Annex C Browns Valley Irrigation District

C.1 Introduction

This Annex details the hazard mitigation planning elements specific to the Browns Valley Irrigation District (BVID or District), a new participating jurisdiction to the 2021 Yuba County Local Hazard Mitigation Plan (LHMP) Update. ***Note***: BVID participated in the original 2007 Yuba County LHMP. Staff turnover in the past 14 years has reduced institutional memory of that 2007 Plan. Actions from the 2007 Plan include:

- Protection of fish screen during periods of high water
  - ✓ Complete- two flapper doors were installed that open when water on either side of the fish screen is out of balance. This feature only activates in high flows when the screen is covered in debris and the fish screen is acting as a dam pushing back the Yuba River
- Install Flood Control Structure along Iowa City Road
  - ✓ Complete- a control structure was added to BVID's Pump Line Canal that during rain events forces water into the intersecting slough
- Pipeline installation
  - ✓ Ongoing - new segments have been installed and are planned for the future. New segments of pipe have improved service and eliminated leaking ditch, thus saved water for carry over from one year to another or allowed for more efficient use during the irrigation season.
- Installation of low elevation rain gauge at Virginia Ranch Dam
  - ✓ Complete- Rain gage was installed. Collected rain data was used in developing new Probable maximum Flood analysis for Virginia Ranch Dam.
- Control of Invasive Species
  - ✓ Ongoing – District has a spray program that focuses on keeping unwanted vegetation off the ditch bank. While this does not directly focus invasive species or include affected areas outside the ditch. The spraying does help, to some degree, reduce the number of seeds transported by the water system.
- Establishment of ditch bank fuel breaks
  - ✓ Ongoing - spray program results in reduced fuel. Plans to widen some ditch banks will result in better access for the spry rigs resulting in reduced fuels.
- Water Tank Installation
  - ✓ This project was not pursued. Since 2015 many property owners in the District and surrounding area have added their own tanks with connections compatible with water tender truck. Ponds and open ditches also allow opportunities for water drafting in an emergency.
- Redhill Turbine Upgrade
  - ✓ Complete - two new pumps were installed. One pump is used at a time the second is backup. Pump use is alternated to keep both units exercised

BVID completed several the mitigation projects proposed in the 2007 plan. While the plan itself was not passed along from one manager to another, the most beneficial projects were carried out by the then standing General manager or passed along to his predecessor to complete or maintain. Hazard mitigation is always in mind for the District. The 2007 Plan was not incorporated into any BVID planning mechanisms

Development in the District since 2007 was described by BVID as minimal. As such, it can be assumed that the vulnerability has not changed.

This Annex is not intended to be a standalone document, but appends to and supplements the information contained in the Base Plan document. As such, all sections of the Base Plan, including the planning process and other procedural requirements apply to and were met by the District. This Annex provides additional information specific to BVID, with a focus on providing additional details on the risk assessment and mitigation strategy for this District.

C.2 Planning Process

As described above, the District followed the planning process detailed in Chapter 3 of the Base Plan. In addition to providing representation on the Yuba County Hazard Mitigation Planning Committee (HMPC), the District formulated their own internal planning team to support the broader planning process requirements. Internal planning participants, their positions, and how they participated in the planning process are shown in Table C-1. Additional details on plan participation and District representatives are included in Appendix A.

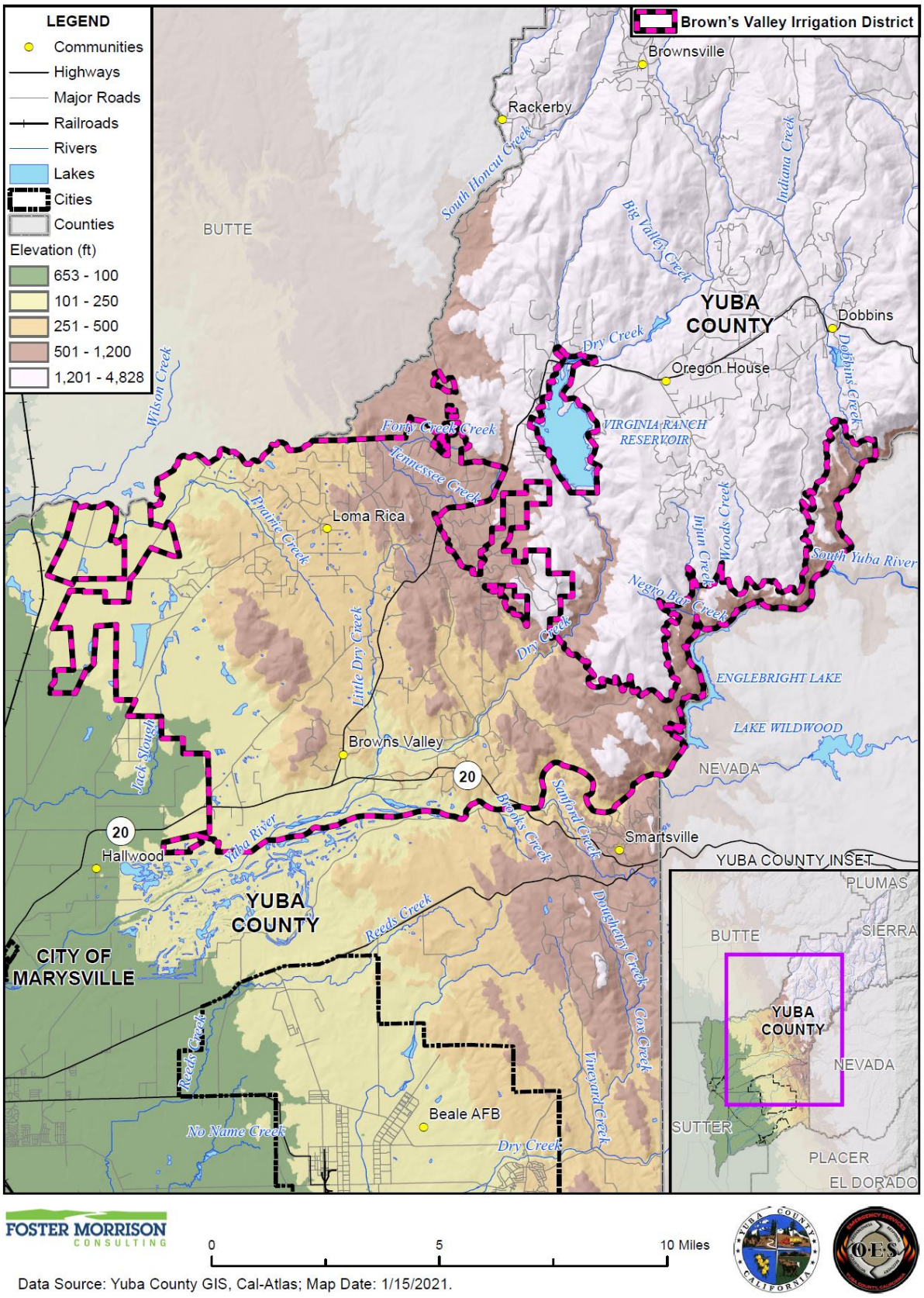
Table C-1 BVID – Planning Team

Name	Position/Title	How Participated
Mark Sayers	Technical Services Manager	Submitted information on prior emergencies, document reviews, updated Annex for BVID, attended meetings.
Joseph Maslan	General Manager	Participated in meeting discussions, submitted mitigation ideas, vote on mitigation ideas, reviewed and edited annex document.
Ryan McNally	General Manager (Former)	Provided staff ideas on mitigation actions.

C.3 District Profile

The District profile for the BVID is detailed in the following sections. Figure C-1 displays a map and the location of the District within Yuba County.

Figure C-1 BVID



C.3.1. Overview and Background

The Browns Valley Irrigation District (BVID) is one of the oldest continually operating irrigation districts in the State of California. It was established on September 19, 1888, under the "Wright Irrigation Act." The first order of business on September 26, 1888, was to set a date for a $110,000 bond election. The reason for the bond sale was to raise funds to construct a diversion dam and ditch to divert water from the North Yuba River into the Browns Valley area. On March 21, 1890, a notice of Approbation of 47.2 CFS (2,500 miners inches) water from the North Yuba was recorded in Yuba County Records.

BVID is located in the foothills of Yuba County, fringing the Sierra Nevada Mountains. The steeply sloping terrain comprising the District ranges from 125 to 1,100 feet in elevation, and is primarily an area of ridge tops with rock outcrops and small areas of moderately deep soils. Soil composition in the District is primarily Sobrante–Auburn with small areas of Flanly–Mildred in the extreme eastern portion of the District along the Yuba River. The extreme southern and western edge of the District contains Redding–Pardee–Corning soils. The northwestern corner of the District contains San Joaquin and Conejo–Kilaga soils. The vegetation of the area hosts oak woodlands and native grasses with Blue Oak and Digger Pine forests at the higher elevations. The foothill area is principally utilized for grazing due to the abundance of rocks in the District with vineyards and occasional orchards growing in the foothill valleys. Small ranches take advantage of the lower, more level reaches to produce hay and raise cattle.

The average annual rainfall in this area is between 22 and 35 inches, the average annual air temperature is between 60 and 62 degrees F, and the average frost–free period is between 250 and 270 days. Precipitation increases with elevation in Yuba County. Annual precipitation is 21.04 at Marysville, near the southern boundary of BVID, and is 35 inches at the highest elevation at Collins Lake. Nearly 34 percent of the annual precipitation falls from March through October. Thunderstorms occur on about 5 days each year, and most often occur in April. (source: Soil Survey of Yuba County, 1998)

There are 55,000 acres in the District served with 78 miles of open ditch and 132 miles of pipeline. The District has experienced rapid change over the past few years. What was a district serving water to pasture and orchard lands is now serving water to family orchards, garden areas, and landscapes. The number of customers has grown from 300 to over 1,500. All BVID water is raw/non-potable. All domestic household water in the area comes from well sources. No planned developments on record have BVID as the domestic water purveyor.

It is very likely that BVID will continue to change significantly over the next several years. Surrounding areas are being looked at for possible annexation. Miles of new pipelines are being planned to presently un-served areas as well as for piping existing ditches. Most of the changes will be driven by development in the area as BVID strives to keep up with the growth. BVID completed an annexation of more than 30 properties in 2019. This was meant to be one of the last expansions of the District Boundary. There are still a number of properties in the Sphere of Influence that could be annexed into the District if the owners desired and are willing to pay the fees involved.

C.4 Hazard Identification

BVID identified the hazards that affect the District and summarized their location, extent, frequency of occurrence, potential magnitude, and significance specific to District (see Table C-2).

Table C-2 BVID—Hazard Identification Assessment

Hazard	Geographic Extent	Likelihood of Future Occurrences	Magnitude/ Severity	Significance	Climate Change Influence
Climate Change	Extensive	Likely	Negligible	Low	–
Dam Failure	Limited	Unlikely	Catastrophic	High	Medium
Drought & Water Shortage	Extensive	Likely	Catastrophic	High	High
Earthquake	Extensive	Occasional	Negligible	Low	Low
Floods: 1%/0.5%/0.2% annual chance	Limited	Occasional	Limited	Medium	Medium
Floods: Localized Stormwater	Limited	Occasional	Negligible	Medium	Medium
Levee Failure	Limited	Unlikely	Negligible	Low	Medium
Pandemic	Significant	Likely	Limited	Low	Medium
Severe Weather: Extreme Cold and Freeze	Limited	Likely	Negligible	Low	Medium
Severe Weather: Extreme Heat	Extensive	Occasional	Negligible	Low	High
Severe Weather: Heavy Rains and Storms	Extensive	Likely	Negligible	Low	Medium
Severe Weather: High Winds and Tornadoes	Significant	Occasional	Negligible	Low	Low
Wildfire	Extensive	Highly unlikely	Catastrophic	High	High

Geographic Extent
Limited: Less than 10% of planning area
Significant: 10-50% of planning area
Extensive: 50-100% of planning area

Likelihood of Future Occurrences
Highly Likely: Near 100% chance of occurrence in next year, or happens every year.
Likely: Between 10 and 100% chance of occurrence in next year, or has a recurrence interval of 10 years or less.
Occasional: Between 1 and 10% chance of occurrence in the next year, or has a recurrence interval of 11 to 100 years.
Unlikely: Less than 1% chance of occurrence in next 100 years, or has a recurrence interval of greater than every 100 years.

Magnitude/Severity
Catastrophic—More than 50 percent of property severely damaged; shutdown of facilities for more than 30 days; and/or multiple deaths
Critical—25-50 percent of property severely damaged; shutdown of facilities for at least two weeks; and/or injuries and/or illnesses result in permanent disability
Limited—10-25 percent of property severely damaged; shutdown of facilities for more than a week; and/or injuries/illnesses treatable do not result in permanent disability
Negligible—Less than 10 percent of property severely damaged, shutdown of facilities and services for less than 24 hours; and/or injuries/illnesses treatable with first aid

Significance
Low: minimal potential impact
Medium: moderate potential impact
High: widespread potential impact

Climate Change Influence
Low: minimal potential impact
Medium: moderate potential impact
High: widespread potential impact

C.5 Hazard Profile and Vulnerability Assessment

The intent of this section is to profile the District's hazards and assess the District's vulnerability separate from that of the Yuba County Planning Area as a whole, which has already been assessed in Section 4.3 Hazard Profiles and Vulnerability Assessment in the Base Plan. The hazard profiles in the Base Plan discuss overall impacts to the Yuba County Planning Area and describes the hazard problem description, hazard location and extent, magnitude/severity, previous occurrences of hazard events and the likelihood of future occurrences. Hazard profile information specific to the District is included in this Annex. This vulnerability assessment analyzes the property and other assets at risk to hazards ranked of medium or high significance specific to the District. For more information about how hazards affect the County as a whole, see Chapter 4 Risk Assessment in the Base Plan.

C.5.1. Hazard Profiles

Each hazard vulnerability assessment in Section C.5.3, includes a hazard profile/problem description as to how each medium or high significant hazard (as shown in Table C-2) affects the District and includes information on past hazard occurrences and the likelihood of future hazard occurrence. The intent of this section is to provide jurisdictional specific information on hazards and further describes how the hazards and risks differ across the Yuba County Planning Area.

C.5.2. Vulnerability Assessment and Assets at Risk

This section identifies the District's total assets at risk, including values at risk, populations at risk, critical facilities and infrastructure, natural resources, and historic and cultural resources. Growth and development trends are also presented for the District. This data is not hazard specific, but is representative of total assets at risk within the District.

Assets at Risk and Critical Facilities

This section considers the BVID's assets at risk, with a focus on key District assets such as critical facilities, infrastructure, and other District assets and their values. With respect to District assets, the majority of these assets are considered critical facilities as defined for this Plan. Critical facilities are defined for this Plan as:

> ***Critical Infrastructure describes the physical and cyber systems and assets that are so vital to the County of Yuba that their incapacity or destruction would have a debilitating impact on our physical or economic security or public health or safety. Critical infrastructure includes any location, facility, or infrastructure that are necessary to maintain normalcy in daily life, and that are essential for the delivery of vital services and for the protection of the community. Critical Facilities are further broken out into three Categories: 1) Essential Services Facilities, 2) Large Group and Vulnerable Populations Facilities, and 3) Infrastructure Facilities.***

Table C-3 lists critical facilities and other District assets identified by the District Planning Team as important to protect in the event of a disaster. BVID's physical assets, valued at over $46 million, consist of the buildings and infrastructure to support the District's operations.

Table C-3 BVID Critical Facilities, Infrastructure, and Other District Assets

Name of Asset	Facility Type	Replacement Value	Which Hazards Pose Risk
BVID-River Pump	Pump (50 hp)	$23,984	Fire, flood, Dam Failure, Storm
BVID-River Pump	Pump (100 hp)	$100,500	Fire, flood, Dam Failure, Storm
BVID-Repeater	Radio Repeater	$10,000	Fire, Storm
BVID-Dam	Dam	$40,000,000	Fire, Dam Failure
BVID-Fish Screen	Fish Screen	$2,500,000	flood
BVID-Power House	Power House	$500,000	Fire, Storm
BVID-Pump Station	Pump Station	$350,000	Fire, flood, Dam Failure
BVID- River Pump	Pump (125 hp)	$100,500	Fire, flood, Dam Failure
BVID-Fuel	2 wall, wood frame, 17 x	$32,3000	fire
BVID-Office	Steel Frame 100'x50'	$1,000,000	fire
BVID-Pesticide	Wood Frame 11'x12'	$6,600	fire
BVID-PL Booster Pump	Pump (7.5 hp)	$10,000	Fire, Storm
BVID-PL Booster Pump	Pump (7.5 hp)	$10,000	Fire, Storm
BVID-PL Booster Pump	Pump (10 hp)	$15,000	Fire, Storm
BVID-Storage	3 wall, wood frame, 48'x	$72,000	fire
BVID-Well	100 hp Well	$250,000	Fire, Storm
BVID-Upper Main Pump	50 HP VFD pump	$102.000	Fire, Storm
BVID-O'Brien Pump Station	60 hp VFD Pump	$100,500	Fire, Storm
Flumes	Metal	$301,500	Fire, Storm
BVID-SBL Pump	100 hp	$100,000	Fire, Storm
Marysville Road Property	Shop, New Office Site	$575,000	Fire, Storm
Total		**$46,348,686**	

Source: BVID

Natural Resources

BVID has a variety of natural resources of value to the District. These natural resources parallels that of Yuba County as a whole. Information can be found in Section 4.3.1 of the Base Plan.

Historic and Cultural Resources

BVID has a variety of historic and cultural resources of value to the District. These historic and cultural resources parallels that of Yuba County as a whole. Information can be found in Section 4.3.1 of the Base Plan.

Populations Served

Also potentially at risk should the District be affected by natural hazard events are the populations served by the District. BVID provides services to over 1,500 households. Families and residents of diverse demographics and physical capabilities inhabit much of the district. Their lives, homes, property and livelihood could be affected by a disaster in the area. The district supports a range of agricultural pursuits including ranching of various livestock, a diverse range of farmer activities including hay, organic vegetable farms, landscaping and nursery supplies.

The most likely incident to affect the most diverse and greatest number of residents is a fire. The Cascade Fire of 2017 is an example. During the fire, BVID's water supply infrastructure was severely damaged cutting off water supply to the area of greatest impact.

Growth and Development Trends

General growth in the District parallels that of the Yuba County Planning Area as a whole. Information can be found in Section 4.3.1 of the Base Plan. Historically, BVID was primarily an agricultural community, with large ranches making up most of the customer base for the District. Recent trends have seen a shift in the District resulting from splitting large parcels into smaller parcels, which must be a minimum of five acres. As these parcels are developed the district is impacted, increasing the number of customers requiring service from BVID. This trend is expected to continue, putting additional pressure on BVID's water supply and facilities to provide water to more people without an increase in water supply.

Future Development

BVID has responsibility to provide pro rata share of water to properties in the District. If a property is located in the District's boundary and it does not have current access to water, the District will provide that property owner any options available to get water. Some properties cannot get water at this point because of limiting factors such as location in proximity to a conveyance. Areas in the District will be given the opportunity to participate as water becomes available. One project BVID is trying to fund will pipe a dich that loses significant amounts of water. The routing of the proposed pipeline could bring water to new areas in the District.

The District has no control over future development in areas the District services. Future development in these areas parallels that of the Yuba County Planning Area. More general information on growth and development in Yuba County as a whole can be found in "Growth and Development Trends" in Section 4.3.1 Yuba County Vulnerability and Assets at Risk of the Base Plan.

C.5.3. Vulnerability to Specific Hazards

This section provides the vulnerability assessment, including any quantifiable loss estimates, for those hazards identified above in Table C-2 as high or medium significance hazards. Impacts of past events and vulnerability of the District to specific hazards are further discussed below (see Section 4.1 Hazard Identification in the Base Plan for more detailed information about these hazards and their impacts on the Yuba County Planning Area). Methodologies for evaluating vulnerabilities and calculating loss estimates are the same as those described in Section 4.3 of the Base Plan.

An estimate of the vulnerability of the District to each identified priority hazard, in addition to the estimate of likelihood of future occurrence, is provided in each of the hazard-specific sections that follow. Vulnerability is measured in general, qualitative terms and is a summary of the potential impact based on past occurrences, spatial extent, and damage and casualty potential. It is categorized into the following classifications:

- **Extremely Low**—The occurrence and potential cost of damage to life and property is very minimal to nonexistent.
- **Low**—Minimal potential impact. The occurrence and potential cost of damage to life and property is minimal.
- **Medium**—Moderate potential impact. This ranking carries a moderate threat level to the general population and/or built environment. Here the potential damage is more isolated and less costly than a more widespread disaster.
- **High**—Widespread potential impact. This ranking carries a high threat to the general population and/or built environment. The potential for damage is widespread. Hazards in this category may have occurred in the past.
- **Extremely High**—Very widespread with catastrophic impact.

Depending on the hazard and availability of data for analysis, this hazard specific vulnerability assessment also includes information on values at risk, critical facilities and infrastructure, populations at risk, and future development.

Power Outage/Power Failure

An impact of almost all hazards below relates to power outage and/or power failures. The US power grid crisscrosses the country, bringing electricity to homes, offices, factories, warehouses, farms, traffic lights and even campgrounds. According to statistics gathered by the Department of Energy, major blackouts are on the upswing. Incredibly, over the past two decades, blackouts impacting at least 50,000 customers have increased 124 percent. The electric power industry does not have a universal agreement for classifying disruptions. Nevertheless, it is important to recognize that different types of outages are possible so that plans may be made to handle them effectively. In addition to blackouts, brownouts can occur. A brownout is an intentional or unintentional drop in voltage in an electrical power supply system. Intentional brownouts are used for load reduction in an emergency. Electric power disruptions can be generally grouped into two categories: intentional and unintentional. More information on types of power disruptions can be found in Section 4.3.3 of the Base Plan.

District assets potentially affected by the PSPS events include building, pumps, BVID well, power plant and dam safety devices. BVID has installed a natural gas generator at the headquarters to allow operations

as usual, The locations that have no auxiliary power include 3 pumps at the Yuba River used to divert water right water, six pumps that boost water uphill (3 are for agriculture), and the BVID powerplant, which is where the dam safety monitoring equipment is located. The District auxiliary power here is not adequate for the duration of many PSPS and a separate source is needed. Various parts of the District experience PSPS differently. All parts of the district have experienced at least one outage. Some locations have experienced more outages than others.

Public Safety Power Shutoff (PSPS)

A new intentional disruption type of power outage/failure event has recently occurred in California. In recent years, several wildfires have started as a result of downed power lines or electrical equipment. This was the case for the Camp Fire in 2018. As a result, California's three largest energy companies (including PG&E), at the direction of the California Public Utilities Commission (CPUC), are coordinating to prepare all Californians for the threat of wildfires and power outages during times of extreme weather. To help protect customers and communities during extreme weather events, electric power may be shut off for public safety in an effort to prevent a wildfire. This is called a PSPS. More information on PSPS criteria can be found in Section 4.3.3 of the Base Plan.

The District has purchased a generator for the Headquarters, and is investigation purchasing a generator for the powerplant so dam safety monitoring equipment will remain operational during PSPS events. Pumps throughout the district can go out, along with the district wells and customer wells causing temporary water shortages and outages.

Dam Failure

Likelihood of Future Occurrence–Unlikely
Vulnerability–High

Hazard Profile and Problem Description

Dams are manmade structures built for a variety of uses including flood protection, power generation, agriculture, water supply, and recreation. When dams are constructed for flood protection, they are usually engineered to withstand a flood with a computed risk of occurrence. For example, a dam may be designed to contain a flood at a location on a stream that has a certain probability of occurring in any one year. If prolonged periods of rainfall and flooding occur that exceed the design requirements, that structure may be overtopped or fail. Overtopping is the primary cause of earthen dam failure in the United States.

Location and Extent

Dam failure is a natural disaster from two perspectives. First, the inundation from released waters resulting from dam failure is related to naturally occurring floodwaters. Second, a total dam failure would most probably happen as a consequence of the natural disaster triggering the event, such as an earthquake. There is no scale with which to measure dam failure. However, Cal DWR Division of Safety of Dams (DOSD) assigns hazard ratings to dams within the State that provides information on the potential impact should a dam fail. The following two factors are considered when assigning hazard ratings: existing land use and land use controls (zoning) downstream of the dam. Dams are classified in four categories that identify the

potential hazard to life and property: Low, Significant, High, and Extremely High. These were discussed in more detail in Section 4.3.7 of the Base Plan.

While a dam may fill slowly with runoff from winter storms, a dam break has a very quick speed of onset. The duration of dam failure is generally not long – only as long as it takes to empty the reservoir of water the dam held back. The District would be affected for as long as the flood waters from the dam failure took to drain downstream.

Extremely High Hazard Dams inside the County that can affect the District can be seen on Figure C-2. High Hazard Dams inside the County that can affect the District can be seen on Figure C-3. Extremely High Hazard Dams outside the County that can affect the District can be seen on Figure C-4. High Hazard Dams outside the County that can affect the District can be seen on Figure C-5.

Figure C-2 BVID – Dam Inundation Areas from Extremely High Hazard Dams Inside the County

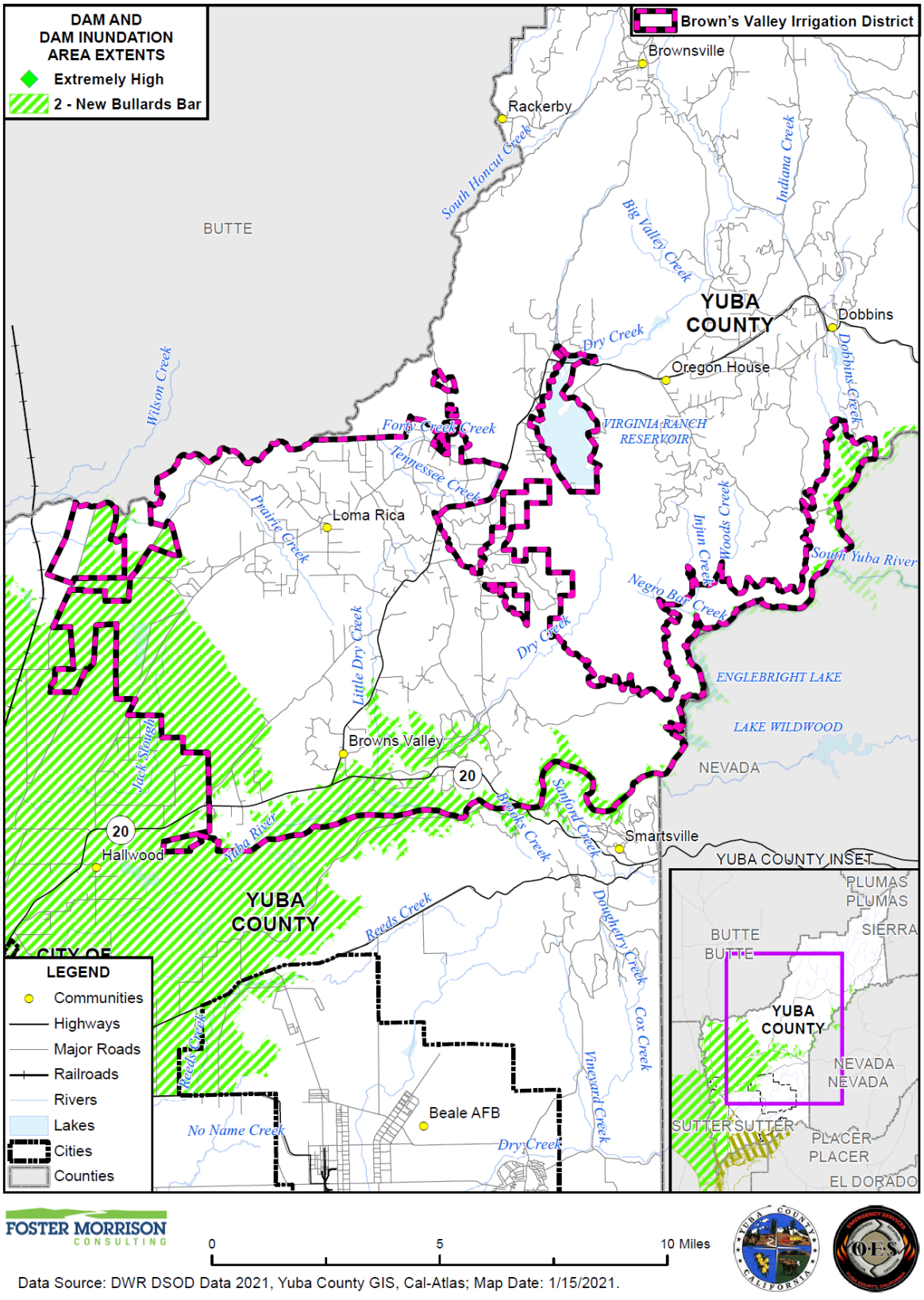


Figure C-3 BVID – Dam Inundation Areas from High Hazard Dams Inside the County

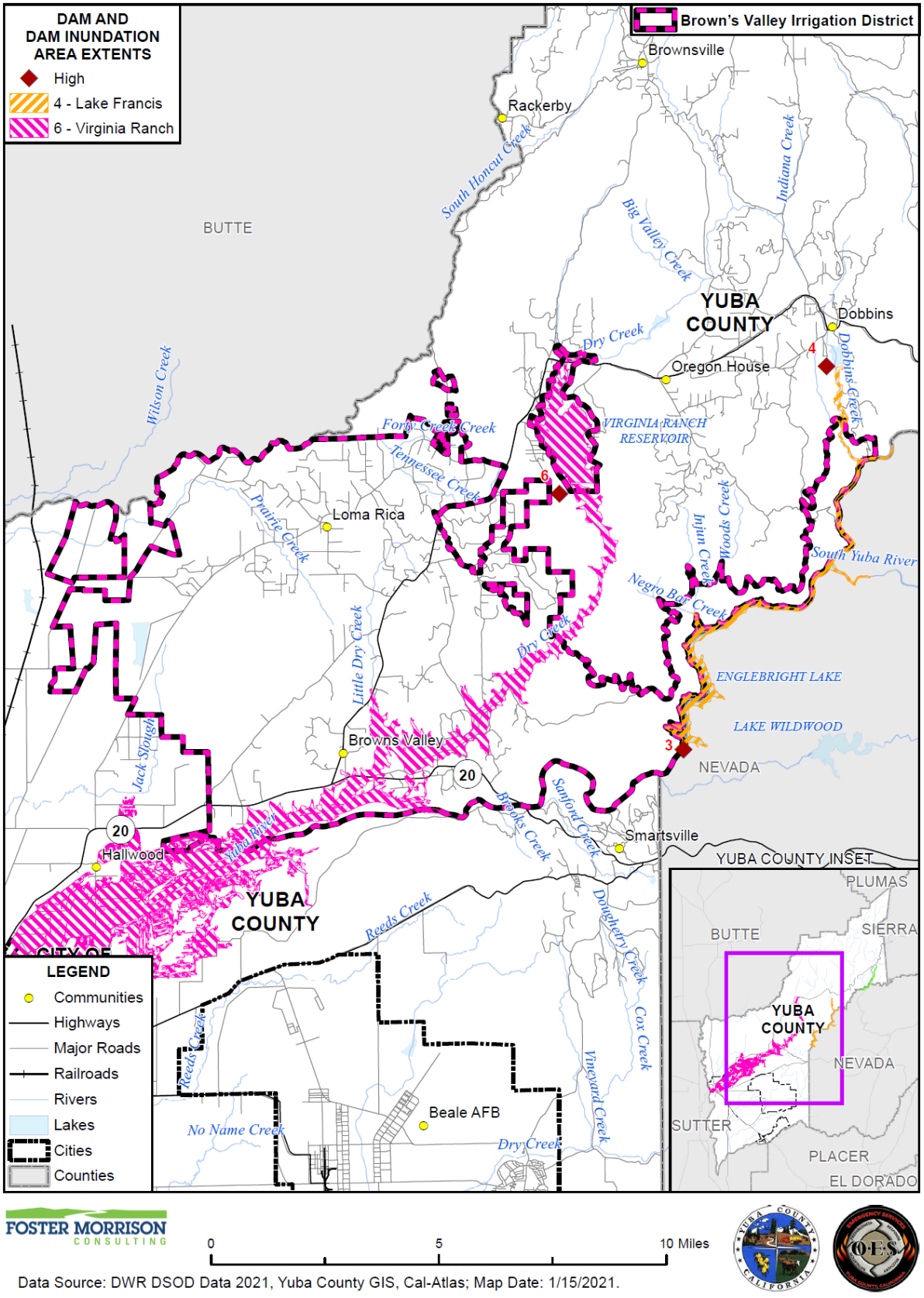


Figure C-4 BVID – Dam Inundation Areas from Extremely High Hazard Dams Outside the County

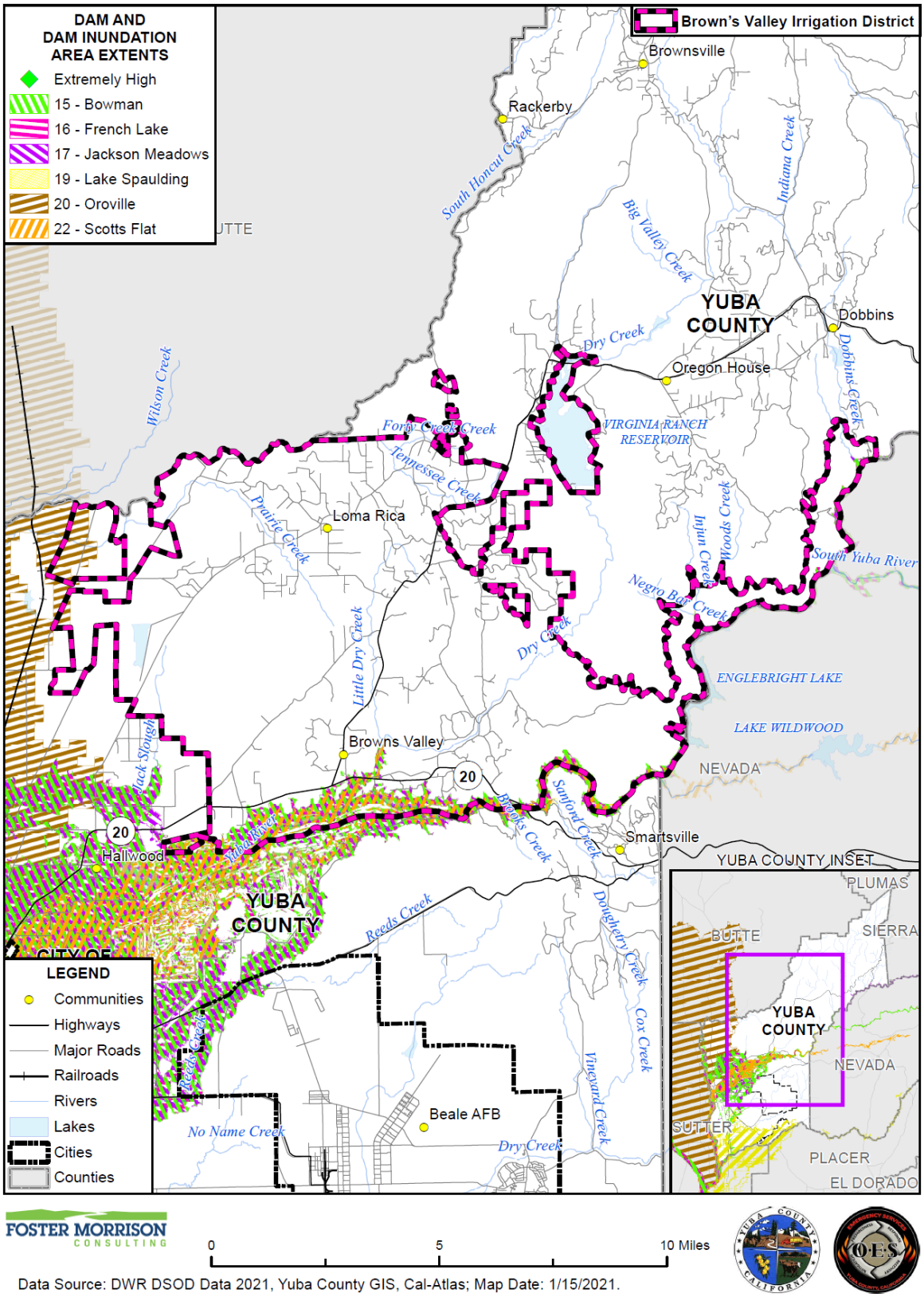
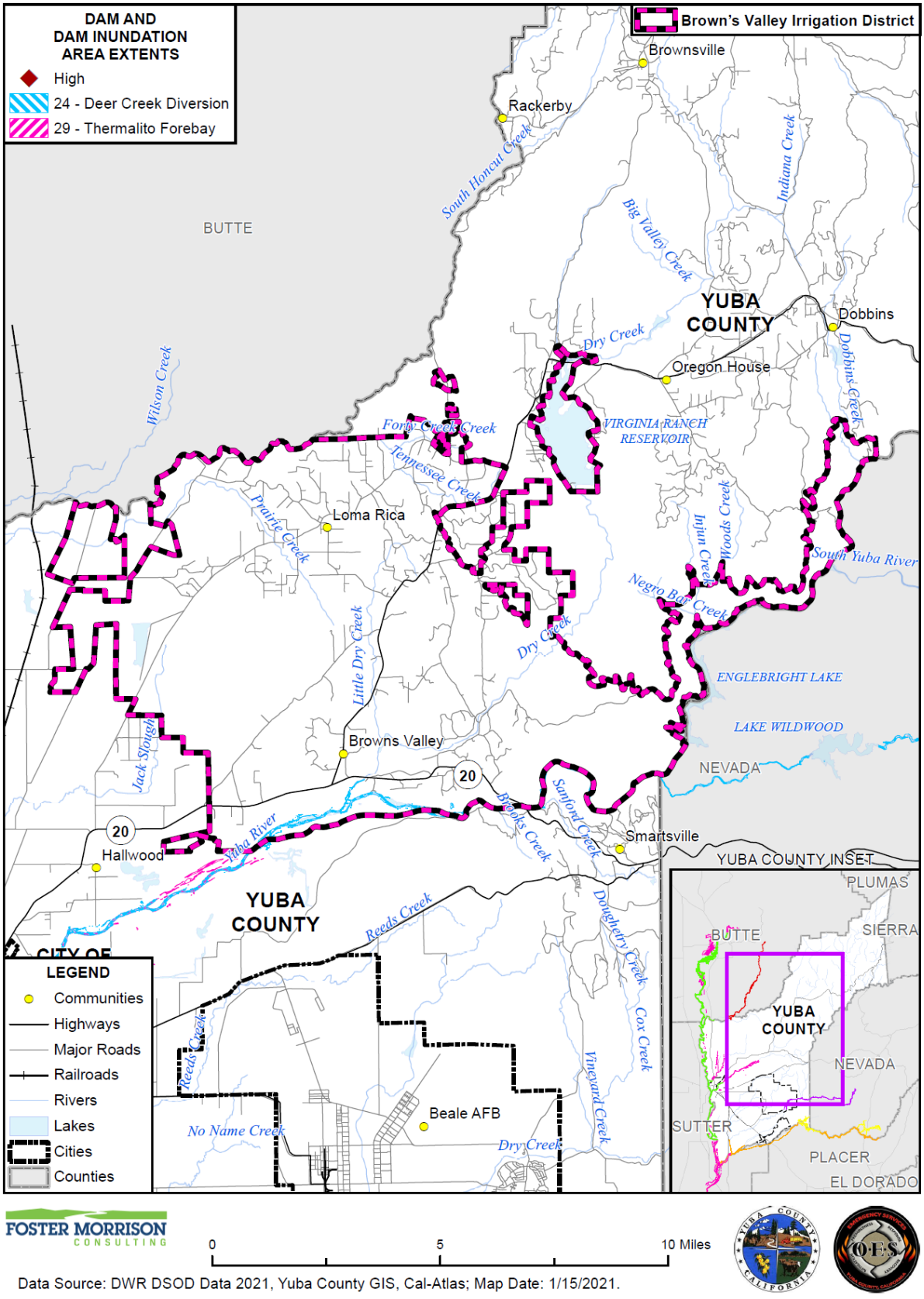


Figure C-5 BVID – Dam Inundation Areas from High Hazard Dams Outside the County



BVID also noted that the Virginia Ranch dam, a high hazard dam located inside Yuba County is owned and operated by the District. This is a primary source of irrigation water serving BVID customers.

Past Occurrences

There has been one federal or state disaster declarations for dam failure in the County, as shown on Table C-4. This was associated with the Oroville spillway incidence in Butte County. While the dam did not fail, mass evacuations were ordered resulting in significant economic and other impacts to Butte and neighboring counties.

Table C-4 Yuba County – State and Federal Disaster Declarations from Dam Failure 1950-2021

Disaster Type	State Declarations		Federal Declarations	
	Count	Years	Count	Years
Dam Failure	0	–	1	2017

Source: Cal OES, FEMA

The District noted no other dam failure occurrences that have affected the District. There were hardships to some District employees from Oroville Spillway incident. Some employees were displaced when evacuated from their homes and others were unable to physically reach work because of the extent of evacuation zone and limited road infrastructure to go around.

Vulnerability to and Impacts from Dam Failure

Dam failure flooding would vary by community depending on which dam fails and the nature and extent of the dam failure and associated flooding. Impacts to the District from a dam failure flood could include loss of life and injury, flooding and damage to property and structures, damage to critical facilities and infrastructure, loss of natural resources, and all other flood related impacts. Additionally, mass evacuations and associated economic losses can also be significant.

Virginia Ranch Dam

Should a breach in the dam occur, the water would flow south along Dry Creek. Flooding could occur along Long Bar Road where it parallels Dry Creek (initial wave arrive in under 40 minutes and peak in under 57 minutes per Virginia Ranch Dam Sunny Day Hypothetical Map 2018 cross section 4) within ten minutes. Further downstream flooding could occur along Highway 20 at Dry Creek (initial wave arrive in under 40 minutes and peak in 1 hour 12 minutes per Virginia Ranch Dam Sunny Day Hypothetical Map 2018 cross section 6) 15 minutes and within the Yuba River levee system within two hours (initial wave arrive in 1 hour 56 minutes and peak in 2 hour 32 minutes per Virginia Ranch Dam Sunny Day Hypothetical Map 2018 cross section 8). The community of Browns Valley lies within the dam's inundation path. In the event of a dam failure, the flood wave would reach Browns Valley in approximately 15 minutes (initial wave arrive in 40 minutes and peak in 57 minutes per Virginia Ranch Dam Sunny Day Hypothetical Map 2018 cross section 4), and would reach the City of Marysville 2 hours (initial wave arrive in 2 hours 25 minutes and peak in 3 hour 44 minutes per Virginia Ranch Dam Sunny Day Hypothetical Map 2018 cross section 9) later.

Los Verjeles Dam and its 120–acre lake are located on Dry Creek, approximately 4.5 miles upstream from the Virginia Ranch Dam and Collins Lake. The Dry Creek channel below Virginia Ranch Dam is a deep narrow ravine for approximately five miles, which broadens until it joins with the Yuba River. Stanfield Hill is to the west of Collins Lake and Chaparral Hill is located to the east.

Virginia Ranch Dam on Collins Lake has no upstream control of inflows, due to upstream protocols approved by California Division of Safety of Dams for Los Verjeles Dam. Los Verjeles Dam retains up to 2,300 cubic yards of water. Los Verjeles passes all inflows from October 15 to April 15 (the irrigation season) through two spillways that have five–foot gates. These gates remain in place during this time. There are two gates at the bottom of the dam that are also left fully open. During the summer, while the spillway boards are in place, the goal is to maintain the lake level at the top of the spillway. The dam releases inflows plus additional water as necessary to achieve its 6 cfs minimum fish flows. During the winter months the spillway gates are opened to allow passage of the fish out of the lake.

In the event of large, uncontrolled releases from Virginia Ranch Dam on Dry Creek, water releases from the other facilities may be reduced to mitigate the effects of high flows from the confluence of Dry Creek and the Yuba River downstream to Marysville and beyond. (Henwood Energy Services, Inc, 2005).

The District does not own any other dams. There are several private ponds impounded by dams in the District. Some may hold back enough water that a localized emergency with possible loss of property could occur such as fences being destroyed or culverts/access roads being washed out. The District is aware of one incident In the past ten years when a property owner called Yuba OES about a potential pond dam failure. The incident was resolved without damage occurring. BVID hears about these incidents because it deals with the water, but has no jurisdiction in such an incident.

Assets at Risk

The Dam, Fish screen, pumpstation, 2 x Pump 100 hp, Pump 150 hp, Pump 50 hp, and powerhouse are at risk to this hazard.

Drought & Water Shortage

Likelihood of Future Occurrence–Likely
Vulnerability–High

Hazard Profile and Problem Description

Drought is a complex issue involving many factors—it occurs when a normal amount of precipitation and snow is not available to satisfy an area's usual water-consuming activities. Drought can often be defined regionally based on its effects. Drought is different than many of the other natural hazards in that it is not a distinct event and usually has a slow onset. Drought can severely impact a region both physically and economically. Drought affects different sectors in different ways and with varying intensities. Adequate water is the most critical issue and is critical for agriculture, manufacturing, tourism, recreation, and commercial and domestic use. As the population in the area continues to grow, so will the demand for water.

Location and Extent

Drought and water shortage are regional phenomenon. The whole of the County, as well as the whole of the District, is at risk. The US Drought Monitor categorizes drought conditions with the following scale:

- None
- D0 – Abnormally dry
- D1 – Moderate Drought
- D2 – Severe Drought
- D3 – Extreme drought
- D4 – Exceptional drought

Drought has a slow speed of onset and a variable duration. Drought can last for a short period of time, which does not usually affect water shortages and for longer periods. Should a drought last for a long period of time, water shortage becomes a larger issue. Current drought conditions in the District and the County are shown in Section 4.3.8 of the Base Plan.

Past Occurrences

There has been one state and one federal disaster declaration due to drought since 1950. This can be seen in Table C-5.

Table C-5 Yuba County – State and Federal Disaster Declarations Summary 1950-2020

Disaster Type	State Declarations		Federal Declarations	
	Count	Years	Count	Years
Drought	1	2014	1	1977

Source: Cal OES, FEMA

Since drought is a regional phenomenon, past occurrences of drought for the District are the same as those for the County and includes 5 multi-year droughts over an 85-year period. Details on past drought occurrences can be found in Section 4.3.8 of the Base Plan.

The District noted the 2014/2015 drought. Given the District function, drought is a significant issue to the BVID. While starting in 2014, the most significant drought effects were felt by BVID in 2015. According to the District, the magnitude of the drought experienced in 2015 was unusual. This drought resulted in the second lowest end of irrigation season reservoir reserve; the lowest was 1977, during the previous drought disaster declaration in California. All of 2015 (BVID Irrigation Season 4/1/2015 to 10/23/2015), the District was affected. Impacts were significant. While the 2015 drought resulted in a change in BVID's operational protocols, the District was able to meet the demands for a full irrigation season. Fortunately drought conditions moved to more normal in 2016. Continued drought would have been devastating for the next irrigation season at BVID. Also to note, since and before the 2014/2015 drought, BVID has implemented drought ordinances to stretch limited resources as far as possible.

Vulnerability to and Impacts from Drought and Water Shortage

Based on historical information, the occurrence of drought in California, including the District, is cyclical, driven by weather patterns. Drought has occurred in the past and will occur in the future. Periods of actual drought with adverse impacts can vary in duration, and the period between droughts can be extended. Although an area may be under an extended dry period, determining when it becomes a drought is based on impacts to individual water users. Drought impacts are wide-reaching and may be economic, environmental, and/or societal. Tracking drought impacts can be difficult.

The most significant qualitative impacts associated with drought in the Yuba County Planning Area are those related to water intensive activities such as agriculture, wildfire protection, municipal usage, commerce, tourism, recreation, and wildlife preservation. Mandatory conservation measures are typically implemented during extended droughts. Drought conditions can also cause soil to compact and not absorb water well, potentially making an area more susceptible to flooding. With a reduction in water, water supply issues based on water rights becomes more evident. Climate change may create additional impacts to drought and water shortage in the County and the District.

During periods of drought, vegetation can dry out which increases fire risk. Drought that occurs during periods of extreme heat and high winds can cause PSPS events to occur in the County.

BVID receives the water it distributes to its patrons from Merle Collins Lake (Collins Lake) and the Yuba River through its own water right, and additional water by contract with Yuba County Water Agency (YCWA). BVID provides non–potable irrigation water to the communities of Browns Valley and Loma Rica through an open ditch and underground pipe delivery system, and wholesales domestic non–potable water.

BVID owns and operates Virginia Ranch Dam at Collins Lake, with a water right license for 36,000 acre feet. While BVID is exempt from FERC relicensing for the Virginia Ranch Dam, other FERC requirements apply. BVID is the responsible agency for downstream notification in the event of a dam failure. BVID owns Water Rights for 24,400 acre feet, and a Project Base Contract with YCWA for 9,500 acre feet for water from the Yuba River. BVID sporadically participates in out-of-district water transfers.

The Browns Valley Irrigation District is a partner in the 2015 Yuba County Integrated Regional Water Management Plan which addresses local water resource planning and management needs for the next 20 years. The IRWM Plan addresses forecasted water demands for urban needs, agricultural uses, and water supply availability; flood protection requirements; ecosystem restoration needs; and recreational opportunities.

2021 has surpassed 2015 as the second most impactful drought since 1977. Collins Lake is projected to reach minimum pool by mid to late September, at which point, water delivery from the lake will be discontinued. Subscribers have reduced water use, implemented best watering practices and some ranchers have made plans to buy more feed than usual or reduce herd sizes. As the season is still unfolding the overall impacts are still unknown. Having no water toward the end of September is a concern since fire season could stretch through November as it has several times in the last five years.

Concurrent with limited water at Collins Lake, the Yuba River has a short fall and BVID could be allotted only 75% of normal April through September water and none of its fall water, October – March. To supplement lack of surface water, farmers with ag wells will pump ground water. Additional measures could see some farmers fallow fields. There is no precedence for this so the overall on impacts are unknown since it is still playing out.

Assets at Risk

No District assets from Table C-3 are at direct risk from this hazard. The risk from this hazard is for the population served by the District.

Flood: 1%/0.2% Annual Chance

Likelihood of Future Occurrence–Occasional/Unlikely
Vulnerability–Low

Hazard Profile and Problem Description

This hazard analyzes the FEMA DFIRM 1% and 0.2% annual chance floods. These tend to be the larger floods that can occur in the County or in the District, and have caused damages in the past. Flooding is a significant problem in Yuba County and the District. Historically, the District has been at risk to flooding primarily during the winter and spring months when river systems in the County swell with heavy rainfall and snowmelt runoff. Normally, storm floodwaters are kept within defined limits by a variety of storm drainage and flood control measures. Occasionally, extended heavy rains result in floodwaters that exceed normal high-water boundaries and cause damage. As previously described in Section 4.3.10 of the Base Plan, the Yuba County Planning Area and the BVID have been subject to historical flooding.

Location and Extent

Parts of BVID are within or lie adjacent to FEMA 1% annual chance floodplain (Figure C-6) and could be vulnerable in the event of a high water event along the Dry Creek, Little Dry Creek, Tennessee Creek, South Honcut Creek, Prairie Creek, the head waters of Jack Slough, Willow Glen Creek, and the Yuba River.

Figure C-6 BVID – FEMA DFIRM Flood Zones

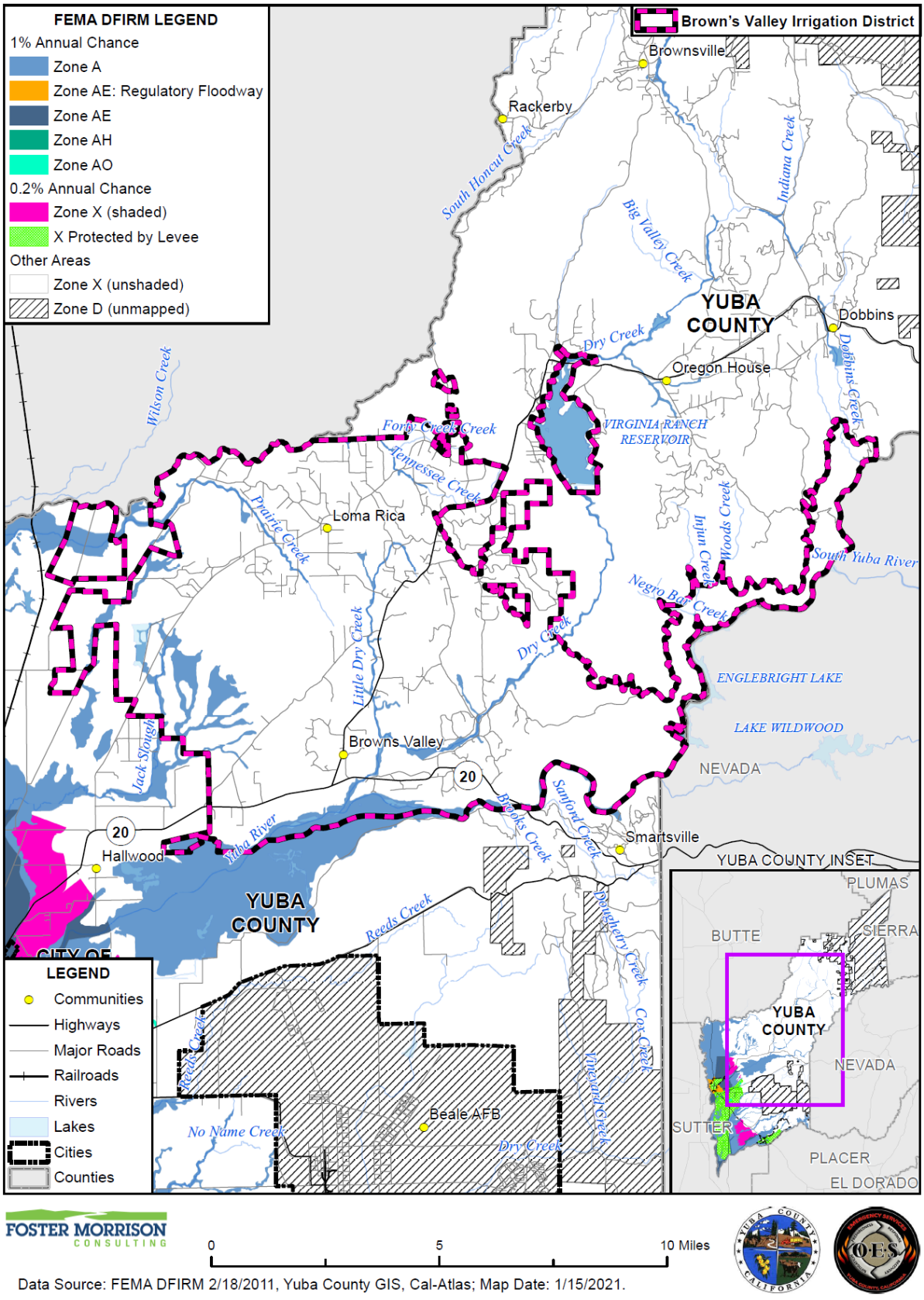


Table C-6 details the DFIRM mapped flood zones within the 1% annual chance flood zone as well as other flood zones located within the District.

Table C-6 BVID– DFIRM Flood Hazard Zones

Flood Zone	Description	Flood Zone Present in the District
A	1% annual chance flooding: No base flood elevations provided	X
AE	1% annual chance flooding: Base flood elevations provided	
AE Floodway	1% annual chance flood: Regulatory floodway; Base flood elevations provided	
AH	1% annual chance flood areas of shallow flooding between one to three feet deep. Regulatory floodway; Base flood elevations provided	
AO	1% annual chance flooding: sheet flow areas. BFEs derived from detailed hydraulic analyses are shown in this zone.	
Shaded X	0.2% annual chance flooding: The areas between the limits of the 1% annual chance flood and the 0.2-percent-annual-chance (or 500-year) flood	
X Protected by Levee	Areas protected by levees from 1% annual chance flood event. Levee protection places these areas in the 0.2% annual chance flood zone.	
X (unshaded)	No flood hazard	X

Source: FEMA

Additionally, flood extents can generally be measured in volume, velocity, and depths of flooding. Expected flood depths in the District vary, depending on the nature and extent of a flood event; specific depths are unknown. Flood durations in the District tend to be short to medium term, or until either the storm drainage system can catch up or flood waters move downstream. Flooding in the District tends to have a shorter speed of onset, due to the amount of water that flows through the District.

Past Occurrences

A list of state and federal disaster declarations for Yuba County from flooding is shown on Table C-7. These events also likely affected the District to some degree.

Table C-7 Yuba County – State and Federal Disaster Declarations from Flood 1950-2020

Disaster Type	Federal Declarations		State Declarations	
	Count	Years	Count	Years
Flood (including heavy rains and storms)	16	1950, 1955, 1958, 1962, 1963 (twice), 1969, 1973, 1982, 1983, 1986, 1995 (twice), 1997, 2008, 2017	15	1955, 1962, 1963, 1964, 1969, 1970, 1983, 1986, 1995 (twice), 1997, 1998, 2006, 2017 (twice)

Source: Cal OES, FEMA

The District has been affected by the 1986 and 1997 flood events, though specific damages could not be recalled. A high water event in May 2005 caused substantial damage to BVID's fish screen. The cost to

repair the structure was $107,650. Debris removal from the bypass channel following the 2005-2006 winter storm event cost $17,960 to repair.

More recently, in early 2017, an atmospheric river rain event occurred. Heavy rains fell from January 3rd to the 12th. BVID ditch infrastructure suffered blockages caused by two minor mud slides. One pipeline adjacent to a road was exposed by excessive runoff. Pumps at the Yuba River were removed in advance of high water inundation. The power plant at Collins Lake experienced damage, and BVID pump stations on Yuba River lost access to the river after water receded because of redistribution of materials in the river. BVID's damages were limited to these infrastructure impacts.

Vulnerability to and Impacts from Flood

Floods have been a part of the District's historical past and will continue to be so in the future. During winter months, long periods of precipitation and the timing of that precipitation are critical in determining the threat of flood, and these characteristics further dictate the potential for widespread structural and property damages. Predominantly, the effects of flooding are generally confined to areas near the waterways of the County. As waterways grow in size from local drainages, so grows the threat of flood and dimensions of the threat. This threatens structures in the floodplain. Structures can also be damaged from trees falling as a result of water-saturated soils. Electrical power outages happen, and the interruption of power causes major problems. Loss of power is usually a precursor to closure of governmental offices and community businesses. Roads can be damaged and closed, causing safety and evacuation issues. People may be swept away in floodwaters, causing injuries or deaths.

Floods are among the costliest natural disasters in terms of human hardship and economic loss nationwide. Floods can cause substantial damage to structures, landscapes, and utilities as well as life safety issues. Floods can be extremely dangerous, and even six inches of moving water can knock over a person given a strong current. During a flood, people can also suffer heart attacks or electrocution due to electrical equipment short outs. Floodwaters can transport large objects downstream which can damage or remove stationary structures. Ground saturation can result in instability, collapse, or other damage. Objects can also be buried or destroyed through sediment deposition. Floodwaters can also break utility lines and interrupt services. Standing water can cause damage to crops, roads, foundations, and electrical circuits. Direct impacts, such as drowning, can be limited with adequate warning and public education about what to do during floods. Other problems connected with flooding and stormwater runoff include erosion, sedimentation, degradation of water quality, loss of environmental resources, and economic impacts.

The flooding hazard within the District has the possibility of influence arising from the capacity of the Virginia Ranch Dam Spillway and the Virginia Ranch Dam. The Virginia Ranch Dam has the capacity to hold 57,000 acre feet of water. BVID passes water through the powerhouse at the base of the dam to prevent the spilling of waters over the spillway and to meet its irrigation demand.

Assets at Risk

Due to the nature of BVID, the provision of irrigation waters, the District's assets generally lie within the 100– year flood zone; with the exception of buildings. Most pumps have been designed to be removed to

higher ground in the event of high water events. The District's vulnerability to this threat arises from the location of several of its pumps, pipelines, and ditches within the 1% annual chance flood zone.

The impact from flooding to BVID typically occurs as damage to the District's ditch system. This damage occurs in the form of a breach of the ditch or the filling of the ditch with debris. To clean out a ditch costs roughly $250 dollars an hour at a rate of approximately 400 feet per day. If a ditch is breached, the existing infrastructure for the ditch will have been washed away, necessitating additional resources. A conservative estimate of the cost by BVID puts the cost at $500 per hour. Several BVID wells are located within the FEMA 100-year floodplain. The BVID fish screen is adjacent to the Yuba River and has historically suffered damage as the result of flooding.

Flood: Localized Stormwater Flooding

Likelihood of Future Occurrence–Occasional
Vulnerability–Medium

Hazard Profile and Problem Description

Flooding occurs in areas other than the FEMA mapped 1% and 0.2% annual chance floodplains. Flooding may be from drainages not studied by FEMA, lack of or inadequate drainage infrastructure, or inadequate maintenance. Localized, stormwater flooding occurs throughout the County and the District during the rainy season from November through April. Prolonged heavy rainfall contributes to a large volume of runoff resulting in high peak flows of moderate duration.

Location and Extent

The BVID is subject to localized flooding throughout the District. Flood extents are usually measured in areas affected, velocity of flooding, and depths of flooding. Expected flood depths in the District vary by location. Flood durations in the District tend to be short to medium term, or until either the storm drainage system can catch up or flood waters move downstream. Localized flooding in the District tends to have a shorter speed of onset, especially when antecedent rainfall has soaked the ground and reduced its capacity to absorb additional moisture.

The District tracks localized flooding areas. These localized flood areas identified by the BVID are summarized in Table C-8.

Table C-8 BVID – List of Localized Flooding Problem Areas

Area Name	Flooding	Pavement Deterioration	Washout	High Water	Landslide/ Mudslide	Debris	Downed Trees
Yuba River Bypass Channel	X		X	X		X	

Source: BVID

Damage to canals usually occur from slides of saturated uplands. Runoff along pipelines in road shoulders have led to erosion and exposing of pipelines. Downed trees occur from saturated ground and high winds. The main concern is loss of the bypass channel that brings water right water to BVID's fish screen and diversion pump station. The channel is located within the Yuba River Ordinary High Water Mark.

Past Occurrences

There have been no federal or state disaster declarations in the County due to localized flooding. The District noted that localized flooding occurred in the District in 2017. No damages were suffered by the District itself.

Vulnerability to and Impacts from Localized Flooding

Historically, much of the growth in the District and County has occurred adjacent to streams, resulting in significant damages to property, and losses from disruption of community activities when the streams overflow. Additional development in the watersheds of these streams affects both the frequency and duration of damaging floods through an increase in stormwater runoff.

Primary concerns associated with stormwater flooding include impacts to infrastructure that provides a means of ingress and egress throughout the community. Ground saturation can result in instability, collapse, or other damage to trees, structures, roadways and other critical infrastructure. Objects can also be buried or destroyed through sediment deposition. Floodwaters can break utility lines and interrupt services. Standing water can cause damage to crops, roads, and foundations. Other problems connected with flooding and stormwater runoff include erosion, sedimentation, degradation of water quality, losses of environmental resources, and certain health hazards.

District has adequate drainage. Ditch Spill boards are pulled in the winter to allow storm water to drain out of the ditch system into natural drains and water ways and prevent potential issues at road crossings and siphon screens.

Assets at Risk

No District assets from Table C-3 are at direct risk from this hazard.

Wildfire

Likelihood of Future Occurrence–Highly Likely
Vulnerability–Extremely High

Hazard Profile and Problem Description

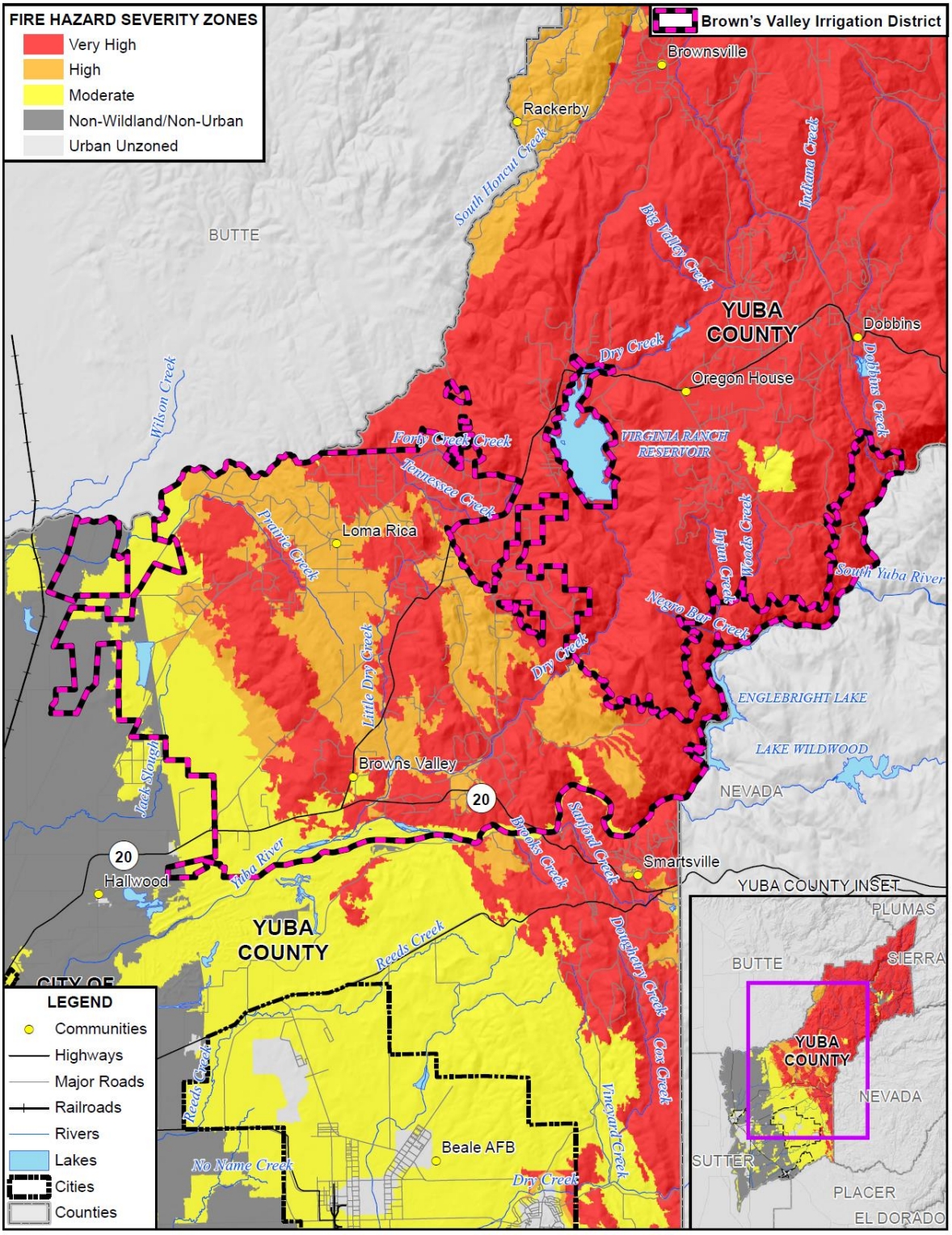
Wildland fire and the risk of a conflagration is an ongoing concern for the BVID. Throughout California, communities are increasingly concerned about wildfire safety as increased development in the foothills and mountain areas and subsequent fire control practices have affected the natural cycle of the ecosystem. Wildland fires affect grass, forest, and brushlands, as well as any structures located within them. Where there is human access to wildland areas the risk of fire increases due to a greater chance for human carelessness and historical fire management practices. Historically, the fire season extends from early spring through late fall of each year during the hotter, dryer months; however, in recent years, the risk of wildfire has become a year around concern. Fire conditions arise from a combination of high temperatures, low moisture content in the air and fuel, accumulation of vegetation, and high winds. While wildfire risk

has predominantly been associated with more remote forested areas and wildland urban interface (WUI) areas, significant wildfires can also occur in more populated, urban areas.

Location and Extent

Wildfire can affect all areas of the District. CAL FIRE has estimated that the risk varies across the District and has created maps showing risk variance. Following the methodology described in Section 4.3.14 of the Base Plan, wildfire maps for the BVID were created. Figure C-7 shows the CAL FIRE FHSZ in the District. As shown on the maps, FHSZs within the District range from Moderate to Very High.

Figure C-7 BVID – Fire Hazard Severity Zones



Data Source: CAL FIRE (Draft 9/2007 - c58fhszl06_1, Adopted, 11/2007 - fhszs06_3_58), Yuba County GIS, Cal-Atlas; Map Date: 1/15/2021.

Wildfires tend to be measured in structure damages, injuries, and loss of life as well as on acres burned. Fires can have a quick speed of onset, especially during periods of drought or during hot dry summer months. Fires can burn for a short period of time, or may have durations lasting for a week or more.

Undeveloped rugged terrain, with heavily forested and highly flammable brush–covered land, long dry summers with high temperatures and high winds can exacerbate the potential for wildland fires. Threat levels are also exacerbated during this period when the population doubles due to the large influx of recreational visitors and tourists who frequent the District. This additional transient population increases the potential for wildland fires from camping, off–road vehicle use, and improper fire prevention practices. Prolonged drought and limited water supply can convert usually irrigated pasture to dry grassland contributing to potential fire risk.

Past Occurrences

There has been three state and seven federal disaster declarations for Yuba County from fire.

Table C-9 Yuba County – State and Federal Disaster Declarations Summary 1950-2020

Disaster Type	State Declarations		Federal Declarations	
	Count	Years	Count	Years
Wildfire	3	1997, 2010, 2017	7	1988, 1999, 2009, 2017 (twice), 2020 (twice)

Source: Cal OES, FEMA

BVID has had approximately multiple major fires since 1909.

The **1997 Williams** fire destroyed thousands of acres and hundreds of structures in Yuba County, including areas in the District.

The **Marysville Fire** occurred **August 16, 2006,** and consumed 442 acres north of Dobbins. In addition to CDF command, 15 personnel were committed in the attack. One residence was destroyed in the fire.

2017 Cascade Fire – The District was affected by the Cascade Fire, which started on October 8 near Cascade Way and Marysville Road (north of Collins Lake). According to the District and CAL FIRE, low humidity, warm weather, and high winds (15-35 mph sustained, with gusts of 40-55 mph) moved the initial fire quickly. It burned almost 10,00 acres of mostly private land. 264 residences and outbuildings were damaged. The District noted that the fire size equaled almost 10% of the District size. The speed at which fire moved and ignition time (11:02 PM) caught many residents off guard. The BVID water distribution system was damaged severely enough to cause water outages and loss of pressure in some areas. Damages included destroyed wooden flumes, destroyed services and other above ground fittings, and trees killed along ditch banks creating hazard to employees, infrastructure, and public. In addition to BVIDs infrastructure, PG&E and AT&T lost poles, lines and other equipment. The majority of District closed due to evacuation orders. Several businesses were closed. Most roads were closed. Schools were closed. Mandatory evacuations were in place for several days. BVID costs to repair uninsured damages were about $219,000.00; much of these costs were reimbursed by Federal and State grants. FEMA declared a Federal

Disaster (DR-4344). The Cascade Fire and the La Porte Fire in Butte County eventually merged, burning 16,140 acres. The combined fires were known as the Wind Incident.

Vulnerability to and Impacts from Wildfire

Risk and vulnerability to the Yuba County Planning Area and the District from wildfire is of significant concern, with some areas of the Planning Area being at greater risk than others as described further in this section. High fuel loads in the Planning Area, combined with a large built environment and population, create the potential for both natural and human-caused fires that can result in loss of life and property. These factors, combined with natural weather conditions common to the area, including periods of drought, high temperatures, low relative humidity, and periodic winds, can result in frequent and potentially catastrophic fires. During the May to October fire season, the dry vegetation and hot and sometimes windy weather results in an increase in the number of ignitions. Any fire, once ignited, has the potential to quickly become a large, out-of-control fire. As development continues throughout the County and the District, especially in these interface areas, the risk and vulnerability to wildfires will likely increase.

Potential impacts from wildfire include loss of life and injuries; damage to structures and other improvements, natural and cultural resources, croplands, and loss of recreational opportunities. Wildfires can cause short-term and long-term disruption to the District. Fires can have devastating effects on watersheds through loss of vegetation and soil erosion, which may impact the District by changing runoff patterns, increasing sedimentation, reducing natural and reservoir water storage capacity, and degrading water quality. Fires can also affect air quality in the District; smoke and air pollution from wildfires can be a severe health hazard. Fire in all directions have cause high particulate smoke days in BVID. Fires in surrounding counties Lake County, Butte County, Tehama County, Plumas County and others have contributed to bad air days.

Although the physical damages and casualties arising from large fires may be severe, it is important to recognize that they also cause significant economic impacts by resulting in a loss of function of buildings and infrastructure. Economic impacts of loss of transportation and utility services may include traffic delays/detours from road and bridge closures and loss of electric power, potable water, and wastewater services. Schools and businesses can be forced to close for extended periods of time. Recently, the threat of wildfire, combined with the potential for high winds, heat, and low humidity, has caused PG&E to initiate PSPSs which can also significantly impact a community through loss of services, business closures, and other impacts associated with loss of power for an extended period. In addition, catastrophic wildfire can create favorable conditions for other hazards such as flooding, landslides, and erosion during the rainy season.

The District's vulnerability to fire arises from its flammable buildings, pipelines, valves, and service boxes. The District uses PVC for its pipelines, which while combustible, does not continue to burn once a flame source is removed. District impacts include destroyed wooden flumes, destroyed services and other above ground fittings, and trees killed along ditch banks creating hazard to employees, infrastructure, and public. In addition to BVIDs infrastructure, PG&E and AT&T can lose poles, lines and other equipment, which can affect District operations. Businesses, schools, and roads can be closed. Mandatory evacuations may be put in place. BVID can suffer costs to repair uninsured damages that may or may not be reimbursed by federal and state grants.

Some District pipelines have valve connections which can be used for firefighting purposes. While the District allows these valves to be used for firefighting purposes, there will be times when no water service is available from these lines. Accordingly, the District makes no guarantee or assurance that water would be available in its water system at all or in adequate quantities or pressure for firefighting purposes.

When necessary, water from Collins Lake can be accessed through aerial pickup for firefighting purposes. There are also four water storage tanks within the District that are used to fight fires. These tanks are strategically placed within the District to provide quick access to fire response units, and range in capacity from 2,500 to 10,000 gallons. These tanks are privately owned and are on private property. Tanks are refilled from well water, springs, local irrigation canals, and ditches. There are privately owned tanks throughout the District. Staff are unsure of the capacity of these tanks. Yuba County (in coordination with CAL FIRE) required water tanks for fire protection purposes to be install on properties as part of building permit requirements. Some of the subdivisions in the District (the District is unsure of the number) have fire ponds that feed water to wharf/hydrant valves. BVID has no ponds or holding tanks dedicated to fire suppression and has no knowledge of the readiness of any of the private water tanks or any of the fire ponds.

Assets at Risk

Besides the threat to the people in the District, the greatest damage impact to the District would be the total loss of BVID infrastructure from a wildland fire. The loss occurs from two sources, the direct loss due to the destruction of BVID assets by fire and the loss that occurs when heavy equipment maneuvers over BVID assets during firefighting. All assets have vulnerability to fire damage. After losing wood flumes in the 2007 fire, they were replaced with metal flumes that should prove to be more resistant to fire. Pipelines and above ground control structures, anti-siphoning devices, control valves, etc. are vulnerable to vehicular damage as they maintain low profile to the ground and can go unseen.

C.6 Capability Assessment

Capabilities are the programs and policies currently in use to reduce hazard impacts or that could be used to implement hazard mitigation activities. This capabilities assessment is divided into five sections: regulatory mitigation capabilities, administrative and technical mitigation capabilities, fiscal mitigation capabilities, mitigation education, outreach, and partnerships, and other mitigation efforts.

C.6.1. Regulatory Mitigation Capabilities

Table C-10 lists regulatory mitigation capabilities, including planning and land management tools, typically used by local jurisdictions to implement hazard mitigation activities and indicates those that are in place in the BVID.

Table C-10 BVID Regulatory Mitigation Capabilities

Plans	Y/N Year	Does the plan/program address hazards? Does the plan identify projects to include in the mitigation strategy? Can the plan be used to implement mitigation actions?
Comprehensive/Master Plan/General Plan	N	BVID reviews Yuba County General Plan when necessary. This plan includes Hazard mitigation strategies. BVID coordinates with YC and other local agencies when appropriate.
Capital Improvements Plan	Y	A yearly plan through budgeting process identify capital improvement needs. Longer term or more expensive projects are subject to committee meetings and board Actions, memorialized in Board minutes. Reasons behind projects are to mitigate water losses or improve efficiency.
Economic Development Plan	Y	Prop 218 rate studies, last one was 2016. Costs of operating District identify every day and unexpected costs including mitigating disaster. Through budgeting and board meetings identify improvements in District that can help generate revenue to reduce costs passed on to customers
Local Emergency Operations Plan	Y	Emergency Action Plan, FERC Security Assessment, Yuba County Local hazard mitigation Plan. Identifies hazards and helps develop most effective mitigation through deployment of the plan which coordinates several first responder organizations.
Continuity of Operations Plan	Y	Plans for Dam Safety have continuity. Regular updates are required and over seen by FERC and DSOD. Many reviews by BVID personnel, Consulting Expert Engineers and Regulatory Agencies result in continuity, identification of hazards and effective mitigation plans.
Transportation Plan	Y	Project specific, addressed in CEQA. Identifies hazard and provides mitigation.
Stormwater Management Plan/Program	Y	Yuba River Bypass Cleaning permit/agreements with ACOE, CDFW and RWQCB. Hazards and mitigations are identified. Not a document however, District seasonally sets up open ditched to drain down natural drains avoiding damage and flood caused by ditch overtopping. BVID also coordinates with Yuba County when necessary.
Engineering Studies for Streams	Y	Probable Maximum Flood Study for Virginia Ranch Dam, results in the identification of potential hazard. Spillway assessment study involving FERC, Consulting Engineers and BVID Staff identify potential issues and mitigation
Community Wildfire Protection Plan	N	However, BVID has requested to be a coordinating agency for Yuba OES to contact to work behind fire lines to keep water facilities in repair and operating.
Other special plans (e.g., brownfields redevelopment, disaster recovery, coastal zone management, climate change adaptation)	Y	Project specific CEQA for projects will identify and provide mitigation for potential hazards caused by a project and appropriate mitigation. Insurance plans are in place to replace critical infrastructure.

Building Code, Permitting, and Inspections	Y/N	Are codes adequately enforced?
Building Code	Y	Yuba County Building Department inspects qualifying construction and equipment. Public Works reviews easement Encroachment Permits and inspects work to mitigate gate potential hazards of any proposed work BVID consults with property owners when they will encroach on BVID easements to mitigate potential hazards of any proposed work.
Building Code Effectiveness Grading Schedule (BCEGS) Score	Y	Yuba County Building Department prior to construction of applicable projects
Fire department ISO rating:	Y	CalFire periodically conducts safety inspection at BVID HQ.
Site plan review requirements	Y	YC Public Works Reviews plans for BVID buildings, etc.
Land Use Planning and Ordinances	**Y/N**	**Is the ordinance an effective measure for reducing hazard impacts? Is the ordinance adequately administered and enforced?**
Zoning ordinance	Y	BVID follows zoning requirements and works with Yuba County when appropriate to reduce hazards. Zoning is enforced adequately.
Subdivision ordinance	Y	BVID as a public agency is provided subdivision maps from Yuba County to comment on. Based on past reviews hazard mitigation and enforcement of ordinances appear to be enforced.
Floodplain ordinance	Y	BVID as a public agency is provided subdivision maps from Yuba County to comment on. Based on past reviews floodplain ordinances appear to be enforced.
Natural hazard specific ordinance (stormwater, steep slope, wildfire)	N	BVID would refer to Yuba County to respond to ordinances relating to Natural Hazards.
Flood insurance rate maps	N	BVID would refer to Yuba County to respond to ordinances relating to Flood Insurance maps.
Elevation Certificates	N	BVID would refer to Yuba County to respond to ordinances relating to Elevation Certificates
Acquisition of land for open space and public recreation uses	N	BVID would refer to Yuba County to respond to ordinances relating to Acquisition of land for open space and public recreation uses
Erosion or sediment control program	N	BVID would refer to Yuba County to respond to ordinances relating to Erosion or sediment control program
Other	Y	BVID Rules and Regulations outline expectation and allowances for its customers. It also outlines the District's enforcement powers. Rules are enforced.
How can these capabilities be expanded and improved to reduce risk?		
BVID has several outlets to participate with YC if necessary. BVID can attend YC Planning Commission Meetings, Pan Development Workshops, continue to review subdivision maps, etc. BVID can continue to develop and update its own Rules and Regulations.		

Source: BVID

2015 BVID Agricultural Water Management Plan

Browns Valley Irrigation District (BVID or District) has prepared this Agricultural Water Management Plan (AWMP) to comply with both the requirements of SBx7-7 and with Governor Browns' Executive Order B-29-15 (April 1, 2015). The District received grant funds from the California Department of Water Resources (DWR) under Proposition 50 to develop this AWMP. Throughout this AWMP, additional water management practices and projects within BVID are identified and described in more detail. The BVID Board of Directors approved and adopted the AWMP on June 23, 2016.

Yuba County IRWMP (2015)

According to DWR, an Integrated Regional Water Management Plan (IRMWP) is a comprehensive planning document to encourage development of voluntary regional strategies for management of water resources. IRWMP's investigate a broad spectrum of water resource management strategies, identify the benefits of integrating water management strategies, and develop priorities for implementing projects and programs. Additionally, IRWMP's serve as comprehensive planning documents which encourage regional strategies and cooperative solutions for issues of water quality, water quantity, and watershed health. The District is an active partner in the Yuba County Regional Water Management Group (Yuba RWMG) and is committed to the successful implementation of the Yuba County Integrated Regional Water Management Plan (Yuba IRWMP). The Yuba IRWMP's objective is to plan efforts supporting solutions the Yuba region, and ensuring sustainable resources. The 2015 update of the Yuba IRWMP was adopted in May of 2015, and is available online at http://yubairwmp.org/the-plan-irwmp. The Yuba IRWMP addresses the local water resource planning and management needs through 2025, and will be referenced throughout this AWMP.

C.6.2. Administrative/Technical Mitigation Capabilities

Table C-11 identifies the District department(s) responsible for activities related to mitigation and loss prevention in BVID.

Table C-11 BVID's Administrative and Technical Mitigation Capabilities

Administration	Y/N	Describe capability Is coordination effective?
Planning Commission	N	n/a
Mitigation Planning Committee	Y	Through their participation on the Yuba County LHMP project.
Maintenance programs to reduce risk (e.g., tree trimming, clearing drainage systems)	Y	Weed abatement along ditch banks. Clearance of downed limbs and trees. Regular maintenance of valves on pipeline/ditches
Mutual aid agreements	N	n/a
Other		
Staff	**Y/N FT/PT**	**Is staffing adequate to enforce regulations? Is staff trained on hazards and mitigation? Is coordination between agencies and staff effective?**
Chief Building Official	N	BVID has no inhouse staff -will work with Yuba County Staff if needed. Staffing is adequate.

Floodplain Administrator	N	BVID has no inhouse staff -will work with Yuba County Staff if needed. Staffing is adequate.
Emergency Manager	Y	BVID does not have someone with this job title, but management staff would assume this responsibility in time of emergency.
Community Planner	N	BVID has no inhouse staff -will work with Yuba County Staff if needed
Civil Engineer	N	BVID will hire outside consultant or utilize qualified public agency engineers in emergency situations.
GIS Coordinator	Y	BVID does have someone who works with GIS information, but it is as needed for infrastructure mapping and is not full time.
Other	N	
Technical		
Warning systems/services (Reverse 911, outdoor warning signals)	N	BVID EAP for Virginia Ranch Dam is with Yuba OES who would put warning system into motion.
Hazard data and information	Y	BVIDs has Emergency Action Plan (EAP) for Virginia Ranch Dam. It is distributed to all applicable local, state, and federal emergency responders.
Grant writing	N	BVID does in house grant writing for minor projects but hires consultants or applies for local help on big projects requiring more detailed applications.
Hazus analysis	N	BVID hires a consultant for necessary Hazus Analysis.
Other		
How can these capabilities be expanded and improved to reduce risk?		
BVID has a small staff and has to stretch those resources as far as possible. Yuba Co. and YCWA have always been effective in coordinating with the District. Additional revenue could lead to additional hiring – though the length and value of the funding would determine what positions would be hired and whether or not they would be full or part time employees (or contract workers).		

Source: BVID

C.6.3. Fiscal Mitigation Capabilities

Table C-12 identifies financial tools or resources that the District could potentially use to help fund mitigation activities.

Table C-12 BVID's Fiscal Mitigation Capabilities

Funding Resource	Access/ Eligibility (Y/N)	Has the funding resource been used in past and for what type of activities? Could the resource be used to fund future mitigation actions?
Capital improvements project funding	Y	Capital improvements have been used on projects that could be considered mitigations. If necessary, could be used for mitigation funds.

Funding Resource	Access/ Eligibility (Y/N)	Has the funding resource been used in past and for what type of activities? Could the resource be used to fund future mitigation actions?
Authority to levy taxes for specific purposes	Y	No current tax. Used in past to construct Virginia Ranch Dam. Could be used in future but must be approved by vote.
Fees for water, sewer, gas, or electric services	Y	Fees go to general operation of the District and could be used to fund mitigations. If necessary, could be used for mitigation funds. Requires Prop 218 Study.
Impact fees for new development	Y	BVID does not have this fee. An easement encroachment fee could be charged.
Storm water utility fee	N	Not a funding mechanism for BVID. District does not operate storm water utility.
Incur debt through general obligation bonds and/or special tax bonds	Y	Has been used in the past to fund building Virginia Ranch Dam (Collins Lake). Must be approved by district wide vote. Would have to be a substantially beneficial project to win enough support to pass a district wide vote.
Incur debt through private activities	N	BVID is a public agency
Community Development Block Grant	N	Unless coordinated with a larger entity such as Yuba County or the State
Other federal funding programs	Y	Have been funded through FEMA disaster grant in 2017. Have also applied for and been selected for USBR water smart grant. The would be pipeline funded by Water Smart grant could fall under drought mitigation as it would save around 3,000 acre-feet of water.
State funding programs	Y	CAOES in 2017 and not sure of other state grants. Not sure of state mitigation opportunities
Other	Y	Local Grant funding. Local Grant along with Federal Water Smart Grant will help fund pipeline considered drought mitigation.
How can these capabilities be expanded and improved to reduce risk?		
BVID has/ could use many of the above funding sources on projects and improvements that would qualify as mitigation. Other grant opportunities may be available including local, state, and federal grants.		

Source: BVID

C.6.4. Mitigation Education, Outreach, and Partnerships

Table C-13 identifies education and outreach programs and methods already in place that could be/or are used to implement mitigation activities and communicate hazard-related information.

Table C-13 BVID's Mitigation Education, Outreach, and Partnerships

Program/Organization	Yes/No	Describe program/organization and how relates to disaster resilience and mitigation. Could the program/organization help implement future mitigation activities?
Local citizen groups or non-profit organizations focused on environmental protection, emergency preparedness, access and functional needs populations, etc.	Yes	Cosumnes, American, Bear & Yuba River Integrated Regional Water Management Plan (CABY), could possibly help with grants concentrating on water quality.
Ongoing public education or information program (e.g., responsible water use, fire safety, household preparedness, environmental education)	No	The District depends on other agencies (Yuba County, Yuba County Water Agency) for outreach on hazards.
Natural disaster or safety related school programs	No	Unaware of school programs
StormReady certification	Yes	Yuba County is a StormReady County. BVID would work through the County.
Firewise Communities certification	No	Yuba Watershed Protection & Firesafe Council but BVID not involved
Public-private partnership initiatives addressing disaster-related issues	Yes	Various agencies conduct tabletop exercises that can overlap in emergency readiness training for other agencies. These agencies include YWA, YC, BVID.
Other		Yuba County provides code reds alert and BVID participates in County emergency exercise. Also participates in YWA EAP exercises. BVID hosts our own EAP exercises that several first responder and operation related organizations attend
How can these capabilities be expanded and improved to reduce risk?		
The District will seek additional grant funding opportunities from FEMA, Cal OES, CA DWR, and other sources. This would allow for staff to put a public education campaign together.		

Source: BVID

C.6.5. Other Mitigation Efforts

The District has many other completed or ongoing mitigation efforts that include the following:

1. Replaced wooden flumes with metal flumes. The first wood flumes replaced with metal flumes were those 7 destroyed in the 2017 Cascade Fire. A few other wooden flumes remained. BVID has now replaced all but one wooden flume with metal ones. The last one should be replaced in late 2021 or early 2022.

2. Installed generator at main office for PSPS.

3. Piped leaky part of ditch to conserve water in Collins Lake.

4. Community outreach during 2021 irrigation season to inform users of short falls and encourage conservation.

Upper Main Canal Water Conservation Project (1990)

BVID's Upper Main Canal was constructed during the Gold Rush Era, and consists of about 20 miles of flumes and ditches. Water losses on the Upper Main Canal were substantial, typical of losses experienced by similar Gold Rush Era water conveyance facilities throughout the Sierra Nevada foothills. In 1990, BVID began a water conservation project to construct a pipeline to deliver water from Collins Lake to serve the area that had previously been served from the Upper Main Canal. With the completion of the project, BVID has terminated the use of the Upper Main Canal for water deliveries, and it is estimated that 5,500 acre feet (AF) of water is conserved each year due to this project.

Regional Issues

On a regional level, BVID is also closely involved with other water users in the area. For example, the Lower Yuba River Accord (Yuba Accord) is a consensus-based, comprehensive program in the region, approved by the State Water Resources Control Board (SWRCB) to protect and enhance 24 miles of aquatic habitat in the Lower Yuba River. The Yuba Accord pilot program was implemented in 2006 and 2007, and was fully implemented in 2008. Since that time, the Yuba Accord has managed flows to protect Chinook salmon and steelhead trout. The Yuba Accord is highly dependent on local surface water and groundwater conjunctive use management operations. There are three integrated agreements that make up the Yuba Accord: a fisheries agreement establishing in-stream flow requirements; a water purchase agreement utilizing some of the higher fishery flows as transferable water supplies for statewide uses; and a conjunctive use agreement between Yuba County Water Agency (YCWA) and local irrigation districts (including BVID), enhancing groundwater substitution transfer opportunities, in addition to a groundwater management program.

C.7 Mitigation Strategy

C.7.1. Mitigation Goals and Objectives

The BVID adopts the hazard mitigation goals and objectives developed by the HMPC and described in Chapter 5 Mitigation Strategy.

C.7.2. Mitigation Actions

The planning team for the BVID identified and prioritized the following mitigation actions based on the risk assessment. Background information and information on how each action will be implemented and administered, such as ideas for implementation, responsible office, potential funding, estimated cost, and timeline are also included. The following hazards were considered a priority for purposes of mitigation action planning:

- Dam Failure
- Drought & Water Shortage
- Floods: 1%/0.2% annual chance
- Floods: Localized Stormwater
- Wildfire

It should be noted that many of the projects submitted by each jurisdiction in Table 5-4 in the Base Plan benefit all jurisdictions whether or not they are the lead agency. Further, many of these mitigation efforts are collaborative efforts among multiple local, state, and federal agencies. In addition, the countywide public outreach action, as well as many of the emergency services actions, apply to all hazards regardless of hazard priority. Collectively, this multi-jurisdictional mitigation strategy includes only those actions and projects which reflect the actual priorities and capacity of each jurisdiction to implement over the next 5-years covered by this plan. It should further be noted, that although a jurisdiction may not have specific projects identified for each priority hazard for the five year coverage of this planning process, each jurisdiction has focused on identifying those projects which are realistic and reasonable for them to implement and would like to preserve their hazard priorities should future projects be identified where the implementing jurisdiction has the future capacity to implement.

Multi-Hazard Actions

Action 1. Install Backup Natural Gas Tank and Generator

Hazards Addressed: Dam Failure

Goals Addressed: 1, 2, 3, 4, 5, 6

Issue/Background: The in place auxiliary power battery bank is designed to keep power to panel and phone system. Monitoring upgrades, SCADA, Cameras, Internet, and VOIP phone line allow for real time site information but these improvements have also increased the power draw, which now requires a greater auxiliary power source for power outages than is currently available.

Project Description: Add auxiliary power to Virginia Ranch Dam powerhouse to run surveillance equipment, monitoring equipment and alarm redial equipment. A natural gas generator would be the most cost-effective option. BVID may need approval from DSOD and FERC and special protective requirements may be needed.

Other Alternatives: Looked at increasing battery capacity and solar.

Existing Planning Mechanisms through which Action will be Implemented: Budget committee

Responsible Office: BVID Management

Priority (H, M, L): High

Cost Estimate: $15,000

Potential Funding: Grants, BVID capital improvement fund

Benefits (avoided Losses): continued remote access to cameras, redial alarm system and other monitoring equipment during power outages. If power outage is during a storm, this is one of the most critical times to be able to monitor the Dam.

Schedule: 2021/2022

Action 2. Public Outreach via Newsletter and Mobile Phone Text

Hazards Addressed: Drought & Wildfire (or other emergencies)

Goals Addressed: 1, 2, 3, 4, 5, 6

Issue/Background: During drought years the District asks its customers to conserve water. Many residents are new to the area so providing a newsletter/website with resources can help these new customers and customers that may want to try new ways to save water. Also keep customers aware of breaks.

Project Description: Public outreach and education. Start monthly mailings to educate customers about the District and make them aware of anything of extreme important. This mailing can be used to pass along drought education, updates, best practices, fire safety, etc. It is a perfect tool to broach any important topic affecting the District. Staff has also looked into a texting app that could send out a mass message regarding important events such as Season start, season end, rain induced shutoff, or more location specific notices such as breaks.

Other Alternatives: Social media, website

Existing Planning Mechanisms through which Action will be Implemented: Drought committee

Responsible Office: BVID management

Priority (H, M, L): High

Cost Estimate: $2000 per mailing & $100 per mass text

Potential Funding: Water rates, capital improvement

Benefits (avoided Losses): Potentially extended water season by customer engagement and conservation. Keep customers informed of outages and major announcements.

Schedule: 2021

Action 3. Sicard Flat Ditch with Pipeline

Hazards Addressed: Drought and Water Shortage

Goals Addressed: 1, 2, 3, 4, 5, 6

Issue/Background: over a season Sicard Flat Ditch can lose ~3,000AF of water. Piping the ditch could convert the lost water to 3-4 more weeks of water in critical drought years.

Project Description: The project will replace the open ditch about 12 miles with a pipeline. Half the pipeline will follow existing ditch and the other side will follow a new route along roads and in new easements. District has 90% plans, is working on CEQA, NEPA, permitting, and easement acquisition for the project.

Other Alternatives: line the ditch with concern or plastic liner. This is a short time solution compared to piping.

Existing Planning Mechanisms through which Action will be Implemented: BVID pipeline committee & board of directors.

Responsible Office: BVID management

Priority (H, M, L): High

Cost Estimate: $6 – 7 million

Potential Funding: Grant funding, capital improvement funding

Benefits (avoided Losses): Piping the ditch could convert the lost water to 3-4 more weeks of water in critical drought years.

Schedule: 5 years

Action 4. Replace Remaining Wood Flume with Metal Flume during Regular Maintenance

Hazards Addressed: Wildfire

Goals Addressed: 1, 2, 3, 4, 5, 6

Issue/Background: Several flumes and pipes were destroyed during 2017 Cascade Fire. This led to temporary loss of water to areas affected by the fire. Damaged flumes were replaced with metal flumes, which should hold up better in a fire. The district has a one remaining wood flume

Project Description: Replace wood flumes with metal flume. Only one left to replace.

Other Alternatives: Pipe the ditch and altogether eliminate the need for flumes. This would be much more expensive. It is the plan at some point but I so far down the line there is no schedule.

Existing Planning Mechanisms through which Action will be Implemented: maintenance decision. Flumes require upkeep and approval is not typically needed.

Responsible Office: BVID management

Priority (H, M, L): medium

Cost Estimate: $20,000

Potential Funding: Capital Improvements

Benefits (avoided Losses): potentially increase likelihood of water availability during a fire event.

Schedule: 2021 or 2022

Action 5. Relocate Bypass Channel that Supplies Yuba River Water to BVID Fish Screen/Pump Station

Hazards Addressed: Floods: 1%/0.2% Annual Chance and Localized Flood

Goals Addressed: 1, 2, 3, 4, 5, 6

Issue/Background: Fish screen was built on the mainstem of Yuba River. River moved so gravel bar between screen and river. District built bypass through bar to river, restoring flow to fish screen and pump station. Maintaining bypass requires permitting and much coordination. Rerouting bypass and establishing a self-cleaning channel would be ideal.

Project Description: Extend bypass channel along training wall all the way to the Yuba River main stem about 1,000'. Studies, engineering and environmental would need to take place. Substantial mitigations may be needed.

Other Alternatives: continue as is

Existing Planning Mechanisms through which Action will be Implemented: None. BVID wants to be ready if a qualifying grant becomes available.

Responsible Office: BVID

Priority (H, M, L): Low

Cost Estimate: Not sure probably in the range of $1,000,000.00

Potential Funding: Grant

Benefits (avoided Losses): Potential situation where water is unavailable to part of the District's agricultural (rice) area if water is needed, and regulatory agencies denies District emergency cleaning request.

Schedule: n/a

Action 6. Update Collins Lake Drawdown vs Lake Level Chart

Hazards Addressed: Drought and Water Shorage

Goals Addressed: 1, 2, 3, 4, 5, 6

Issue/Background: BVID determines the amount of water left in the lake using a chart developed in 1966. When releases from the Lake are compared to numbers from the chart, there are some discrepancies. For better planning, especially during drought years, BVID wants to update the lake volume chart.

Project Description: Hire consultant to conduct study with boat sonar or combined boat sonar and Lidar fly over and generate new foot contour and lake volume capacity of Collins Lake water storage totals, both usable and total.

Other Alternatives: calculate difference between outflow and chart provided volume. This would take several years and can affected by inputs such as rainfall or unmeasured flows upstream.

Existing Planning Mechanisms through which Action will be Implemented: Drought committee, Board of Directors.

Responsible Office: BVID

Priority (H, M, L): medium to low

Cost Estimate: $20,000

Potential Funding: Grant or Water fees.

Benefits (avoided Losses): Better planning during drought years.

Schedule: unplanned