WMP. It is anticipated that progress of hardening projects and data collected will inform the SFPUC staff of system improvements and areas that need additional attention. The SFPUC staff are committed to providing safe and reliable transmission of power while reducing the risk that the SFPUC facilities could be the source of ignition for a catastrophic wildfire.

This Plan is subject to review and approval by the SFPUC Commission. The SFPUC staff will review, update, and present this plan to the Commission on an annual basis. Additionally, a qualified Independent Evaluator will present a report on this Plan to the SFPUC Commission following each comprehensive review, which occurs every three years. The next scheduled comprehensive review of this WMP is scheduled for 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, which is learned through experience and monitoring industry best practices. Once identified, any gaps or deficiencies will be corrected.

The SFPUC understands that changes to the Plan may occur due to new policies, changes in strategies, changes in technology, or identifying previously unknown risks. These may add gaps to the Plan; however, these gaps should be identified and addressed during annual WMP updates.

The SFPUC will evaluate such gaps and determine a solution. Any such changes will be incorporated into the Plan and will be submitted to the SFPUC Commission for review and consideration as a part of the annual review. Changes requiring additional funding or staff will be submitted and are subject to approval through the CCSF biennial budget process.

E. Monitoring the Effectiveness of the Plan

The SFPUC strives for continuous improvement in their goal to reduce the risk of the SFPUC facilities being the origin or contributing source for 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.

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 assess the comprehensiveness of this WMP. The independent evaluator must issue a report that is posted to the SFPUC's website. This report must also be presented to the SFPUC Commission at a public meeting. An IE evaluated SFPUC's 2019 WMP. The IE's report was presented to the SFPUC Commission on June 9, 2020 and SFPUC posted this report on its website.¹⁸ SFPUC is using the IE's recommendations to update and improve its WMP.

The SFPUC will perform a comprehensive Plan update every three years, as required by §8387 (b)(1). At the time of the comprehensive Plan update, scheduled for 2023, the SFPUC will use an IE to evaluate the Plan and provide a report to the SFPUC Commission. The Plan and IE report will be posted to the SFPUC website and accessible to the public.

¹⁸ [Wildfire Mitigation Plan | SFPUC](#)