2020 Upper Mokelumne River Watershed Sanitary Survey Update

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1.0 INTRODUCTION

This report presents the findings of the 2020 Watershed Sanitary Survey (WSS) for the Upper Mokelumne River Watershed (Watershed). The WSS was conducted for Calaveras County Water District (CCWD) and Calaveras Public Utility District (CPUD) to comply with California State Water Resources Board (SWRCB) Division of Drinking Water (DDW) regulations. This WSS represents the five-year update to previous sanitary surveys and Watershed analyses, including:

- Report for Mokelumne River Watershed Sanitary Survey, November 1995
- Upper Mokelumne River Sanitary Survey Final Report, December 2000
- Watershed Sanitary Survey 2005 Update for the Upper Mokelumne Watershed
- 2010 Upper Mokelumne River Watershed Sanitary Survey, October 2011
- 2015 Upper Mokelumne River Watershed Sanitary Survey, August 2016
- Calaveras County Mokelumne River Long-Term Water Needs Study, September 2017

The Background, Objectives and Organization of this WSS are described below:

1.1 BACKGROUND

The Upper Mokelumne River Watershed (Watershed) consists of the Middle and South Forks of the Mokelumne River, and their tributaries, including: Bear and Forest Creeks on the Middle Fork, Licking Fork on the South Fork, and several smaller unnamed streams on both forks. The Watershed is located entirely within Calaveras County (County). The Watershed provides the principal surface water supply sources for CCWD's West Point Service Area (West Point), and CPUD's San Andreas and Mokelumne Hill water systems (CPUD Systems). CCWD owns and operates the West Point Water Treatment Plant (WTP) for West Point, and CPUD owns and operates the Jeff Davis WTP near Railroad Flat for their CPUD Systems. Figure 1 presents the location of the Watershed. Only West Point is located within the Watershed, while the CPUD Systems are located to the southwest of the Watershed. CCWD and CPUD each maintain diversions and treatment plant raw water reservoirs in the Watershed, the Bummerville Regulating Reservoir and Jeff Davis Reservoir, respectively. No public access is permitted at either of these reservoirs. CPUD also owns Schaad's Reservoir which permits public access under specific terms set by the property owner; CPUD does not regulate public access to this facility.

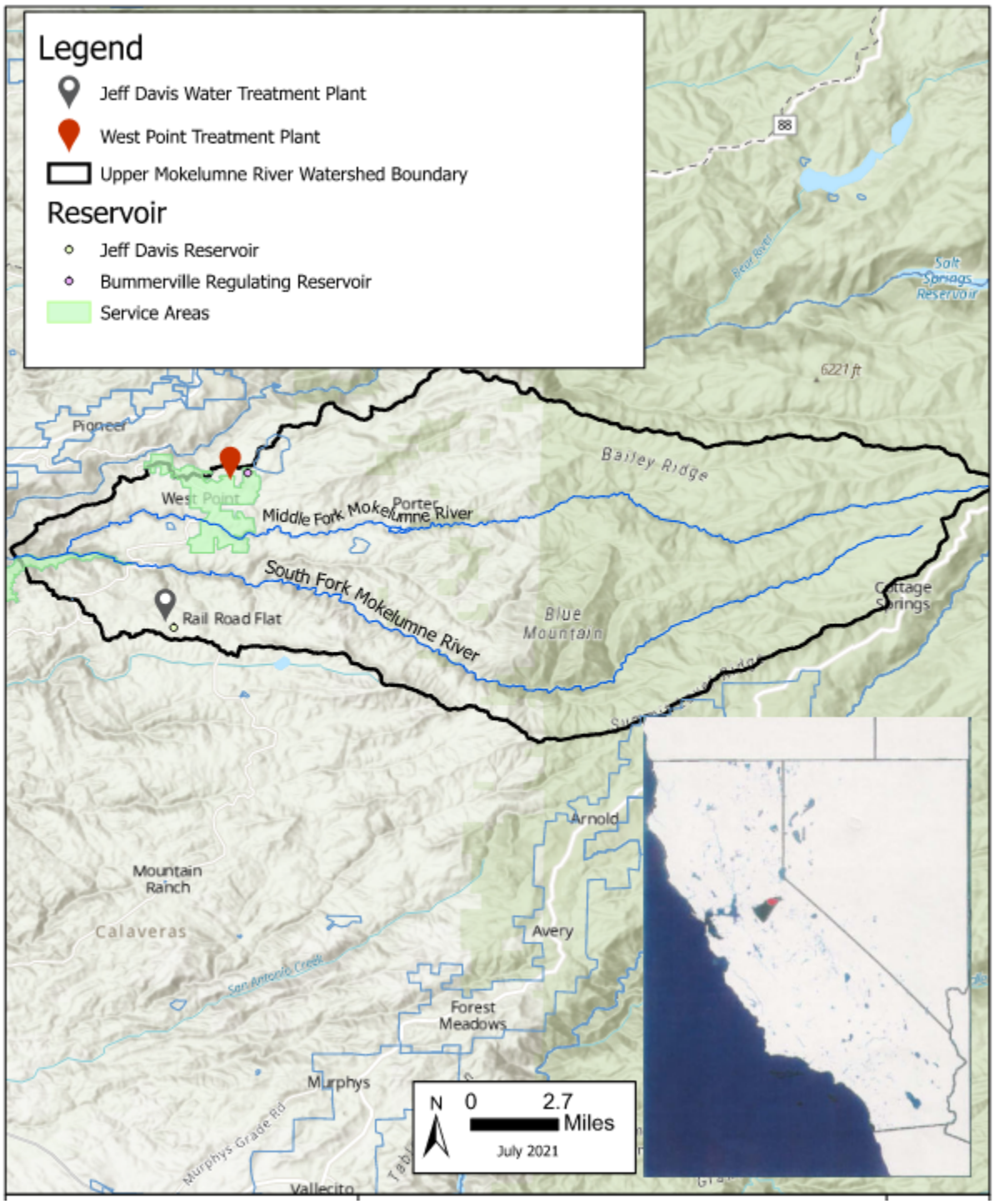

Figure 1. Upper Mokelumne River Watershed

Serviced Population

The West Point and CPUD System areas serviced an estimated 7,297 people in total (in 2020). Population growth in these areas over the past 5 years has been continuously declining. Although growth was predicted to increase from 2015, when these areas serviced 7,339 people,

the latest 2020 California Department of Finance (DOF) data confirm the declining rate of approximately -0.28% per year. There are likely several reasons for the population decline, such as local economic conditions, housing prices, or the 2020 COVID-19 Coronavirus Pandemic, which are all beyond the scope of this WSS. Per DOF, future growth projections indicate an continued forecasted decrease at an average rate of -0.64% per year between 2020 and 2060.

Watershed Planning Activities

The Mokelumne River Watershed has been dramatically altered over the 20th Century, with several reservoirs, diversions, and hydropower facilities having been developed mostly to benefit water supplies for the East Bay Municipal Utilities District (EBMUD) and Amador Water Agency (AWA), and for power generation by the Pacific Gas & Electric Company (PG&E). CCWD and CPUD maintains watershed management responsibilities for its Upper Mokelumne River Watershed portions within the County, but frequently coordinates with these other agencies regarding broader Mokelumne River Watershed issues.

The key forums for agency coordination are the Upper Mokelumne River Watershed Authority (UMRWA) and Mokelumne-Amador-Calaveras Integrated Regional Water Management group (MAC IRWM). Both the UMRWA and MAC IRWM organizations focus on integrated water management projects and programs that enhance water supply systems and watershed management efforts for the Mokelumne River Watershed upstream of EBMUD's Pardee and Camanche Reservoirs. CCWD, CPUD, AWA, EBMUD, and other agencies are members of UMRWA and the MAC IRWM. A discussion of related efforts is presented in Section 2.0 below.

Other WSS Coverage

This WSS covers the Upper Mokelumne River Watershed within Calaveras County. Other agencies in different parts of the broader Mokelumne River Watershed prepare separate WSS documents for their compliance with DDW regulations. A list of these of WSSs is provide below, for reference purposes. Some contents are coordinated between this WSS and the other efforts, to the extent that water quality controls or issues upstream may impact downstream water users.

- EBMUD Mokelumne River Watershed Sanitary Survey (latest 2005 Update): covers North Fork Mokelumne River and EBMUD Mokelumne Aqueduct diversion facilities, including their Pardee and Camanche Reservoirs.

- City of Lodi Lower Mokelumne River Watershed Sanitary Survey (latest 2015 Update): covers Mokelumne River downstream of Camanche Reservoir to City of Lodi diversions for surface water treatment facilities.

1.2 OBJECTIVES

On behalf of CCWD and CPUD, the objectives of this WSS are to:

- Satisfy requirements of DDW regulations;
- Assess Watershed land and hydrologic conditions which could affect the quality of water used at the WTPs;
- Identify Watershed management practices that have the potential to reduce existing and future contaminant loading, and
- Conduct analyses of 5-year raw and finished water quality data, and compare data with standards included in the current and future Surface Water Treatment and Disinfection Byproducts Rules.

1.3 REPORT ORGANIZATION

This WSS includes the following sections:

- Section 1.0 - Introduction
- Section 2.0 - Summary of Progress Since 2015
- Section 3.0 - Watershed Description
- Section 4.0 - Water Supply Systems
- Section 5.0 - Potential Contaminant Sources
- Section 6.0 - Water Quality
- Section 7.0 - Conclusions and Recommendations
- Section 8.0 - References

2.0 SUMMARY OF PROGRESS SINCE 2015

The 2015 Upper Mokelumne River Watershed Sanitary Survey (2015 Update) presented conclusions and recommendations for improving drinking water quality in the Watershed, per then-applicable DDW regulations. That 2015 Update concluded that water quality conditions in the Upper Mokelumne River Watershed had not changed significantly since prior surveys, and were not expected to change significantly in the foreseeable future owing to relatively stable rural conditions and few pollutant sources. Given the water quality data for both the West Point and the Jeff Davis WTPs in the 2015 Update, it appeared they were able to meet water quality goals and were expected to meet foreseeable future SWRCB regulations.

The most significant potential contaminant sources that could impact water quality, identified in the 2015 Update, were private septic system failures, large Watershed wildfire event(s), erosion, new land development(s), rural grazing areas with livestock, and wild animals. The 2015 Update (reviewing 2010 through 2015 years) recommended that measures be taken to enforce new regulations on septic systems, and that both CCWD and CPUD better prepare their infrastructure for wildfires, to the extent practicable. In 2012, Calaveras County updated the Rules and Regulations for Onsite Wastewater Treatment Systems (septic tanks). The new regulations were a response to California Assembly Bill (AB) 885, implementing new permitting, siting, and inspection requirements, including addressing the proximity of septic tanks to sources of water supply. During development of the 2015 Update, CCWD and CPUD were in the process of developing compliance actions for the County regulation. In 2013, the MAC Integrated Regional Water Management Plan Update (MAC IRWM Plan) addressed potential water resource issues and conflicts such as land use and water use conflicts, environmental protection, water quality conflicts, forest management, and fire management. UMRWA and MAC IRWM have continued coordination and adopted an update to the MAC IRWM Plan to comply with California Proposition 1 IRWM program requirements regarding water resources planning efforts.

From the 2015 Update and MAC IRWM Plan, the list below identifies the major conflicts and issues for the Watershed (in no particular order):

1. Land and Water Use Conflicts
    - Development and maintenance of infrastructure in low density areas.
    - Watershed protection versus economic and land developments.
2. Environmental Protection
    - Coordination with federal, state, and County land management agencies and understanding of project and program environmental impacts.
    - Invasive species control and pest mitigation.
    - Watershed forest and biomass management (e.g., wildfire severity mitigation).

3. Water Quality Conflicts
    - Water-related recreational opportunities versus resultant water quality impacts.
    - Wastewater discharge impacts to water quality (e.g., spray and leach fields).
    - Failing (private) septic system contaminant leakage.
    - Improper disposal of household wastes.
    - Inactive and legacy mines without restoration, causing potential leaching of soils with high mineral content and contaminant runoff.
    - Road maintenance practices that contribute to erosion, peak runoff, and transport of sediments and contaminant runoff.
4. Water Supply Management
    - Drought and dry hydrologic conditions impacting available supplies.
    - Potential climate change impacts to Watershed hydrology.
    - Multiple and potentially conflicting Watershed diverters and water users (i.e., water rights concerns).
    - Several Watershed meadows require rehabilitation to increase water (snowpack) sequestration in winter months.
5. Forest Management
    - Timber operations disturbs vegetation and soils contributing to sediment loading.
    - Changes in vegetation densities outside the naturally occurring conditions.
6. Fire Management
    - Vegetation and soil disturbances caused by wildfire event(s) contributing to sediment loading.
    - Fire containment responses to protect landowner property and environment.
    - Biomass removal of excess fuels in forested landscapes.
7. Economic Impacts
    - Costs of project and program financing (e.g., water supply projects, forest and fire management efforts).
    - Aging water and wastewater infrastructure.

The MAC IRWM Plan solicited specific Watershed projects to address the issues listed above, and other MAC and UMRWA needs. Table 1 presents the projects identified in the latest MAC IRWM Plan.

Table 1. Watershed Issues Addressed by MAC IRWM Plan Projects

Problem/Issue	Objective or Solution	Project(s) Meeting Objective
Sediment loading and buildup has decreased the water storage capacity of certain Watershed reservoirs.	Study the potential of rehabilitating and expanding existing reservoirs to increase water storage capacity by dredging sediments.	PG&E Storage Recovery of Salt Spring Valley and Upper/Lower Bear River Reservoirs on North Fork Mokelumne River *(pilot project for other reservoirs).*
Customer water meters located in variety of box types and are arduous, inefficient, and time-consuming to manually read.	Implement upgraded automated meter replacement project, referred to as "Automated Meter Infrastructure" (AMI).	CCWD West Point AMI Conversation Project (AMI being implemented for all CCWD service areas).
Aging reservoir infrastructure (dam) issues with seepage issues, failing outlet controls, and other problems.	Rehabilitate reservoir(s) for environmental restoration, or repair aging infrastructure.	CCWD Wilson Dam Meadow Restoration and Habitat Enhancement Plan
Watershed meadow lands have been degraded over time with drought conditions, developments, and other natural hazards.	Restore high-elevation meadows to approximate natural function to provide water supply, water storage, and ecosystem enhancement benefits.	Mokelumne High Country Project in portions of Mokelumne Wilderness (Multi UMRWA member effort)
Noxious and nonnative weeds and plants have been proliferating along Amador and Calaveras County waterways.	Develop maps of noxious weed infestations along local waterways and to work with community and river/water stakeholders to explore eradication options and develop an eradication plan.	Develop Riparian Noxious Weed Abatement Plan for Calaveras and Amador Counties, and for key Watershed areas.
No landowner's reference guide for ongoing planning efforts, water resources management contacts, or other information currently exists for the Watershed.	Develop a Watershed landowner's guide.	Develop a Watershed landowner's guide, with details specific to each agency (e.g., CCWD and CPUD).
Sedimentation occurs in watershed streams and other water bodies in the Mokelumne River Watershed, adversely impacts water quality and aquatic resources.	Identify the current level and sources of sediment delivery to the Mokelumne River Watershed and select, prioritize, and implement restoration actions to improve watershed conditions.	Example projects include development of the Upper Mokelumne Erosion and Water Quality Assessment and Restoration Plan, and the South Fork Mokelumne River Watershed Restoration effort.
The West Point WTP is currently in violation with the California Department of Public Health regarding installation of a backup filter system for redundance purposes.	Install a backup filtration system at the West Point WTP.	CCWD is implementing the West Point WTP Drinking Water Compliance Project via grant funding received through the MAC IRWM group.
Chinook salmon and steelhead populations have been blocked from historic Watershed spawning habitat by dams and other facilities.	Study fish habitat improvement programs and implement a program to restore spawning salmon and steelhead populations.	Broad effort towards restoring the Upper Mokelumne's Anadromous Fish Populations (specific efforts to be determined).
Certain lands of the Middle Fork Mokelumne River requires restoration and maintenance to improve forest resiliency, watershed conditions, meadow function, and wildlife and ethno-botanical connectivity and diversity.	Implement landscape restoration treatments.	Hemlock Forest Restoration Water Yield Project Study

3.0 WATERSHED DESCRIPTION

A description of the Watershed, including the Sub-Watersheds of the Middle Fork Mokelumne River, with Bear and Forest Creeks, and the South Fork Mokelumne River, with Licking Fork, are presented in this section. Figure 2 illustrates the location of each sub-watershed.

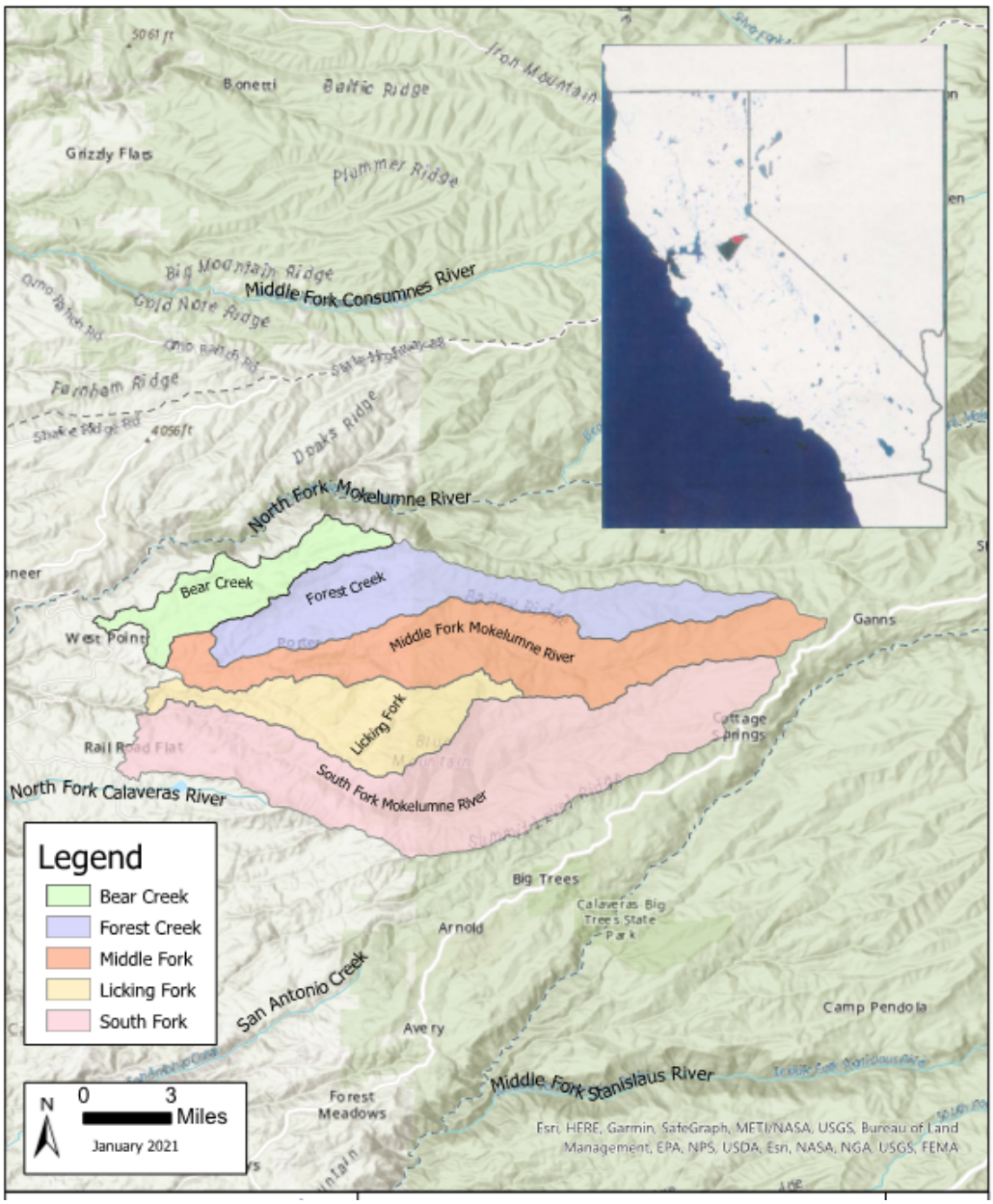

Figure 2. Sub-Watersheds of the Upper Mokelumne River Watershed (from USGS HUC-12 dataset)

3.1 WATERSHED OVERVIEW

The Watershed, as defined in this WSS, is an informal consolidation of US Geologic Survey (USGS) Hydrologic Unit Code (HUC)[1] watershed boundaries covering the principal waterways used by CCWD and CPUD in the Mokelumne River Watershed for water supply purposes. The "Upper Mokelumne River Watershed" name is based on a reference to the broader Mokelumne River Watershed located upstream of EBMUD's Pardee and Camanche Reservoirs. As noted in Section 1.1, only the West Point Service Area lies within the Watershed, while the CPUD Systems are located to the Southwest for Mokelumne Hill and San Andreas. Both the Watershed boundary and naming conventions presented in this WSS are not intended to formally establish a watershed designation for purposes beyond this WSS for CCWD and CPUD. Table 2 below presents the size of each HUC Sub-Watershed shown in Figure 2.

Table 2. Sub-Watershed of Upper Mokelumne River Watershed

Sub-Watershed Name	Area (square miles)	Percent of Total Area	Features/Facilities
Bear Creek	10.1	7%	CCWD: Wilson Lake, Bear Creek Diversion, and Bummerville Regulating Reservoir
Forest Creek	23.8	15%	
Middle Fork Mokelumne	41.5	27%	CPUD: Schaads Reservoir
Licking Fork	16.8	11%	
South Fork Mokelumne	61.8	40%	CPUD: South Fork Diversion
Total	**154.0**	--	

Watershed Contaminant Sources

Calaveras County adopted their General Plan in November 2019. That General Plan analyzed County-wide land use and population trends for the purposes of guiding County government services and providing useful analyses to CCWD and CPUD for water utility service planning. The list below highlights the key finding from the General Plan which may impact contaminant sources and could contribute to water quality degradation in the Watershed:

- *Land Use:* The Watershed is comprised of mostly open-space and forest lands with small concentrations of residential development. Specific land uses include resource management, resource production, working lands, rural transition, and public/institutional
- *Land Ownership*: Land ownership within the Watershed is mostly private except for federally protected lands including the Stanislaus National Forest and Mokelumne Wilderness. These federal lands comprise most of the watershed and are actively managed by the U.S. Forest Service (USFS), in coordination with other state and federal

[1] HUC 12-Digit Hydrologic Unit (HUC 12) was used to identify the hydrologic areas, following USGS Federal Standards and Procedures for the National Watershed Boundary Dataset, 4th ed. 2013.

partner agencies. Sierra Pacific Industries (SPI), a forest products company operating in California and Washington, owns and manages many of the private properties in the Watershed for timber harvest purposes.

- *Residential Areas:* As noted above, the Watershed is sparsely populated with a few scattered unincorporated communities. These communities include West Point, Wilseyville, Bummerville, and Lynn Park Acres (comprising CCWD's West Point Service Area), and Glencoe and Railroad Flat. Most of these residential areas are in the lower elevation portions of the Watershed.
- *Agriculture:* There are a few higher-valued crop orchards and vineyards in the Watershed, including some apple and walnut orchards and small/boutique wine grape vineyards. No other agriculture is present except for SPI timber harvesting, constituting most of the agricultural operations.
- *Cattle Grazing:* Grazing on public and private land is common in the lower portions of the Watershed, typically on lands which were developed as open range in the late 19th Century and early 20th Century. Some of these rangelands have since been abandoned.
- *Mining*: As with much of the Sierra Nevada Mountain areas, mining operations were once very active in the Watershed. There are currently two active mining operations remaining. A review of historic mining maps (See Figure 3) suggests that there are many abandoned and legacy mine sites scattered across the Watershed which may require some form of rehabilitation to prevent water quality or other issues.
- *Recreation*: Outdoor recreation activities in the Watershed include fishing, camping, and hiking. No body contact water recreation occurs in the primary CCWD and CPUD reservoir storage systems, Bummerville and Schaads, respectively. However, CCWD believes there are likely on-lake summer recreational activities which occur at Wilson Lake on Bear Creek upstream of the Bear Creek Diversion (Wilson Lake is not protected from public access).

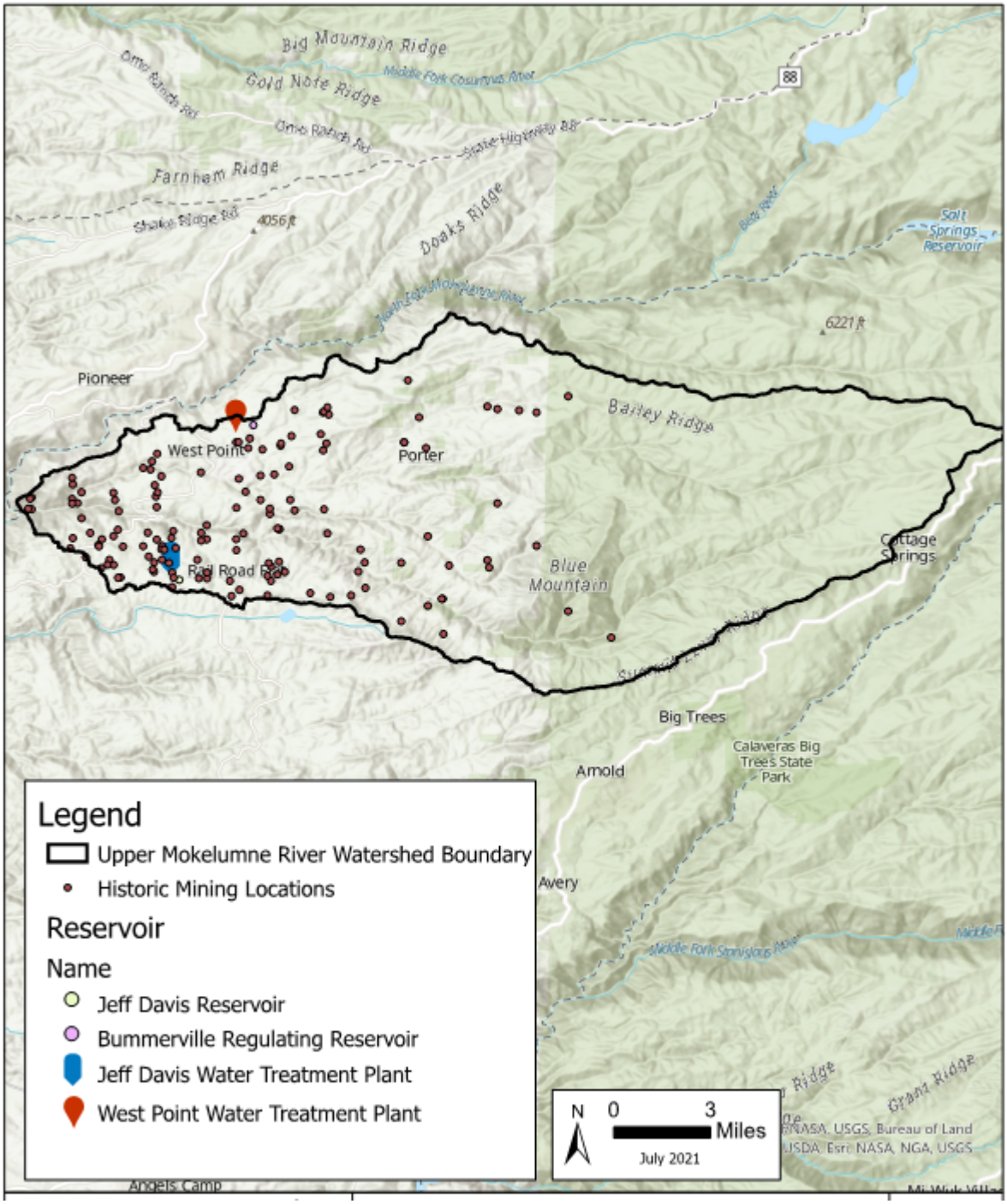

Figure 3. Upper Mokelumne Watershed Historic Mining Map

Natural Setting

The Watershed covers portions of the northeastern part of the County, in the Sierra Nevada Mountains. The Middle and South Forks of the Mokelumne River originate on the western slope of the Sierra Nevada Mountains at an elevation of approximately 7,000 feet. At this elevation, there are generally sparce forests and granite rock formations which form several peaks and

valleys where runoff collects and drains to the streams. The hydrology of these waterways is largely based on accumulated precipitation (via snowpack) during the winter months, typically October through May, which melts and flows to lower elevations during Spring and early-Summer months. Additional details for the Sub-Watershed settings are provided below:

- ***Setting of Middle Fork Mokelumne River, Bear and Forest Creeks*:** These waterways are located entirely within the County between the North and South Fork of the Mokelumne River. Major tributaries include Forest Creek, which enters the Middle Fork Mokelumne River roughly 2.5 miles east of Wilseyville, and Bear Creek which flows into the Middle Fork about 1 mile east of Wilseyville. Communities in these Sub-Watersheds include West Point, Wilseyville, Bummerville, and Lynn Park Acres (comprising CCWD's West Point Service Area). State Highway 26 runs along the western portion of these Sub-Watersheds, passing through West Point and Wilseyville.
- ***Setting of South Fork Mokelumne River and Licking Fork:*** These waterways are also located entirely within the County. The major tributary is Licking Fork, which flows into the South Fork Mokelumne River approximately 1 mile southeast of Wilseyville. Communities in these Sub-Watersheds include Railroad Flat and Glencoe. Glencoe relies on privately obtained water supplies and is not serviced by CCWD or CPUD. State Highway 26 also runs through these Sub-Watersheds as the main thoroughfare to nearby areas.
- ***Climate*:** Mild, dry summers and moderately wet winters in the mountainous northern portion of the County, with temperatures ranging from the low-30's to the low-90's deg-F, sometimes exceeding the mid-90's during the summer. Average January low for West Point is around 33 deg-F, and the average July high is around 93 deg-F. Usual precipitation during winter months, typically October through following April, is mostly as rain with some snow during particularly cold temperature spells. Average long-term precipitation (since 2003) is around 35.6 inches per year; typical range is between 23 and 48 inches per year. Cumulative seasonal snowfalls depths above 6,000 feet typically approach 400 inches, with compacted snow depths attaining 100 inches or more. Since most of the area of the Watershed is below 5,000 feet elevation, precipitation occurs primarily as rain.
- ***Geology:*** The Watershed is in the Sierra Nevada Geomorphic Province, characterized by Paleozoic metamorphic rocks, granitic rocks of the Sierra Nevada batholith, and Tertiary volcanic rocks. Additional details are provided below:
    - *Paleozoic Metamorphic Rocks*: Paleozoic metamorphic rocks crop out prominently in the Western Sierra Nevada Foothills. These highly variable, complexly deformed rocks are the result of low-grade metamorphism of sedimentary and volcanic rocks. Rocks within the Watershed are part of the Calaveras Formation. This formation includes lenses of recrystallized

limestone and dolomite with some quartz-mica schist, graphitic schist, metachert, quartzite, and slate.

- *Granite Batholith Rocks:* The Sierra Nevada Mountains are comprised primarily of granitic mafic rock. This mafic rock intrudes the metamorphic rocks of the watershed, with granodiorite the most common rock type. The rock in the area has weathered into decomposed granite unevenly to depths ranging from a few feet to over 100 feet.
- *Volcanic Rocks:* Tertiary volcanic rock is present on ridge tops in the watershed which are part of the Mehrten Formation and the Valley Springs Formation. These geologic formations consist of Andesitic detritus, mudflows, massive andesite, sand, and gravel. A thick unit of welded rhyolite tuff of the Valley Springs Formation crops out on the hill just east of the Licking Fork. The Valley Springs Formation is Miocene in age and is composed of a series of interbedded, light-colored vitric tuff and welded tuff units. Five small, flow-banded dacitic and rhyodacitic volcanic domes of iocene-Pliocene age occur along the Melones fault near Mokelumne Hill.

- ***Soils:*** The higher elevations of the Watershed have shallow to deep, medium-textured-stony soils, weathered from metamorphic or granitic rock. These soils are located on a variety of topographic settings including ridge tops and steep canyon sides. Shallow soil layers above bedrock are a common feature in the Watershed. This poses a particular problem where septic systems are installed at a depth below ground level which, although installed consistent with permitting guidelines, could cause water quality and other erosion concerns.
- ***Vegetation***: The Watershed contains vegetation found commonly in the Sierra Nevada Mountains and associated foothills. This vegetation includes ponderosa pine, black oak, and other mixed conifer communities. Ponderosa Pines are most common between 2,000- and 5,000-feet elevation. Black oak is abundant in the lower Watershed canyons. Mixed conifers are common in moist areas between 3,000 and 6,000 feet. White Fir is a common coniferous species at higher elevations. Open grasslands, dense oak woodlands, and oak savannah communities are common at the lower elevations. Sub-dominant vegetation types include chaparral and riparian scrub communities.

Climate Change

Climate change refers to the long-term change in the statistical distribution of weather patterns in precipitation, temperature, wind, and severe weather events over a period of decades and centuries with respect to 'historically-expected' (average) weather conditions. Climate change can occur from both natural and anthropogenic causes; however, studies have shown that the high levels of greenhouse gas emissions since the late-19th Century have accelerated

the rate of climate change. The potential impacts of climate change are far reaching, and the progression of these changes on environmental conditions has differed around the world.

Specific climate change impacts on a particular region over time are difficult to predict. Rather, generalized effects on regional and statewide climates can be estimated, such as changes in the precipitation, temperature, and environmental (forest and vegetation) conditions which impact the water resources in the watershed and downstream users. The Watershed's surface water supplies are largely dictated by changes in the volume, nature, and timing of precipitation events during the winter months. Accordingly, any adverse effects from climate change on the runoff in these watersheds would aggravate the ability of the CCWD and CPUD to utilize its water infrastructure to provide water supplies which are adequate to meet current and future demands. Moreover, more intense and frequent drought periods impacting the Watershed, as is expected for mid-to-late Century conditions under climate change, could lead to diminished forest and vegetation conditions, more intense wildfire and erosion events, and many other water quality concerns.

4.0 WATER SUPPLY SYSTEMS

There are two water supply systems in the Watershed covered under this WSS:

- *CCWD's West Point Service Area*: single West Point WTP providing treated water supplies to an estimated 1,043 people in communities of West Point, Wilseyville, Bummerville, and Lynn Park Acres. The primary water supply sources are from Bear Creek downstream of CCWD's Wilson Lake, via the Bear Creek Diversion, and from a water purchase agreement with CPUD for Middle Fork Mokelumne River supplies released from Schaads pumped at CCWD's Middle Fork Pumping Plant. CCWD may store its raw water supplies at its 60 acre-foot capacity Bummerville Regulating Reservoir (Bummerville Reservoir).
- *CPUD's Mokelumne Hill and San Andreas Systems:* single Jeff Davis WTP providing treated water supplies to an estimated 6,254 people in communities of Mokelumne Hill and San Andreas. The primary water supply source is the South Fork Mokelumne River, via CPUD's diversion facility. CPUD stores Middle Fork Mokelumne River water at Schaads, although these supplies are only used for hydropower generation, in-stream flow requirements, and to facilitate the agreement with CCWD. CPUD may store its raw water supplies at its 1,800 acre-foot capacity Jeff Davis Reservoir located near its WTP.

Additional details for each of these water supply systems is provided in the sections below.

4.1 CCWD WEST POINT

A map of CCWD's West Point service area is provided in Figure 1. CCWD is permitted to divert up to 4 cubic feet per second (cfs), effectively up to 1,830 acre-feet annually, of raw water

from Bear Creek at its Bear Creek Diversion (per CCWD's Water Rights Permit P015452). These flows are diverted downstream of CCWD's Wilson Lake, gravity fed via pipeline to the Bummerville Reservoir for later treatment at the West Point WTP. Wilson Lake, the Bear Creek Diversion, and Bummerville Reservoir are shown in Figures 4, 5, and 6, respectively. This Bear Creek infrastructure is the primary water supply system for West Point.

Figure 4. Wilson Lake

Figure 5. Bear Creek Diversion

Figure 6. Bummerville Regulating Reservoir

The Bummerville Reservoir is surrounded by private lands with some private residences and private septic systems. The reservoir water quality is effectively protected from septic leakage by an abandoned diversion ditch with surrounds the southern side of the reservoir nearest the private properties. From the Bummerville Reservoir water is pumped to the West Point WTP via an on-site pumping facility.

CCWD also has a July 2006 water supply purchase agreement with CPUD for up to 200 acre-feet of water annually made available to CCWD from Schaads on the Middle Fork Mokelumne River. The original purchase agreement for this configuration dates to 1976, with construction of CCWD's Middle Fork Pumping Plant to facilitate CCWD's purchase of water supplies. Between 2016 and 2020, 29% of CCWD's water supply was sourced from the Middle Fork Mokelumne River under this agreement. Figure 7 shows CCWD's Middle Fork Pumping Plant. CCWD's water diverted from the Middle Fork Mokelumne River can be pumped into Bummerville Reservoir at a rate of approximately 200 gallons per minute (gpm), or directly to the West Point WTP, as needed. This pumping plant relies on a perforated pipe located in the Middle Fork Mokelumne River streambed, which has been prone to sediment and debris clogging thereby requiring constant maintenance to ensure its reliable use. CCWD is investigating ways to improve this facility without adversely impacting in-stream flow conditions.

Figure 7. CCWD Middle Fork Pumping Plant

The West Point WTP was upgraded in 2002 to include Microfloc filtration. The previous WTP setup, consisting of a pressure clarifier followed by two dual-media filters, was kept as a standby treatment train in the event the Microfloc treatment cannot operate; however, this standby treatment unit is no longer operable. CCWD is in the process of adding a second Microfloc filtration unit to provide redundancy. The West Point WTP has a capacity of 700 gpm. Polyaluminum chloride is used as a filter aid and sodium hypochlorite solution is used as a disinfectant, with zinc ortho-phosphate added for corrosion protection.

Treated water for distribution is stored in one of two clearwells at the West Point WTP, and an 80,000 gallon tank located in Bummerville. Each clearwell has a 335,000 gallon capacity. These two clearwells replaced the previously existing 450,000 gallon clearwell in 2010 and 2011. The 80,000 gallon Bummerville tank replaced previously existing 30,000 gallon tank in 2013. Following treatment at the WTP and storage, treated water supplies are provided to the service area using dedicated and enclosed pipeline infrastructure.

4.2 CPUD SYSTEM

CPUD owns and operates the Jeff Davis WTP, which receives water from the South Fork Mokelumne River via a diversion facility located between Wilseyville and Railroad Flat, and downstream from the confluence of the South Fork Mokelumne River and the Licking Fork. Historically, CPUD had a Middle Fork Diversion Canal which diverted flow from the Middle Fork Mokelumne River downstream of Schaads to their WTP; however, this canal is no longer operable. As such, CPUD does not use Schaads water supplies for its service areas. CPUD may store raw water in its Jeff Davis Reservoir located near Railroad Flat prior to treatment. A map of the CPUD System is provided in Figure 8.

The pump station at CPUD's Diversion Dam on the South Fork Mokelumne River consists of two 400 horsepower vertical turbine pumps. Water is pumped into a 20-inch diameter steel transmission pipeline which delivers water into the Jeff Davis Reservoir. The design capacity of that pipeline is 9.7 million gallons per day (MGD). Raw water is stored in Jeff Davis Reservoir, which covers an area of 66 acres and has a capacity of 1,800 acre-feet. Since the total annual water use for the system is approximately 1,000 acre-feet, the reservoir has the capacity to store enough water for almost two year's usage. Algae is controlled with copper sulfate. A solar powered aerator has been added to the reservoir to improve water quality.

The depth of the reservoir is approximately 60 ft, but raw water is typically drawn from the reservoir at a depth of approximately 20 ft. Vegetation around the perimeter of the reservoir is controlled by an annual application of herbicide. The reservoir is fenced, and access is prohibited, and CPUD staff frequently monitor the area.

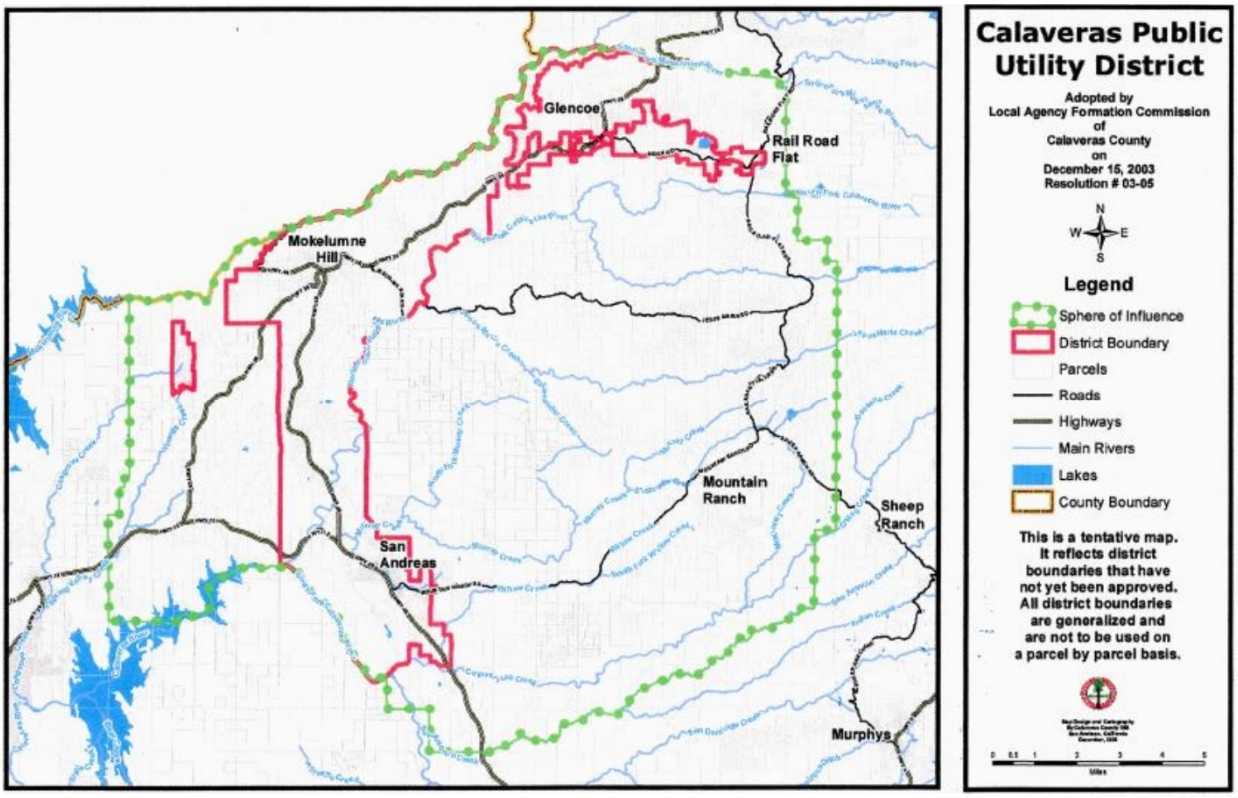

Figure 8. CPUD Service Area

The area surrounding Jeff Davis Reservoir that is privately owned, with several homes built on the hills overlooking the reservoir. These houses have individual septic systems. An interceptor ditch encircles the reservoir and diverts local surface runoff to a point below the main dam. The water supply is treated at a filtration plant located just below the dam at the Jeff Davis Reservoir. Water can be withdrawn from the reservoir by three outlets at different levels in the outlet tower structure, with the top outlet used most frequently.

The Jeff Davis WTP is an in-line pressure filtration plant which uses a cationic polymer as the only coagulant. The plant was built in 1974, with a design capacity of 6 MGD. Six pressure filter tanks are used; each 8-feet in diameter by 30-feet long with a design flow rate of 6 MGD. The Loprest pressure filters in the WTP were rebuilt in 2005. Water is treated with NTU Technologies Pro Pac 9825 polymer for coagulation of suspended matter, sodium hypochlorite for pre-oxidation and disinfection, and a zinc orthophosphate chemical for corrosion control. NTU Technologies Pro Pac 9825 polymer and sodium hypochlorite are applied into the pipeline upstream of the filters and zinc orthophosphate and sodium hypochlorite are applied into the pipeline downstream of the filters. The goal is to have a free chlorine residual of 1.2 to 1.6 milligrams per liter (mg/L) in the water leaving the water treatment plant. The plant is only operated in periods with low turbidity; a high turbidity alarm set at 0.2 NTU shuts off the

treatment facility and notifies the operator. Treated water is stored in a clearwell located on the site.

5.0 POTENTIAL CONTAMINANT SOURCES

Potential contaminant sources in the Watershed were identified from the following activities and analyses:

- CCWD field surveys performed in June 2021 by vehicle within the main paved roads of the Watershed. CCWD's West Point WTP, Bear Creek Diversion, Wilson Lake, Bummerville Reservoir, and Middle Fork Pumping Plant facilities were inspected, along with the confluence of Bear Creek and the Middle Fork Mokelumne River.
    - No similar field surveys were performed for CPUD facilities.
- Review of available water quality and treatment documentation including reports, maps, and databases from:
    - CCWD and CPUD operations staff persons (e.g., respective WTP operators).
    - Calaveras County Departments of Environmental Management and Community Development.
    - DDW online portals.
    - California Departments of Engineering Services, Forestry and Fire Protection (Cal Fire) and Pesticide Regulation documentation.
    - USFS documentation.
    - Latest MAC IRWM Plan.

The objective of this WSS is to assess known and potential sources of contamination that could impact the Watershed. Such activities, their significance, and growth potential are detailed in the sections below.

5.1 WATERSHED ACTIVITIES

Details regarding activities with the potential to impact Watershed water quality are provided below. This list is likely not exhaustive of all potential contaminant sources in the Watershed but represents the most notable activities found from field surveys and available reports, maps, and databases in preparation of this WSS.

Wastewater Management

- *Middle Fork Mokelumne River, Bear and Forest Creeks:* CCWD's West Point and Wilseyville Wastewater Treatment Plants (WWTPs)[2] collect and treat wastewater from their respective communities (from around 199 connections). CCWD's WWTPs dispose of treated wastewater in local spray fields per applicable Waste Discharge Requirements (WDRs)[3]. The rest of these Sub-Watersheds rely on privately-owned septic systems. No direct discharges of treated wastewater occur to any waters of these Sub-Watersheds. The WWTPs are also located downstream of the West Point WTP and therefore pose a minimal risk to drinking water.
- *South Fork Mokelumne River and Licking Fork:* There are no community wastewater collection and treatment systems located in these Sub-Watersheds. All residences are serviced by individual septic systems. A few private residences along the Licking Fork are located adjacent to and upstream of the CPUD South Fork Mokelumne River Diversion. These residences combined with their proximity to the Licking Fork and the low-density population in the sub-watershed presents a low-level potential to affect surface water quality.
- According to Calaveras County Environmental Health Department, Building and Planning Division, there have been a few septic system failures throughout the County and particularly within the Watershed. For instance, the Lynn Park Acres subdivision has several septic systems adjacent to the Middle Fork Mokelumne River. The potential for surface water impairment by failed septic systems in the Bear Creek and Forest Creek Sub-Watersheds is high. The potential for surface water impairment by failed septic systems in the Middle Fork Mokelumne River Sub-Watershed is medium, with the lowest risk to the South Fork Mokelumne River.
- Other potential locations of septic contamination impact include the Bummerville Reservoir, which has private residences on septic systems located directly up-gradient of that reservoir. The Bummerville Reservoir has an abandoned ditch between the reservoir and residences to capture surface runoff and route it downstream of the reservoir. Potential for septic systems to impact the reservoir is medium due to its proximity to the West Point WTP intake. Whereas Jeff Davis Reservoir is surrounded by a ditch to capture surface runoff and route it downstream of the water treatment plant, and potential for septic systems to impact that reservoir is low.

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[2] CCWD is in the process of consolidating the West Point and Wilseyville WWTPs.

[3] The effluent from CCWD's WWPTs is treated to secondary standards, disinfected, and disposed of through on-site spray irrigation per applicable WDRs.

Solid Waste Disposal

The only solid waste handling facility in the Watershed is the Wilseyville Transfer Station, located in the South Fork Sub-Watershed just south of Wilseyville. That transfer station operates four days per week and processes approximately 10 tons of solid waste each operating day. Given the lack of proximity to Watershed waterways and low exposure, the risk to drinking water sources from the transfer station appears to be low.

Illegal Dumping

The remains of illegal dumping were observed during the June 2021 field survey (Figure) in the ditch adjacent to the Bummerville Regulating Reservoir and has been observed in previous Watershed field surveys. Material that was dumped includes home appliances, abandoned cars and furniture. No dumping was observed directly in or adjacent to a water body. Based on this information the level of risk to drinking water sources caused by illegal dumping is characterized as low.

Figure 9. Illegal Dumping Example

Urban Runoff

There are few concentrated residential, industrial, and commercial areas in the Watershed which could contribute significant urban runoff into surface waters. As discussed in other sections, the Watershed is mostly rural in nature with spacing between communities and residential areas. Urban and industrial runoff is characterized as currently posing a low-level threat to surface water quality in the watershed.

Transported Hazardous Materials

There is little transportation of hazardous materials in or through the Watershed given existing highways are not a major thoroughfare for transportation of goods between larger urban areas (e.g., most Eastern Sierra Nevada and State of Nevada transportation to populated areas west of County occurs farther north using the major highways near Lake Tahoe). Additionally, there are no railroads used to transport hazardous materials. There were six reported hazardous material spills between 2016 and 2020. Most of the spills were petroleum based due to traffic accidents. None were reported as reaching a waterway. The risk of contamination to surface water quality in the Watershed is characterized as low-level.

Agricultural Crop Land Use

Agricultural activities can typically result in a release of fertilizer, pesticides, and herbicide residues into surface waters via runoff, groundwater, or directly. The agricultural lands within the Watershed are limited in size, extent, and are generally located far from the major tributaries of the Watershed. However, additional agricultural activities in the form of cannabis farming have increased in recent years. CCWD has reported that suspected runoff from cannabis farm(s) following rain events have led to algae blooms in the Bummerville Reservoir. As such and given that several of these agricultural activities are unknown in size and location (especially for cannabis operations), the potential threat of agricultural crop land use is characterized as low-medium level.

Grazing Animals

Grazing animals such as cattle can enter streams and creeks, damaging stream banks and causing increased turbidity downstream. They can also introduce waste directly into the water, increasing fecal coliform bacteria, microorganisms, virus, and nutrients.

Grazing occurs throughout the lower elevations of the Watershed, with both public and private lands being used. Grazing on public lands operated by the USFS are subject to lease agreements, with the maximum number of grazing animals permitted being determined annually based on several factors. SPI has also been known to allow grazing animals on their lands; however, the concentration of livestock is relatively low throughout

the watershed. Therefore, the potential threat to surface water quality in any of the sub-watersheds caused by grazing is low-medium.

Concentrated Animal Facilities

There are no concentrated animal facilities in the Watershed. Therefore, the potential threat to surface water quality in any of the sub-watersheds caused by concentrated animal facilities is low.

Pesticide/Herbicide Use

Applicators of herbicides and pesticides in the Watershed have historically included the USFS, California Department of Transportation (CalTrans), and SPI, for various vegetation management purposes. Based on available information and the field surveys, it appears the use of herbicides in the Watershed has been largely discontinued and replaced with mechanical removal. There are no reports of pesticides being applied by any of the major landowners or land managers in the Watershed. Due to the limited application, pesticides and herbicides are characterized as posing a low threat to surface water quality in the watershed.

Wild Animals

Wild animal populations pose a potential threat to surface water quality because they may contribute pathogenic organisms such as Giardia and Cryptosporidium, bacteria, and viruses to the water supply. Much of the land in the Watershed is remote and undeveloped, with a relatively large population of wild animals. Just like domestic grazing animals, wild animals also congregate near bodies of water and can contribute increased turbidity, nutrients, and pathogenic organisms to the water body. The remoteness and large amount of undeveloped land combined with a large population of large mammals suggest that wild animal populations pose a low-medium threat to surface water quality.

Logging Activities

Logging activities may pose a potential threat to surface water quality since it can promote erosion and transport of sediments into the water bodies, since less vegetation is available to secure soils and sloped areas. Increased sedimentation and turbidity impede the effectiveness of disinfection processes. As noted above, besides protected forest lands, SPI logging is the major land use activity in all the Sub-Watersheds.

USFS inspects logging within the federally protected lands, and Cal Fire inspects logging operations on private lands. SPI and other timber harvesters in the Stanislaus National Forest operate regularly and are familiar with the highly regulated timber production practices. Most violations are minor, and generally do not impact water quality. SPI also has an extensive environmental program to monitor timber harvesting practices. A

low level of potential impact should be applied to the effects of logging in the sub-watersheds.

Mine Runoff

Two permitted mines are identified as being active in the Watershed, both in the Middle Fork Mokelumne River Sub-Watershed (California Geological Survey, 2004). Both mines are in the vicinity of West Point, classified as Lode Gold mines (gold deposited in hard rock), and are believed to operate only one or two days a week. State and local agencies have no reports that there have been water quality problems associated with the mines.

The Watershed was actively mined during the historic gold rush of the 19th and early 20th Centuries, and as a result there are several inactive mines. None are known to be causing any significant water quality degradation problems.

Based on there being no reports of water quality impacts that could be attributed to mine drainage (low pH, elevated heavy metals) and that metals concentrations in both water treatment plants were nearly all non-detectable, the active and abandoned mines in the watershed appear to be a low threat to surface water quality. Thallium was detected over the regulatory threshold in one sample collected from Bear Creek, as noted in the 2003 Source Water Assessment (DPH, 2003). This metal can indicate the presence of mine run-off. However, based on the incidence of occurrence, the actual source is unknown. No thallium was detected in routine monitoring at either the West Point WTP or Jeff Davis WTP between 2016 and 2020.

Traffic Accidents & Spills

Records indicate that there have been few spills on roads in the Watershed in the past five years. These factors contribute to a low-level of risk to surface waters in the Watershed.

Geologic Hazards

Calaveras County lies in a low seismic risk area[4]. In the Watershed, soils have a relatively high potential for erosion, especially in areas having steep slopes. CCWD's West Point WTP has seen an increase in the maximum raw water turbidity from less than 10 NTU[5] in the previous WSS to nearly 150 NTU in the current WSS. Notes logged by that WTP's staff operator suggest that erosion was occurring on the banks of the Bummerville Reservoir, impacting stored water prior to being pumped to the WTP for treatment. Figure presents a

[4] Additional details regarding natural hazards are provided in CCWD's 2018 Local Hazard Mitigation Plan.
[5] Nephelometric Turbidity Units (NTU), a measure of the clarity of raw water supplies to detect particulate matter.

photo of the erosion observed at the Bummerville Regulating Reservoir. The potential for sediment transport into the water source due to erosion is therefore characterized as low-medium.

Figure 10. Erosion Example at Bummerville Reservoir

Wildfires

Fires can contribute large quantities of suspended solids and organic matter to the water supply system during and immediately after a fire event, such as a large-scale wildfire. Erosion from fires results in elevated turbidity and decreased disinfection efficiencies. Wildfires do not typically cause long-term increases in turbidity, sediment, or other water quality-related parameters in the watershed but can have large and impactful short-term affects. For example, the 2015 Butte Fire in Amador and Calaveras Counties occurred downhill of the Watershed. The Butte Fire impacted parts of the Mokelumne River and Calaveras River Watersheds – below the confluence of the South Fork Mokelumne River with the North and Middle Forks. The impacts of the Butte Fire on downstream WTPs included increased turbidity and total organic carbon levels.

Much of the land in the Watershed is remote, undeveloped, and heavily forested, which makes it highly susceptible to wildfires[4]. In such events, Calaveras County is

responsible for responding to structure fires, the USFS is responsible for fires within the federally protected lands, and Cal Fire is responsible for fires on private lands.

The Watershed has experienced many fires historically and another large fire could occur in the future, with accompanying temporary increased erosion and stream turbidity, among other impacts to CCWD and/or CPUD infrastructure depending on the extent of such event(s). Between 2016 and 2019, approximately 3100 acres burned in the County according to CalFire. However, only 135 acres of higher elevation timber or woodland areas were reported as burned in the same time. There were no major fires in the Watershed during the past five years, but one recent fire was observed along Winton Road, parallel to Bear Creek, downstream of Wilson Lake during the field survey (Figure). The threat of contamination in the Upper Mokelumne River Watershed due to wildfires is characterized as high.

Figure 11. Recent Fire Along Winton Road (Details Unknown)

Body Contact Recreation

There are no authorized recreational activities at the key water storage facilities for CCWD and CPUD in the Watershed which would allow for body contact with the water. Areas where water body contact recreation could potentially take place are patrolled on a regular basis; with no unauthorized use reported. Both CCWD and CPUD recognize that recreation in the rivers and streams of the Mokelumne River Watershed, especially in the national

forest lands, could theoretically impact their downstream diversions. Additionally, CCWD suspects there is frequently summer on-water recreation that occurs at Wilson Lake upstream of the Bear Creek diversion. However, these instances are likely minor and located with enough distance to primary water supply diversions such that body contact contamination risks are minimal. Therefore, the risk of contamination to drinking water supplies from body contact recreation is low.

Off-Highway Vehicle Recreation

Off-highway vehicle use (OHV) may contribute increased sedimentation, metals, and petroleum hydrocarbons to surface waters via runoff. OHVs used on national forest lands include motorcycles and all-terrain, off-highway, over-snow, and street legal four-wheel drive vehicles. USFS keeps OHV roads away from water courses, where the potential for damage is the greatest. OHV use on lands owned by SPI, CCWD, and CPUD is prohibited. OHV use in the Watershed is considered to pose a low-level threat to drinking water supplies.

5.2 SIGNIFICANCE OF POTENTIAL CONTAMINANT SOURCES

The significance of each potential contaminant source was described as low, medium, or high in the discussion above – a broad qualitative assessment. The criteria used to determine the potential level of impact to water quality included the number of contaminant sources, the degree by which the water resource could be impacted, and the proximity of the source to the drinking water source water(s). The significance of each activity to degrade Watershed water systems is based on information collected from the field survey, document research, and personal interviews in all versions of this WSS. Table 3 presents a summary of the significance of potential contaminant sources overviewed in the prior section.

Table 3. Summary of Potential Contaminant Source Significance

Potential Contaminant Source	Significance (Ranking)
Wastewater Management	Medium
Solid Waste Disposal	Low
Urban Runoff	Low
Agricultural Crop Land Use	Low-Medium
Grazing Animals	Low-Medium
Animal Facilities	Low
Pesticide/Herbicide Use	Low
Wild Animals	Low-Medium
Logging Activities	Low
Mine Runoff	Low
Traffic Accidents/Spills	Low
Geologic Hazards	Low-Medium
Wildfires	High
Body Contact Recreation	Low
OHV Recreation	Low

5.3 ANTICIPATED GROWTH WITHIN THE STUDY AREA

As stated in Section 1.1, population growth in the Watershed over the past 5 years has been continuously declining. The latest 2020 California Department of Finance (DOF) data indicate a declining rate of approximately -0.28% per year. There are likely several reasons for the population decline, such as local economic conditions, housing prices, or the 2020 COVID-19 Coronavirus Pandemic, which are all beyond the scope of this WSS. Based on this information, it appears unlikely that the Watershed will dramatically change from a rural setting with scattered and unincorporated communities to a more densely populated region. Both CCWD and CPUD will continue to monitor and respond to population growth and changes in land and water use, such as changes to SPI logging operations in the Watershed.

5.4 CHANGES IN SOURCES OF CONTAMINATION

Land use in the watershed is not expected to change significantly in the near future; therefore, no changes in the type of contaminants that may affect the drinking water sources within the Watershed are anticipated.

6.0 WATER QUALITY

Water quality data was collected for CCWD's West Point and CPUD's Jeff Davis WTPs for the past five years, 2016 through 2020, since the last WSS update. These data, including both raw water and treated (finished) water supplies, are reviewed and summarized in this section. Note that DDW compliance standards were met or exceeded for both WTPs.

6.1 MICROBIAL WATER QUALITY

The Surface Water Treatment Rule (SWTR) requires surface water suppliers to provide treatment for microbial contaminants, including Giardia and viruses. Raw water coliform levels must be monitored to determine the log removal requirements for Giardia and Cryptosporidium. Both West Point WTP and Jeff Davis WTP require 3-log (99.9%) Giardia inactivation and 4-log (99.99%) virus inactivation. Filter performance is also regulated by requiring the turbidity in 95% of the filter effluent samples be 0.3 NTU or less. Turbidity is a measure of water clarity degradation from suspended matter[5]. Turbidity can reduce the efficiency of a disinfectant and is used to measure filtration effectiveness.

The Long Term-1 Enhanced SWTR (LT1ESWTR) increased the requirements for filter performance by requiring turbidity in 95% of the filter effluent to be 0.1 NTU or less.

The Long Term-2 Enhanced SWTR (LT2ESWTR) added provisions for Cryptosporidium testing and removal. Two years of Cryptosporidium monitoring was required to determine treatment requirements for removal. Small systems can monitor E. coli in lieu of Cryptosporidium, if the levels of E. coli are low enough.

CCWD West Point WTP

The West Point WTP is currently meeting the SWTR and LT1ESWTR requirements for treated water and can be reasonably expected to meet future regulations. Specific water quality parameters for the West Point WTP are further explored below:

- *Turbidity*: Table 4 presents a summary of the raw and finished water turbidity at the West Point WTP. The maximum raw water turbidity seen in the past 5 years was 147 NTU. The average raw turbidity for the last 5 years was 2.28 NTU. The maximum turbidity of treated water was observed at 0.81 NTU. Note that the West Point WTP is well within compliance for filter performance requirements of the LT1ESWTR with 98.7% of its treated water turbidity results less than 0.1 NTU.

Table 4. West Point WTP Raw and Treated Water Turbidity

Year	Raw Water Turbidity, NTU			Treated Water Turbidity, NTU		
	Minimum	Maximum	Average	Minimum	Maximum	Average
2016	0.78	3.62	1.69	0.04	0.08	0.06
2017	0.77	5.67	1.95	0.05	0.60	0.07
2018	0.62	21.10	1.66	0.04	0.09	0.06
2019	0.56	147.0	5.49	0.04	0.18	0.06
2020	0.32	0.85	0.61	0.03	0.81	0.08
5 Year Summary	0.32	147.0	2.28	0.03	0.81	0.07

- *Coliform*: Table 5 presents a summary of the raw water fecal coliform test results for both the raw water sources (Bear Creek and Middle Fork) for the West Point WTP. The maximum raw water fecal coliform level observed at the was >2419.6 MPN/100mL in the past 5 years. Treated water from the West Point WTP contained no detected coliform.

Table 5. West Point WTP Raw Water Coliform

Year	Raw Water Fecal Coliform, MPN/100mL		
	Minimum	Median	Maximum
2016	32	960	>2,419.6
2017	32	1000	>2,419.6
2018	32	960	>2,419.6
2019	7.5	307.6	>2,419.6
2020	7.5	307.6	>2,419.6

- *Cryptosporidium:* CCWD started its second round Cryptosporidium monitoring for the West Point WTP source waters in 2017. The results show that only one sample with 0.1 oocyst/L was detected in 2017 and one sample with 1 oocyst/L was detected in 2018; all other years showed no detection of cryptosporidium. Based on these results, the West Point WTP was assigned "Treatment Bin 1" for Cryptosporidium removal. Treatment Bin 1 requires no additional treatment for Cryptosporidium removal.

CCWD Jeff Davis WTP

The Jeff Davis WTP is currently meeting the SWTR and LT1ESWTR requirements for treated water and can be reasonably expected to meet future regulations. Specific water quality parameters for the Jeff Davis WTP are further explored below:

- *Turbidity*: Table 6 presents a summary of the raw and finished water turbidity at the Jeff Davis WTP. The maximum raw water turbidity seen in the past 5 years was 10.01 NTU, with an average of 1.23 NTU. The maximum treated water turbidity seen in the past 5 years was 0.35 NTU, with a mean of <0.1 NTU. Note that the Jeff Davis WTP is well within compliance for filter performance requirements of the LT1ESWTR with 99.6% of its treated water turbidity results less than 0.1 NTU.

Table 6. Jeff Davis WTP Raw and Treated Water Turbidity

Year	Raw Water Turbidity, NTU			Treated Water Turbidity, NTU		
	Minimum	Maximum	Average	Minimum	Maximum	Average
2016	0.22	10.01	1.16	0.02	0.35	0.04
2017	0.58	10.01	1.50	0.03	0.17	0.04
2018	0.12	2.36	1.16	0.02	0.11	0.04
2019	0.04	10.01	1.41	0.02	0.07	0.03
2020	0.38	2.39	0.89	0.02	0.08	0.03
5 Year Summary	0.04	10.01	1.23	0.02	0.35	0.04

- *Coliform:* Table 7 presents a summary of the raw water total coliform test results at the Jeff Davis WTP. The maximum raw water total coliform level observed was 41,060 MPN/100mL in the past 5 years. Note that treated water from the Jeff Davis WTP mostly contained no detected coliform – twice between 2016 and 2020 coliform was reported as present.

Table 7. Jeff Davis WTP Raw Water Coliform

Year	Raw Water Total Coliform, MPN/100mL		
	Minimum	Median	Maximum
2016	8.5	204.1	>2,419.6
2017	36	275	>2,419.6
2018	51.2	2,419.6	>2,419.6
2019	2	130	41,060
2020	1	21.1	10,190
5 Year Summary	1	204.1	41,060

- *Cryptosporidium*: CPUD has not been required to test for Cryptosporidium because of the water system's size and the historical E. coli bacteria results.

6.2 DISINFECTION BY-PRODUCT WATER QUALITY

The Stage 1 Disinfection By-Products Rule (DBPR) established maximum residual disinfectant levels (MRDLs) for chlorine and established maximum contaminant levels (MCLs) for total trihalomethanes (TTHM), haloacetic acids (HAA5), chlorite, and bromate. Compliance is determined by a locational annual running average for TTHM and HAA5 for all samples taken in the distribution system. The Stage 2 DBPR requires compliance with the TTHM and HAA5 MCLs at each location tested in the distribution system.

CCWD West Point WTP

The West Point WTP is currently meeting the MRDL and MCL requirements for TTHM, HAA5, chlorite, and bromate, and can be reasonably expected to meet future regulations. Specific water quality parameters for the West Point WTP are further explored below:

- *Disinfectant Residual:* Chlorine is used as the residual disinfectant for the West Point WTP distribution system. The average chlorine residual level is 1.3 mg/L. The maximum chlorine residual level during the past five years was 2.25 mg/L in 2020, which is more than half of the MRDL of 4.0 mg/L. The minimum chlorine residual level observed in the last five years was 0.7 mg/L.
- *Total Organic Carbon (TOC) and Alkalinity:* Table presents a summary of the raw water TOC and alkalinity results.
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- Table 8 presents a summary of the treated water TOC and the TOC removal results. The required percent removal of TOC (35%) was met 80% of the time. Note that Table shows that the average raw water TOC level has dropped of the past year years making it more difficult to achieve the 35% TOC removal.

Table 8. West Point WTP Raw Water TOC and Alkalinity

Year	Alkalinity (mg/L)			TOC (mg/L)		
	Minimum	Average	Maximum	Minimum	Average	Maximum
2016	26	30	36	1.9	3.0	3.7
2017	24	33	41	1.3	2.7	3.3
2018	27	31	40	1.2	2.0	3.0
2019	20	29	40	0.6	1.5	3.0
2020	27	35	42	0.6	1.1	2.1
5 Year Summary	20	32	42	0.6	2.1	3.7

Table 9. West Point WTP Treated Water TOC and Percent TOC Removal

Year	TOC (mg/L)			TOC Removal (%)		
	Minimum	Average	Maximum	Minimum	Average	Maximum
2016	1.0	1.6	2.3	37.8	46.9	54.8
2017	0.3	1.4	2.0	37.5	50.4	76.9
2018	0.6	1.2	1.8	33.3	42.2	53.8
2019	0.3	0.9	1.4	10.0	39.7	53.3
2020	0.4	0.8	1.5	2.7	30.7	52.2
5 Year Summary	0.3	1.2	2.3	2.7	42.0	76.9

- *TTHM and HAA5:* Table 10 presents a summary of the TTHM and HAA5 test results for the West Point WTP distribution system. The maximum TTHM level seen in the past 5 years was 48 ug/L, which is under the TTHM MCL of 80 ug/L. The maximum HAA5 level seen in the past 5 years was 45 ug/L, which is below the HAA5 MCL of 60 ug/L.

Table 10. West Point WTP TTHM and HAA5

Year	TTHM (ug/L)		HAA5 (ug/L)	
	Minimum	Maximum	Minimum	Maximum
2016	35	41	25	41
2017	33	41	26	34
2018	27	48	21	45
2019	23	33	18	33
2020	16.2	38.2	19.6	30.6
5 Year Summary	16.2	48	18	45

- *Chlorite and Bromate:* Formation of these compounds is typically due to ozone or chlorine dioxide disinfection. Since neither of these methods is used at the West Point WTP, no chlorite or bromate was detected in the distribution system.

CCWD Jeff Davis WTP

The Jeff Davis WTP is currently meeting the MRDL and MCL requirements for TTHM, HAA5, chlorite, and bromate, and can be reasonably expected to meet future regulations. Specific water quality parameters for the Jeff Davis WTP are further explored below:

- *Disinfectant Residual:* Chlorine is used as the residual disinfectant for the Jeff Davis WTP distribution system. The average chlorine residual level is 1.5 mg/L. The maximum chlorine residual level during the past 5 years was 2.01 mg/L in 2017, which is about half

of the MRDL of 4.0 mg/L. The minimum chlorine residual level observed in the last 5 years was 0.66 mg/L.

- *TTHM and HAA5:* Table11 presents a summary of the TTHM and HAA5 test results for the Jeff Davis WTP distribution system. The maximum TTHM level seen in the past 5 years was 62.9 ug/L, about three-fourths of the TTHM MCL of 80 ug/L. The maximum HAA5 level seen in the past 5 years was 52.2 ug/L, just under the HAA5 MCL of 60 ug/L.

Table 11. Jeff Davis WTP TTHM and HAA5

Year	TTHM (ug/L)		HAA5 (ug/L)	
	Minimum	Maximum	Minimum	Maximum
2016	40.24	53.96	27	47.2
2017	12	45	8.3	32
2018	29.58	62.91	26.1	45.2
2019	37.17	61.7	25.2	52.2
2020	23.01	56.45	19.2	32.2
5 Year Summary	12	62.91	8.3	52.2

- *Chlorite and Bromate:* Formation of these compounds is typically due to ozone or chlorine dioxide disinfection. Since neither of these methods is used at the Jeff Davis WTP, no chlorite or bromate was detected in the distribution system.

6.3 TRACE METALS

Most metals in surface waters originate from natural sources. However, existing or historic mining activities within the Watershed may lead to higher metal concentrations due to drainage from mining areas. Most metal levels are regulated with MCLs. Lead and copper levels are regulated based on action levels in the distribution system by the Lead and Copper Rule. The EPA also sets Public Health Goals (PHG) for some metals. PHG are defined as the level of contamination below which there is no known or expected risk to public health. Facilities with more than 10,000 service connections are required to report contaminant levels exceeding PHG.

CCWD West Point WTP

All metals tested were below the treated water MCL criteria. Most metals are not detected. Copper, lead, barium, manganese, and zinc were detected in the past 5 years at levels well below the MCL. Lead and copper levels were well below the compliance action levels, however, lead was detected at levels above the Public Health Goals set forth by the EPA. The West Point WTP is currently meeting the criteria for drinking water metal concentration standards and can be expected to meet future regulations.

CCWD Jeff Davis WTP

All metals tested were below the treated water MCL criteria. Most metals are not detected. Aluminum, calcium, copper, iron, lead, magnesium, manganese and zinc were

detected in the past 5 years at levels well below the MCL. The Jeff Davis WTP is currently meeting the criteria for drinking water metal concentration standards and can be expected to meet future regulations.

6.4 ORGANIC COMPOUNDS

Most organic compounds in surface waters originate from man-made sources. Existing or historic industrial activities within a watershed may lead to higher organic compound concentrations due to atmospheric deposition, runoff from commercial, industrial or residential sites, or direct discharge. Organic compound levels are regulated with MCLs.

CCWD West Point WTP

All organic compounds tested were below the treated water MCL criteria. No organic compounds were detected at the West Point WTP. As such, the West Point WTP is currently meeting the criteria for drinking water organic compound standards and can be expected to meet future regulations.

CCWD Jeff Davis WTP

All organic compounds tested were below the treated water MCL criteria. No organic compounds were detected at the Jeff Davis WTP. As such, the Jeff Davis WTP is currently meeting the criteria for drinking water organic compound standards and can be expected to meet future regulations.

6.5 SUMMARY OF ABILITY TO MEET WATER QUALITY GOALS

No major changes in watershed activities are anticipated in the near future. Even if growth occurs, even though DOF trends suggest population decrease rather than growth, it would not be expected to be at significant enough levels to impact water quality. The West Point and Jeff Davis WTP can meet current water quality goals and are expected to meet foreseeable water quality goals for the next 5 years. No drinking water regulations currently proposed would cause either the West Point or the Jeff Davis WTP to be out of regulatory compliance.

7.0 CONCLUSIONS AND RECOMMENDATIONS

The objectives of this WSS are defined in Section 1.2. Both CCWD and CPUD will rely on the data, information, and findings of the WSS to guide agency planning and other project efforts which improve the reliability of Watershed supplies. The following sections describe the conclusions of the analyses performed in this WSS and recommend future actions which could be undertaken by CCWD and/or CPUD.

7.1 POTENTIAL WATERSHED CONTAMINANTS

Existing and potential contaminant sources were assessed for the Watershed which indicated that overall, the Watershed is rather pristine with very few potential sources of surface water contamination present. No imminent threats to Watershed water quality were identified as part of the WSS update. Septic systems, and in particular septic system failures, were identified along with wildfires as the most substantial threat to future water quality. This finding, especially regarding wildfire threats to water quality, communities, and infrastructure is consistent with other planning efforts (see Section 1.0), such as CCWD's 2018 Local Hazard Mitigation Plan.

The threat from turbidity caused by erosion, wildfires, or development is always present. Turbidity of source waters for both WTPs in the Watershed showed consistent low turbidity levels, although CCWD's West Point WTP saw significant seasonal rises in turbidity levels likely due to runoff and erosion in the Bummerville Reservoir. Other potential contaminant sources within the watershed with a low-medium risk include grazing, agricultural land use and wild animals which could contaminate water supplies.

All other potential contaminant sources are considered low risk threats to water quality in the watershed including solid waste disposal, urban runoff, transported hazardous materials, concentrated animal facilities, pesticide/herbicide use, logging, mine runoff, traffic accidents, body contact recreation and off-highway vehicle recreation.

7.2 WATER QUALITY

Water quality data from both the West Point and the Jeff Davis WTP were assessed and compared to regulatory drinking water quality standards (e.g., DDW regulations). Given the pristine nature of the raw water sources, both WTPs can meet current water quality objectives and current regulations as of the time of this WSS. Both WTPs are expected to meet foreseeable future regulations. Overall, source and treated water quality is very good for both CCWD and CPUD, although care should be taken to maintain the Watershed and to protect its water resources.

7.3 RECOMMENDATIONS

To ensure a high-quality drinking water source in the Watershed, a few recommended actions for CCWD and CPUD are recommended below:

- Implement measures to control septic systems and sediment erosion that have the potential to impact water quality.
    - Both CCWD and CPUD should work with the Calaveras County Environmental Management Agency and their work to regulate and inspect septic tank systems.
- Both CCWD and CPUD should continue coordination with other agencies who utilize and rely on the broader Mokelumne River Watershed, such as EBMUD, AWA, and others.
    - This includes remaining active in UMRWA and the MAC IRWM aimed at water quality improvements in the Watershed, through the MAC IRWM Plan and the projects presented Table 1.

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