Calaveras River
2021 Watershed Sanitary Survey

Prepared for

Calaveras County Water District
Stockton East Water District

WQTS
Water Quality & Treatment Solutions, Inc.
An environmental engineering and science consulting company

Karen E. Johnson
Water Resources Planning

June 2021

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2021 WATERSHED SANITARY SURVEY

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&
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EXECUTIVE SUMMARY

When California adopted the federal Surface Water Treatment Rule, a requirement was included that public water systems conduct a watershed sanitary survey (WSS) and update it every five years. The Calaveras River 2021 WSS covers the years 2016 to 2020 for Stockton East Water District (SEWD) and Calaveras County Water District (CCWD). For the purposes of this analysis, the Calaveras River watershed is comprised of lands upstream of the lowest intake which is at Bellota. Within the watershed, SEWD owns and operates the Dr. Joe Waidhofer (DJW) Water Treatment Plant (WTP). CCWD owns and operates the Sheep Ranch WTP and Jenny Lind WTP.

The Sheep Ranch WTP intake is on San Antonio Creek, tributary to the South Fork of the Calaveras River. The Jenny Lind WTP and DJW WTP intakes are on the main stem of the river, downstream of New Hogan Reservoir. DJW WTP also has a raw water supply from the Stanislaus River watershed. The primary reservoir in the study area is New Hogan Reservoir in Calaveras County. There are few small lakes and reservoirs, including White Pines Lake and Emery Reservoir.

The objectives of this WSS are to:

1. Comply with California State Water Resources Control Board, Division of Drinking Water requirements,
2. Prepare an inventory and assessment of potential contaminant sources,
3. Review water quality data and evaluate ability to comply with drinking water regulations, and
4. Present findings and any recommendations to maintain and improve water quality.

The following potential sources of contaminants were reviewed and presented in this WSS.

- Forestry activities, such as timber clearing and erosion control measures
- Irrigated agricultural lands and use of pesticides
- Livestock
- Mining and legacy mine sites
- Public-access Recreation
- Solid and hazardous waste
- Urban runoff and contaminant spills
- Wastewater operations
- Wildfire events and resultant burned areas
- Wildlife and habitat trends

Most categories above present a low to medium risk to water quality in the Calaveras River watershed. There is no direct correlation with adverse water quality impacts from most land uses and activities in the study period. However, there were elevated levels of total coliforms during dry years and elevated levels of *E. coli* and elevated turbidity levels during wet years particularly during rainfall events. Year 2016 was the last of five years of drought in California, one of the driest periods on record. 2017 on the other hand - particularly January - was one of the wettest winters on record.

Potential sources of microbial contamination may be associated with livestock grazing, recreation, failing septic systems, and or wildlife. Cattle graze throughout the watershed; primarily in the lower rolling foothills in the winter and in the higher elevations in the summer. Recreation with body contact in waterbodies occurs throughout the watershed. Most of the watershed is not connected to public sewer systems; as these on-site wastewater systems age, they tend to fail, particularly during rainfall events, with raw sewage potentially flowing to waterbodies unnoticed. In addition, Canada geese and other wildlife tend to congregate at streams and reservoirs during migration periods. In addition to the microbial risks, wildfires are considered a high risk to water quality in the watershed. Raw water quality will be experiencing impacts from the 2015 Butte Fire, which burned almost 40 percent of the watershed, for years to come.

During 2016 to 2020, all three raw water intakes experienced elevated levels of total coliforms in the raw water. For Jenny Lind WTP and Sheep Ranch a consistent presence of elevated levels of total coliforms was especially noticeable during 2016. At different times all three intakes had individual samples with elevated levels of *E. coli,* however, there was no indication of persistent fecal contamination of the source waters.

During the period of study, the data indicate elevated raw water turbidity during precipitation events. On approximately 10 occasions during 2016 through 2020, raw water to Sheep Ranch WTP spiked above 10 NTU, which triggers a forced plant operation shutdown. The Jenny Lind WTP is just downstream from New Hogan Reservoir which had low water levels during 2016. This WTP intake experienced elevated turbidity levels during 2016 as well as the seasonal winter increases each year. From September 2016 through April 2017 the DJW WTP intake was 100 percent Calaveras River water. In January and February 2017 there is a noticeable period of elevated turbidity in the raw water.

The intake to the Jenny Lind WTP showed continued elevated levels in TOC beginning in fall 2014 and continuing through the winter of 2017. Following the winter of 2017, TOC in the Jenny Lind raw water intake generally decreased during 2018 through 2020. On occasion, the DJW WTP raw water experienced elevated levels of TOC and high levels of color. All three WTPs complied with the DBP MCLs.

RECOMMENDATIONS

The following recommendations reflect areas where SCRG member agencies have some ability to control source water quality within the Calaveras River watershed.

- The water districts should continually review data for the presence of pathogens associated with failing or leaking OWTSs. Continue working with Calaveras County Environmental Health Department to be notified of any reports of spills or leakage. Work with the County to solicit funding sources to cover the cost of additional monitoring, oversight, and replacement of aging wastewater systems near watershed waterbodies. Work with the County to encourage homeowners to notify the County of any problems with their own OWTS or any leaking systems they may discover.
- Recommend that CCWD post signs stating that White Pines Lake releases to drinking water sources in the watershed, and it is important to keep dogs and babies in diapers out of the reservoir. Goose abatement techniques should be investigated.

- SEWD and CCWD should work with USACOE to encourage monitoring of total coliform and *E. coli* on a regular basis in beach areas and near the outlet of the New Hogan reservoir. Work with USACOE to develop total coliform and *E. coli* triggers that would indicate a halt to body contact recreation.
- Fuel reduction efforts by other agencies should be supported whenever possible to reduce the impact of wildfires in the watershed.
- SEWD and CCWD should continue the current raw water monitoring programs for turbidity, total coliforms, and *E. coli*.
- The Stanislaus/Calaveras River Group (SCRG) participating agencies in both the Calaveras and Stanislaus River watersheds should consider developing a joint monitoring and communication plan with locations throughout the watersheds to identify potential occurrence of algal blooms.
- Related to the above recommendation, in 2021 it is anticipated that DDW will issue Notification Levels for up to four cyanotoxins. SCRG agencies for both the Calaveras and Stanislaus River watersheds should consider developing a joint cyanotoxin monitoring and response plan for the entire watershed. Components of such a plan could include visual inspections for presence of algal blooms, routine monitoring for presence of algal cells and nutrients, triggers to begin raw water monitoring for presence of algal toxins. Combined with developing these plans, agencies should evaluate the effectiveness of their current treatment processes to remove or destroy cyanotoxins.
- While SEWD and CCWD maintained accurate and accessible records, they along with the other members of the SCRG should consider purchasing an off the shelf data management packages. Such a data management package could be a viable tool to use as a centralized water quality database. Contract laboratories can upload water quality results directly into these software packages for the public water system's access and use. Electronic databases would allow agency staff to conduct an annual review of data for trends and unusual results (possibly outliers) and can provide engineering and operations staff with easily accessible data.

SECTION 1 INTRODUCTION

This section presents the regulatory purpose of the watershed sanitary survey, survey methods, report organization, and abbreviations and acronyms.

REGULATORY REQUIREMENT FOR A WATERSHED SANITARY SURVEY

The federal Surface Water Treatment Rule (SWTR) promulgated by the U.S. Environmental Protection Agency (EPA) in 1989 includes a recommendation for all surface water systems to prepare watershed control plans. The State of California Title 22, Code of Regulations (CCR), Article 7, Section 64665, however, requires all water suppliers to conduct a watershed sanitary survey of their watersheds at least once every five years that evaluates potential contaminant sources within the watershed that may impact drinking water quality.

Title 22 of the California Code of Regulations requires that the initial watershed sanitary survey include a physical and hydrological description of the watershed, a summary of source water quality monitoring data, a description of activities and sources of contamination, a description of watershed control and management practices, an evaluation of the system's ability to meet requirements of Title 22 – Chapter 17: Surface Water Filtration and Disinfection Treatment, and recommendations for corrective actions. Updates must include a description of any significant changes that have occurred since the last survey which could affect the quality of the source water. The first Calaveras River WSS was completed in 1995; the most recent update was completed in 2016. This WSS is for the planning period of January 2016 through December 2020.

STANISLAUS/CALAVERAS RIVER GROUP

A number of public water systems formed the Stanislaus/Calaveras River Group (SCRG) as a mechanism through which to prepare the WSS for the Stanislaus and the Calaveras rivers. The SCRG is composed of Stockton East Water District, Calaveras County Water District, Tuolumne Utilities District, Union Public Utility District, South San Joaquin Irrigation District, City of Angels Camp, Pinecrest Permittees Association[1], California Department of Forestry and Fire Protection, California Department of Corrections and Rehabilitation, and Knights Ferry Community Services District.

Stockton East Water District (SEWD) and Calaveras County Water District (CCWD) divert drinking water from the Calaveras River and its tributaries. The study area consists of the Calaveras River watershed upstream of SEWD's Bellota Intake to its headwaters in Calaveras County.

SURVEY METHODS

WQTS, Inc. and Karen Johnson Water Resources Planning prepared this watershed sanitary survey. A literature search consisted of collecting and reviewing reports, maps, aerial photographs, data, file

[1] In the 2016 Stanislaus River Watershed Sanitary Survey the US Forest Service (USFS) participated as a member of the SCRG. In 2017 the USFS shut down their treatment plant and connected to the distribution system of the Pinecrest Permittees Association, who also use Pinecrest Lake as one of their sources of drinking water.

documents, and other information from government agencies and others responsible for land uses and activities in the watershed. Telephone and email contacts were made with various entities for updated information and data. Because of the ongoing coronavirus pandemic during the development of this WSS, return telephone calls from public agencies, with the exception of water and sanitation districts, for data requests were not provided.

The project kick-off meeting was held February 24, 2021. Prior to the kick-off meeting the SCRG participating agencies were provided with a written data request. The requested data included: water quality data, information on modifications to intake and/or treatment facilities, changes in watershed management, etc. A field survey of selected locations in the watershed was conducted in April following all coronavirus protection protocols. A shared public Dropbox™ folder was set up to allow the easy exchange of large amounts of data. This 2021 WSS update brings forward some of details of existing land uses and other information presented in previous surveys, however, the focus is on updating relevant information and changes during the 5-year period 2016 through 2020.

REPORT ORGANIZATION

This report presents a description of the watershed, SCRG intake and treatment facilities, identification of potential contaminant sources, and an analysis of water quality data. The content and organization of this watershed sanitary survey are consistent with the format recommended in the American Water Works Association California-Nevada Section Watershed Sanitary Survey Guidance Manual. Report sections are described below. Appendices provide supporting information and data tables.

SECTION 1 – INTRODUCTION. This section presents the purpose of the watershed sanitary survey, survey methods, report organization, and abbreviations and acronyms used in the report.

SECTION 2 – WATERSHED CHARACTERISTICS AND INFRASTRUCTURE. This section provides background information on the watershed study area. It describes natural physical and hydrologic characteristics. A summary is provided of the SEWD and CCWD surface water supplies and primary infrastructure related to the raw water sources and brief descriptions of the SEWD and CCWD treatment facilities.

SECTION 3 – POTENTIAL CONTAMINANT SOURCES. This section provides a summary and update of potential contaminant sources by land use. Each primary land use is described in terms of significance for the potential to impact drinking water quality, potential contaminant sources in this watershed, and agencies with watershed water quality protection responsibility and their management activities.

SECTION 4 – WATER QUALITY REVIEW. Current drinking water regulations are summarized in this section, along with a discussion of potential drinking water regulations within the next five years. Presented here are source water quality data from the watershed study area and treated water quality data from the various treatment facilities for the study period of 2016 through 2020.

SECTION 5 – CONCLUSIONS AND RECOMMENDATIONS. This section provides a summary of key findings and a list of recommendations.

APPENDIX A – References

APPENDIX B – Title 22 Monitoring Results (2016 to 2020)

ABBREVIATIONS AND ACRONYMS

AL	Action Level
BLM	Bureau of Land Management
BMP	Best Management Practices
BOF	Bureau of Forestry
BTEX	benzene, toluene, ethylbenzene, and xylene
$CaCO_3$	calcium carbonate
Cal EMA	California Emergency management Agency
Cal EPA	California Environmental Protection Agency
CAL FIRE	California Department of Forestry and Fire Protection
Cal OES	California Office of Emergency Services
CCL	Contaminant Candidate List
CCR	Code of Regulations
CCWD	Calaveras County Water District
CDCR	California Department of Corrections and Rehabilitation
CEDEN	California Environmental Data Exchange Network
CDOF	California Department of Finance
CDPR	California Department of Pesticide Regulation
CDFW	California Department of Fish and Wildlife
CFU	Colony Forming Units
CIWMB	California Integrated Waste Management Board
CS	Collection System
CT	disinfectant contact time
CUPA	Certified Unified Program Agency
CVRWQCB	Central Valley Regional Water Quality Control Board
DBP	Disinfection By-Products
D/DBP	disinfectants/disinfection by-products
DDW	SWRCB Division of Drinking Water
DJW WTP	Dr. Joe Waidhofer Water Treatment Plant
DO	Dissolved Oxygen
DAF	dissolved air flotation
DWR	California Department of Water Resources
DQAP	Dairy Quality Assurance Program
E. coli	*Escherichia coli*
FERC	Federal Energy Regulatory Commission
GAC	granular activated carbon
GPD	gallons per day
GPM	gallons per minute
HAA	Haloacetic Acid
IESWTR	Interim Enhanced Surface Water Treatment Rule
IOC	inorganic chemicals
JL WTP	Jenny Lind Water Treatment Plant
L	liter
LRAA	Locational Running Annual Average
LT1ESWTR	Long Term 1 Enhanced Surface Water Treatment Rule
LT2ESWTR	Long Term 2 Enhanced Surface Water Treatment Rule

LUST	Leaking Underground Storage Tank
MCL	Maximum Contaminant Level
MCLG	Maximum Contaminant Level Goal
MG	million gallons
MGD	million gallons per day
mg/L	milligrams per liter
mL	milliliter
MPN	Most Probable Number
MS4	Municipal Separate Storm Sewer System
MRDL	Maximum Residual Disinfectant Level
NL	Notification Level
NOM	natural organic matter
NPDES	National Pollutant Discharge Elimination System
NPS	National Park Service
NRCS	Natural Resources Conservation Service
NTU	Nephelometric Turbidity Units
OHV	off-highway vehicle
OWTS	onsite wastewater treatment
PG&E	Pacific Gas and Electric
psi	pounds per square inch
PWS	Public Water System
RAA	running annual average
RCD	Resource Conservation District
RWQCB	Regional Water Quality Control Board
SCRG	Stanislaus/Calaveras River Group
SDWA	Safe Drinking Water Act
SEWD	Stockton East Water District
SMARA	Surface Mining and Reclamation Act
SOC	synthetic organic chemicals
SPI	Sierra Pacific Industries
SSO	sanitary sewer overflow
SUVA	Specific UV Absorbance
SWRCB	State Water Resources Control Board
SWTR	Surface Water Treatment Rule
TDS	Total Dissolved Solids
THMs	trihalomethanes
TTHMs	total trihalomethanes
THP	Timber Harvest Plan
Title 22	Division 4, Chapter 3, Title 22, California Code of Regulations
TMDL	Total Maximum Daily Load
TOC	Total Organic Carbon
UCMR	Unregulated Contaminant Monitoring Rule
µg/L	micrograms per liter
USACOE	United States Army Corps of Engineers
USBR	United States Bureau of Reclamation
USDA	United States Department of Agriculture

USFS	United States Forest Service
US EPA	United States Environmental Protection Agency
UST	Underground Storage Tank
UV	ultraviolet
VOC	volatile organic chemicals
WDR	Waste Discharge Requirements
WFMP	Working Forest Management Plan
WTP	Water Treatment Plant
WWTF	Wastewater Treatment Facilities
WWTP	Wastewater Treatment Plant

SECTION 2 WATERSHED CHARACTERISTICS AND INFRASTRUCTURE

The Calaveras River watershed is primarily located in the western and central parts of Calaveras County. The westernmost part of the watershed is in San Joaquin County with a small southwestern portion in Stanislaus County. Figure 2-1 presents the watershed boundary, the Calaveras River with its primary tributaries, and population centers. This section describes the two participating agencies, study area characteristics, and water supply systems.

PARTICIPATING AGENCIES

SEWD and CCWD operate three primary drinking water intakes in the Calaveras River watershed—two on the Calaveras River, and one on San Antonio Creek, a tributary to the South Fork Calaveras River (see Figure 2-2). The water treatment plants (WTP) and intakes are described here.

- SEWD owns and operates a WTP located in Stockton, the Dr. Joe Waidhofer (DJW) WTP, which has an intake on the Calaveras River at Bellota, downstream of New Hogan Reservoir.
- CCWD owns and operates two WTPs in this watershed: Sheep Ranch WTP, which has an intake on San Antonio Creek downstream of White Pines Lake[1], and Jenny Lind WTP, which has an intake on the Calaveras River downstream of New Hogan Reservoir and upstream of Bellota.

The DJW WTP serves the City of Stockton and surrounding unincorporated areas. The total population served by the plant is approximately 505,170 (SEWD, 2021). The current operating permit for the WTP is for 65 MGD. The Calaveras River is one of two water supplies for the WTP; the other supply is from the Stanislaus River. A separate WSS covers the Stanislaus River supply.

CCWD's Sheep Ranch WTP serves the rural population of 89 residents in Sheep Ranch, in central Calaveras County, through 48 connections. It served 12 acre-feet in 2020 (CCWD, 2021). CCWD's Jenny Lind WTP is located in the Rancho Calaveras subdivision and serves mostly Rancho Calaveras up through the southern area of Valley Springs. The WTP serves a population of 9,860 with 3,858 connections. It served 2,043 acre-feet in 2020.

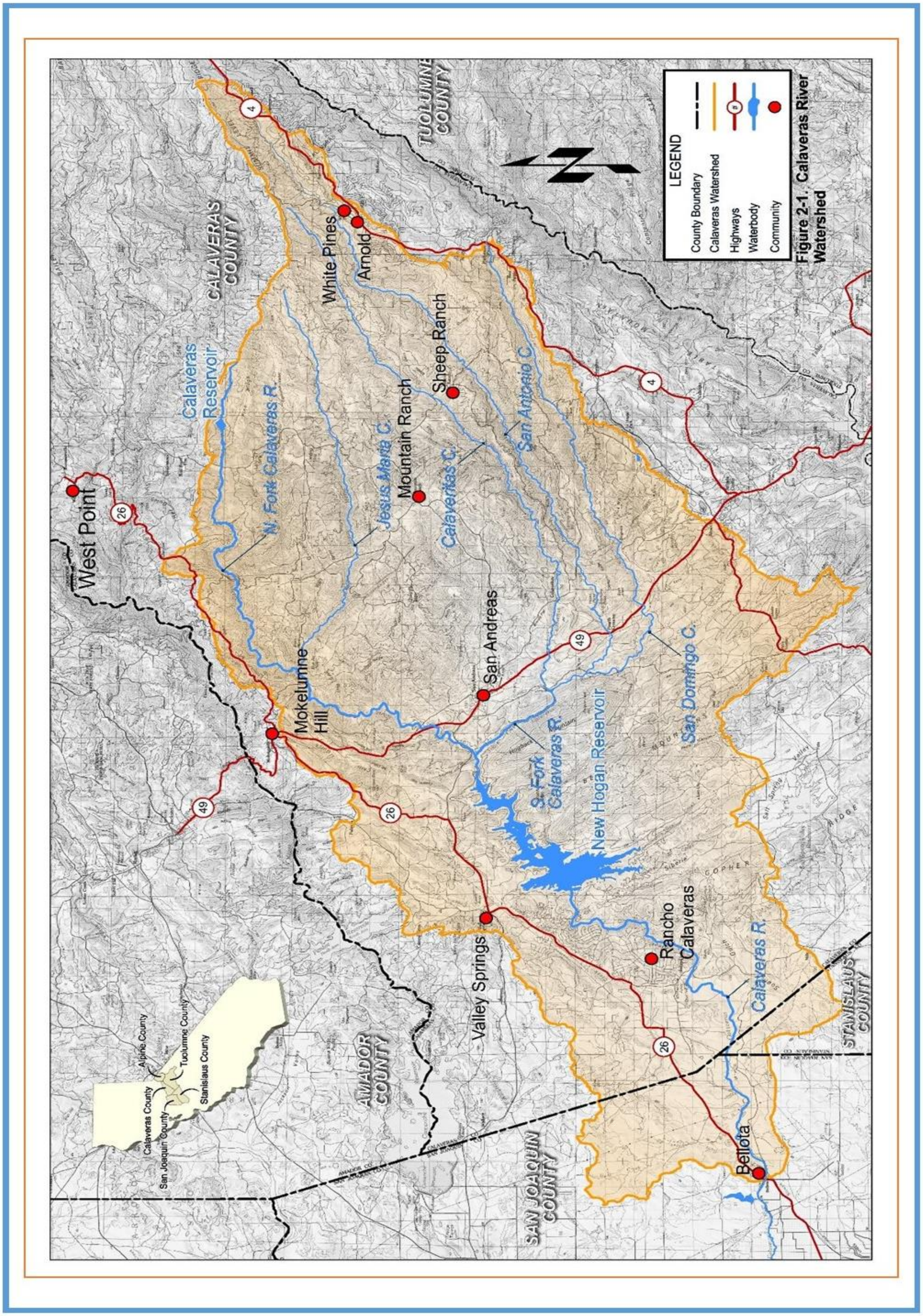
CALAVERAS RIVER WATERSHED STUDY AREA DESCRIPTION

For purposes of the WSS, the Calaveras River watershed ends at SEWD's Bellota Intake.

HYDROLOGY

The Calaveras River watershed ranges from the mountains around Calaveras Big Trees State Park through the Stanislaus National Forest, to the San Joaquin Valley lands near Bellota. Esperanza and Jesus Maria creeks join to form the North Fork Calaveras River; and Calaveritas, San Antonio, and San Domingo creeks join to form the South Fork. The North and South Forks of the Calaveras River join about seven miles above New Hogan Dam.

[1] Sheep Ranch water supplies originate from Big Trees Creek, upstream of White Pines Lake, which is tributary to San Antonio Creek.


LEGEND
County Boundary
Calaveras Watershed
Highways
Waterbody
Community
Figure 2-1. Calaveras River Watershed
West Point
Calaveras Reservoir
N. Fork Calaveras R.
Jesus Maria C.
Mountain Ranch
Calaveritas C.
Sheep Ranch
San Antonio C.
White Pines
Arnold
Mokelumne Hill
San Andreas
S. Fork Calaveras R.
New Hogan Reservoir
San Domingo C.
Valley Springs
Rancho Calaveras
Calaveras R.
Bellota
CALAVERAS COUNTY
TUOLUMNE COUNTY
AMADOR COUNTY
SAN JOAQUIN COUNTY
STANISLAUS COUNTY
Alpine County
Tuolumne County
Calaveras County
San Joaquin County
Stanislaus County

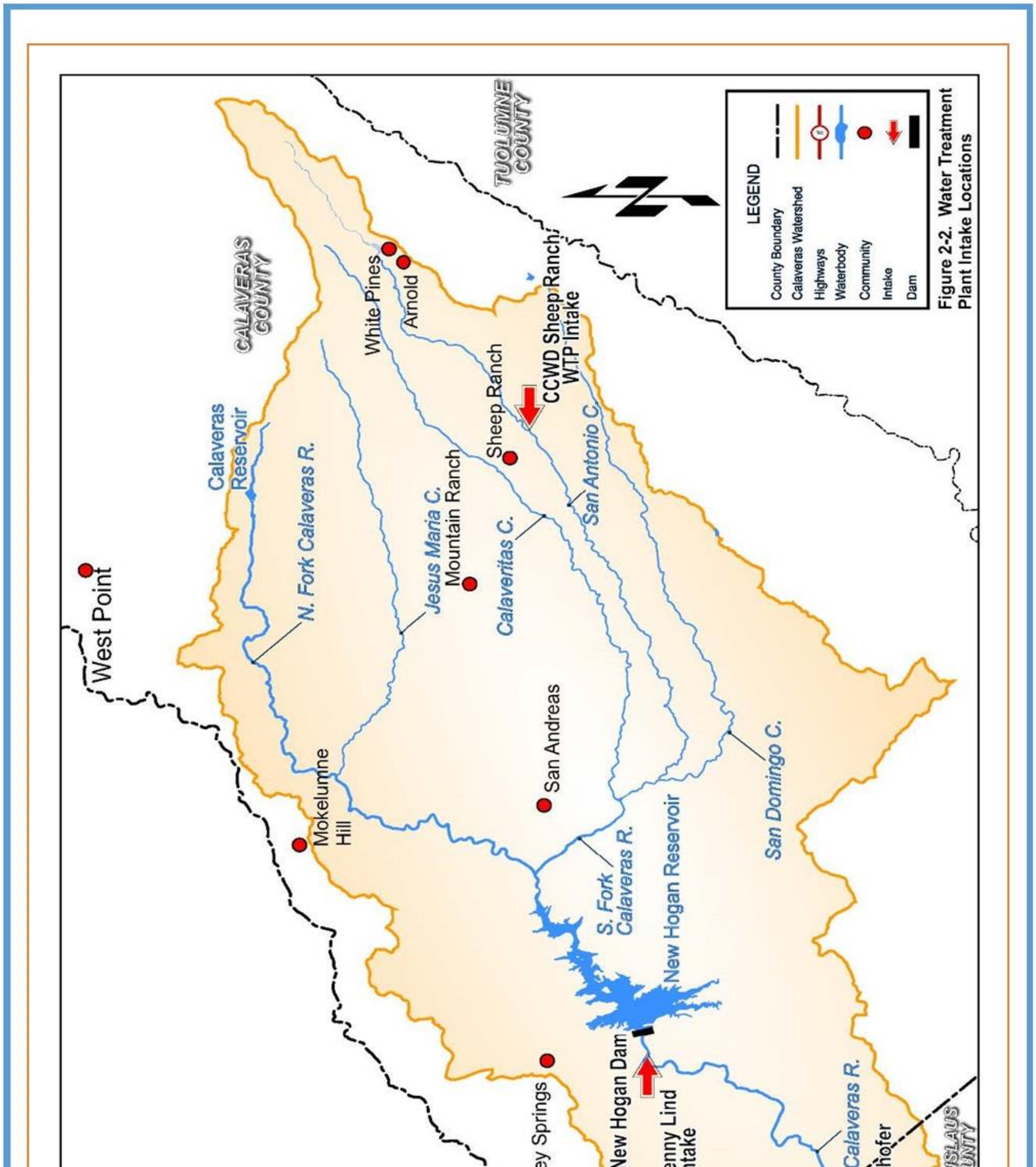


Figure 2-2. Water Treatment Plant Intake Locations

Historically, the lower Calaveras River was an intermittent stream with flows supplied almost entirely by rainfall. Today, flows in the Calaveras River are regulated and controlled by New Hogan Dam and Reservoir. The average annual runoff to New Hogan Reservoir is approximately 166,000 acre-feet.

Figure 2-3 presents average monthly rainfall in inches for the five year study period. Typical patterns found in California and the study area that reflect this Mediterranean climate include the near absence of precipitation over five summer months. It is also important to note the high rainfall in January and February of 2017; storm events during this time are reflected in the water quality data as higher turbidity and *E. coli* levels. The last year of a five year drought was 2016; this is also reflected in the water quality data as higher total coliform and total organic carbon levels.

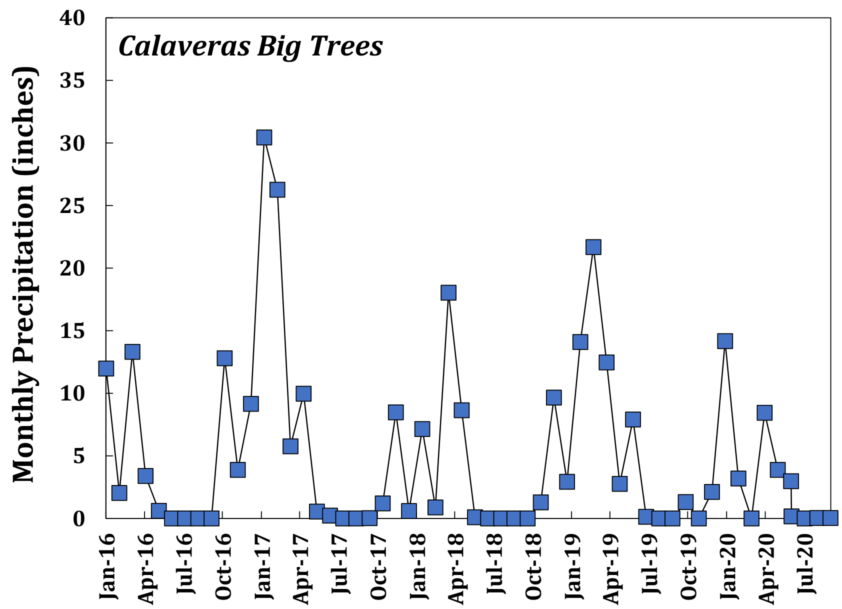


Figure 2-3. Monthly Precipitation
Source: NOAA, 2021

Flows from rainfall runoff in the watershed typically occur from November through April. Rainfall intensities are generally moderate but prolonged over several days. Resulting flows are usually characterized by high, short-duration peaks.

New Hogan Reservoir is the largest water supply reservoir in the watershed. Historic mining ditches and other conveyances, and current drinking and agricultural water supply diversions exist on tributaries to the North and South Forks of the river. Water is diverted from Big Trees Creek, via San Antonio Creek downstream of White Pines Lake, for the Sheep Ranch WTP intake. From New Hogan Dam, the river flows about 18 miles to Bellota, where flow is diverted from the original Calaveras River channel into Mormon Slough and to the Dr. Joe Waidhofer WTP intake.

TOPOGRAPHY

Extending to its confluence with the San Joaquin River, the Calaveras River watershed is a 473-square-mile drainage basin that includes reservoirs and natural lakes. The watershed above the largest reservoir, New Hogan, is 363 square miles. The flows from these waters support various downstream uses, including hydropower generation, domestic and irrigation water supplies, and habitat. The river's headwaters of the North Fork and South Fork originate on the western slopes of the Sierra Nevada.

The terrain varies from mild slopes and meadows in the western rolling foothills to more rugged mountains and wilderness in the upper Sierra Nevada region. Deep ravines and steep ridges are found between these areas, with parallel ridges separating the principal tributaries. Elevations range from 130 feet at Bellota and 550 feet at New Hogan Dam to about 6,000 feet at the highest point.

GEOLOGY

The geology of the Calaveras River watershed study area is meta-sediments and meta-volcanic rock of Mesozoic age, overlain by tertiary sediment and volcanic rocks. Large granitic outcrops are visible in the highest elevations. Upper elevation soils are typically fine textured, meta-volcanic residual of moderate depth and good drainage. Most upper elevation soils are moderately shallow to very shallow, generally loamy, and range from neutral to slightly acid or acid. Most soils are of coarse fragments, and rock outcrops are common. In the lower elevations near New Hogan Dam, soils are residual, derived from meta-sedimentary slate and schist, meta-basic igneous rocks, granitic rock, and volcanic conglomerate.

The Calaveras River watershed lies within a historically low seismicity area. The only fault system that could potentially cause surface rupture within Calaveras County is the Melones-Bear Valley or Sierra Foothills fault system, which extends across the lower portion of Calaveras County, between Murphys and New Hogan Reservoir.

VEGETATION

Plant communities in the Calaveras River watershed include grassland, brush land and chaparral, and deciduous and coniferous forest. Dominant species include large oaks, willows, and alders, with an undergrowth of herbaceous plants and scattered low shrubs such as California scrub oak, dwarf live oak, chemise, digger pine, manzanita, poison oak, elderberry, California bay, and wild grape, depending on water availability. Species of wildflowers commonly found near the river are shooting star, buttercup, larkspur, and mariposa lily. Fruit and nut orchards, vineyards, and row crops are grown along the Calaveras River between New Hogan Dam and Bellota. Vineyards and orchards are present along San Domingo and Calaveritas Creeks in the upper watershed, with some growth in irrigated acreages in these areas over time.

LAND USE

The region is characterized by scattered rural residential land uses and agriculture in the lower watershed. Small urban and commercial centers are concentrated at various locations along major highways. Water-based recreation is located at New Hogan Reservoir and White Pines Lake. Land use in the Calaveras River watershed includes residential, forest, industrial, agricultural, and recreational uses as described in Section 3 of this report. The watershed's eastern edge lies within the Stanislaus National Forest; however, no significant recreation sites are located within this part of the national forest. The north side of Calaveras Big Trees State Park is located in the Calaveras River watershed: Big Trees Creek flows to San Antonio Creek, and subsequently to the South Fork Calaveras River. Additionally, U.S. Forest Service Stanislaus National Forest lands are located in the watershed.

The watershed is sparsely populated. The most recent population estimates available from the California Department of Finance report the population of Calaveras County as 45,036 (CDOF 2021). Small communities within the Calaveras River watershed are located adjacent to the major highways, including San Andreas, Jenny Lind, Rancho Calaveras, and Valley Springs in the lower watershed, and Arnold, Camp Connell, and Dorrington in the upper watershed. Other communities located further off the main roads include Calaveritas, Sheep Ranch, and Mountain Ranch. Many upper watershed communities have an influx of seasonal residents in the summer and winter.

CALAVERAS RIVER WATER SUPPLY SYSTEMS


White Pines Lake

This section discusses the location, description and water supply information pertaining to the various elements of the participating agencies' supply and conveyance systems. New Hogan Reservoir is the primary water supply reservoir in the watershed. A few small lakes and reservoirs are also located in the watershed upstream of New Hogan Reservoir, such as White Pines Lake and Emery Reservoir (Emory Reservoir is a privately owned reservoir). These small reservoirs have much less impact on the main body of the river but may impact the tributaries on which they are located.

Three WTPs are located within the watershed: Sheep Ranch, Dr. Joe Waidhofer, and Jenny Lind. Sheep Ranch WTP receives its water from Big Trees Creek via San Antonio Creek downstream of White Pines Lake. Jenny Lind WTP and DJW WTP obtain their water from the Calaveras River, downstream of New Hogan Reservoir.

WHITE PINES LAKE

White Pines Lake is located at the upstream end of San Antonio Creek in the watershed's northeastern-most area. CCWD owns and operates the reservoir, although its recreational use is managed by the White Pines Park Committee. At high water level, the volume is 262 acre-feet. The reservoir is supplied mostly by surface water runoff from San Antonio Creek and Big Trees Creek, although natural springs may provide minimal flows into the reservoir. White Pines Lake is typically operated so it reaches maximum water level during April. Water is gradually released year-round to maintain flows in San Antonio Creek. Flows are rediverted for supply to the Sheep Ranch WTP. During October and November, the reservoir level is usually at its lowest.

SHEEP RANCH WATER TREATMENT PLANT (SR WTP)

CCWD owns and operates Sheep Ranch WTP with its capacity of 20,000 gallons per day (GPD). Big Trees Creek, originating around Calaveras Big Trees State Park, flows to White Pines Lake. Approximately eight miles after the lake, supply is diverted from San Antonio Creek to Sheep Ranch WTP. Water is diverted at a box diversion structure, where water flows over a weir and into an intake pipeline. Raw water flows by gravity to the WTP, and/or Rite of Passage Athletic Training Center (Fricot Pipeline) for local irrigation.

To begin treatment, a coagulant is added prior to filtration. The chemical is mixed in-line with a static mixer. The water then flows through a 4-foot-diameter, vertical pressure dual-media filter. From the filter, chlorine is injected for disinfection and the water flows directly to a 0.078 MG storage tank. The storage tank provides the detention time needed for disinfection contact time (CT) credit.

NEW HOGAN DAM AND RESERVOIR

The New Hogan Dam provides flood protection to the City of Stockton and water for irrigation, drinking, recreation, and hydroelectric power (via the New Hogan Power Project). New Hogan Dam is an earth filled structure, 200 ft high and 1,935 ft long, completed in 1964. New Hogan Dam impacts both downstream flows and water quality of the Calaveras River.


New Hogan Reservoir

New Hogan Reservoir, centrally located in the watershed, is the main water storage facility on the Calaveras River. SEWD is the watermaster and controls dam releases for irrigation and municipal use for SEWD and CCWD. The U.S. Army Corps of Engineers (USACOE) operates and maintains the reservoir for flood control, while the U.S. Bureau of Reclamation manages the (conservation) water supply agreements with SEWD and CCWD (SEWD, 2021). The reservoir stores 317,100 acre-feet at maximum flood stage.

CCWD owns and holds the Federal Energy Regulatory Commission (FERC) license to the New Hogan Powerhouse located at the base of New Hogan Dam (the New Hogan Power Project). The powerhouse is operated under contract by Modesto Irrigation District. The power facilities operate on a run-of-the-river basis. When reservoir head and flow release rates are within operational parameters, the powerhouse diverts water through the two turbines. Flows beyond the capability of the powerhouse are diverted through the dam's outlet works.

JENNY LIND WATER TREATMENT PLANT (JL WTP)

Owned and operated by CCWD, Jenny Lind WTP is located in Rancho Calaveras, about three miles south of Valley Springs. It has an existing capacity of 6 MGD. JL WTP raw water intake is located on the Calaveras River, about one mile downstream of New Hogan Reservoir. Raw water for the Jenny Lind WTP is withdrawn from the river through an infiltration gallery which is periodically backflushed (at least annually) to maintain hydraulic capacity. Collection pipes are imbedded in the channel bottom and are covered with 1 to 3 feet of rock. The collection pipes route the raw water to the influent pump station. The influent pump station has three vertical turbine pumps that deliver water to the WTP.

Raw water is pumped to the top of one of two ozone contactors, where it flows by gravity through the treatment facilities. Ozone can be added to either chamber in each contactor. Sodium hypochlorite can be added at the raw water pump station if the ozonation facilities are not in service. CCWD had previously eliminated pre-chlorination to minimize disinfection byproduct (DBP) formation and added the ozone contactor. In the first ozone contactor in the second chamber, sodium permanganate is added for iron and manganese removal. Coagulant is added to the water after exiting the ozone contactor and mixed as it enters the in-line, static mixer. A streaming current detector controls coagulant addition rate. From the static mixer, the water enters the bottom of the upflow adsorption clarifier. In the adsorption clarifier, the water passes through a bed of buoyant adsorption media that provide three treatment processes: coagulation, flocculation, and clarification. The adsorption clarifier effluent flows into a mixed media filter containing anthracite, sand, and garnet. Filter effluent is chlorinated, and zinc orthophosphate is added for corrosion control in the distribution system. The filtered water is gravity-fed to the clearwell (0.245-MG capacity). Water from the clearwell is pumped to a 2 MG storage tank.

DR. JOE WAIDHOFER WATER TREATMENT PLANT (DJW WTP)

Owned and operated by SEWD, DJW WTP serves the City of Stockton and surrounding unincorporated areas. SEWD is a wholesaler of treated surface water to the City of Stockton, California Water Service Company, and to San Joaquin County.

The DJW WTP has two water sources, the Calaveras River at Bellota and the Stanislaus River via Goodwin Reservoir. Water is diverted at the Bellota Weir and flows by gravity in a pipeline to the WTP. Raw water can also be stored in five on-site reservoirs, with a total capacity of 240 MG (a new North 120 MG reservoir went into service in 2019).

The DJW WTP has a rated capacity of 65 MGD. Water entering the WTP is first treated with chlorine gas for disinfection followed by addition of alum and polymer for coagulation. The water then passes through rapid mix, flocculation, and sedimentation or plate settlers (depending on treatment train). The settled water flows to dual-media (granular activated carbon [GAC] and sand) filters. Filter-aid polymer is added to the water prior to filtration. Filter effluent flows through the finished water conduit, where sodium hydroxide is added to adjust the pH level for distribution system corrosion control. Chlorine gas is added to the finished water. The water then flows to a buried, finished water reservoir, from which the water is pumped into the distribution system.

SECTION 3 POTENTIAL CONTAMINANT SOURCES

The chapter begins with a description of the counties in relation to watershed boundaries because some of the potential contaminant source data are available only by county. A discussion of water quality parameters of concern is then provided as a basis for understanding the risks or impacts of potential contaminant sources. Finally, the potential contaminant sources in the Calaveras River watershed are summarized using the following format.

CONCERNS: Water quality concerns associated with the potential contaminant source.

POTENTIAL CONTAMINANT SOURCES: Land use or activities specific to this watershed along with general locations.

MANAGEMENT ACTIVITIES: Agencies responsible for managing the land use or activity and general practices employed to control the sources.

This chapter does not repeat background information provided in previous WSSs but does include enough information necessary to provide a stand-alone document.

WATERSHED COUNTIES AND SUBWATERSHEDS

The Calaveras River watershed lies partially within three counties, however, the counties of San Joaquin and Stanislaus contain less than five percent of the watershed; the majority is in Calaveras County. For many of the land uses and activities in the watershed, information is only available by county.

Watershed lands within Stanislaus County and San Joaquin County are primarily grazing or other low intensity agriculture use or open space. Foothill communities include Jenny Lind, Rancho Calaveras, Valley Springs, Paloma, and San Andreas. The mountain communities of Mountain Ranch, Sheep Ranch, and White Pines are in the watershed with Hathaway Pines, Avery, Arnold, and Calaveras Big Trees State Park straddling the watershed divide with the Stanislaus River watershed. There are no incorporated cities in the Calaveras River watershed.

Figure 3-1 provides a schematic of the watershed and water system facilities. This schematic identifies the WTP subwatersheds: intakes and reservoirs in relation to the Calaveras River and its tributaries. They do not contain all of the drinking water related facilities, only those proximate to the treatment plant intakes. When discussing potential contaminate sources, the water treatment plants or receiving waterbodies were often identified in this chapter to aid in understanding correlations between contaminant sources and the water quality data presented in Section 4.

The Calaveras River watershed is comprised of three subwatersheds for each of the three WTP intakes: DJW WTP intake at Bellota, Jenny Lind WTP intake at Jenny Lind, and Sheep Ranch WTP intake on San Antonio Creek, a tributary of South Fork Calaveras River. The Bellota and Jenny Lind intakes are on the main stem Calaveras River, downstream of New Hogan Reservoir. Bellota intake is the downstream end of the entire Calaveras River watershed to that point and is at risk of all potential contaminants presented here.

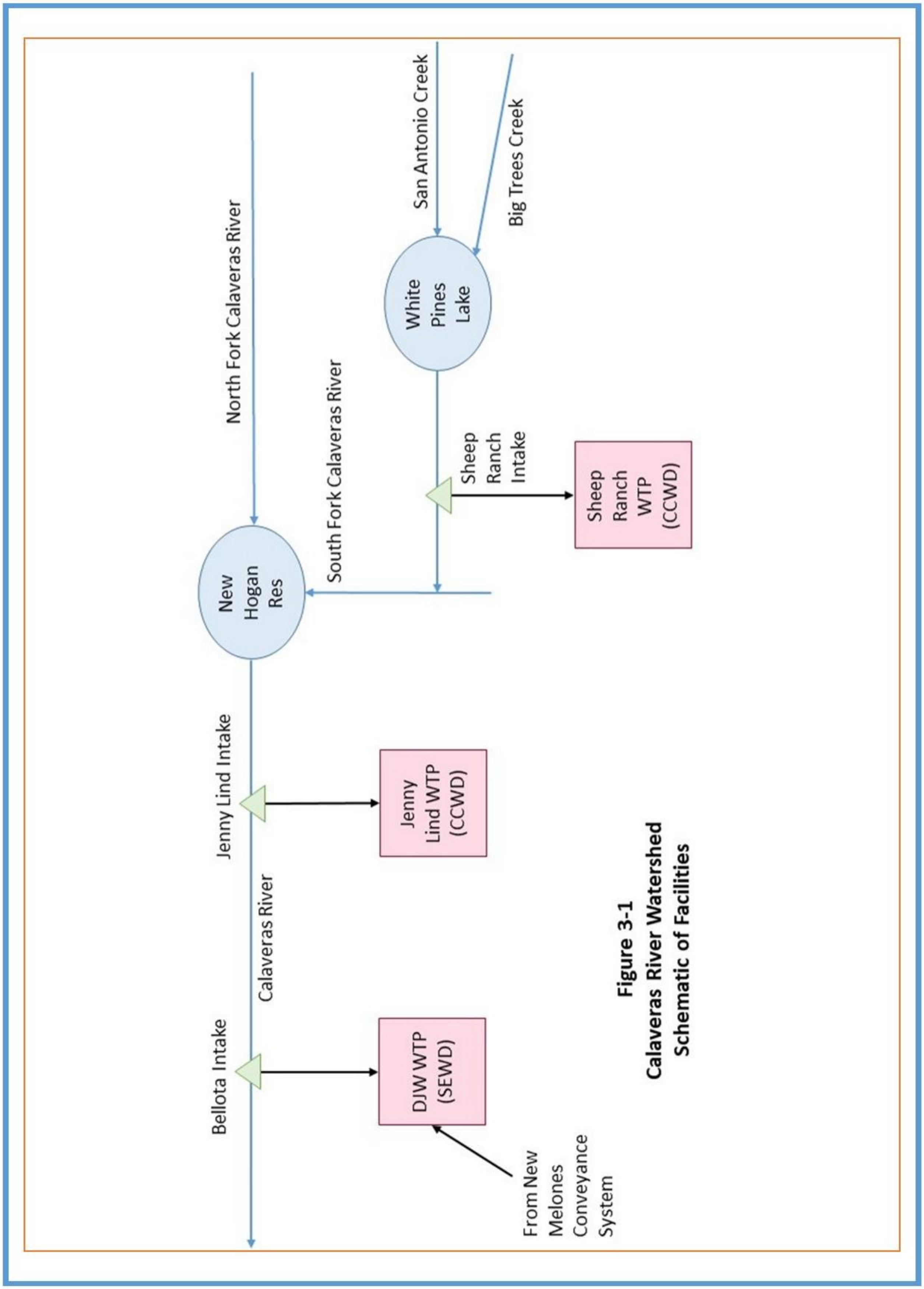


Figure 3-1
Calaveras River Watershed
Schematic of Facilities

WATER QUALITY PARAMETERS OF CONCERN

Water quality parameters of greatest concern in the watershed from a drinking water perspective include the following.

- Microorganisms
- Disinfection by-product precursors
- Turbidity (particulates)
- Synthetic organic chemicals (SOCs), volatile organic chemicals (VOCs), herbicides, and metals

These four groupings are described briefly below. A more thorough discussion as they relate to Calaveras River watershed water quality over the five year study period is provided in Section 4, Source Water Quality.

MICROORGANISMS

Microbiological organisms of concern as agents of waterborne outbreaks of infectious disease or indicators of potential contamination in drinking water include gross bacterial measurements (total coliform, E. coli, HPCs), viruses, and specific pathogens (such as Cryptosporidium and Giardia). Cryptosporidium and Giardia are currently the water quality parameters of greatest concern due to the health risks and the difficulty of treatment. For example, Cryptosporidium strongly resists chlorine disinfection. Also, there is no maximum contaminant level (MCL) for Cryptosporidium and Giardia. Utilities demonstrate compliance with drinking water regulations for these two organisms by meeting specific treatment technique requirements established by the U.S. Environmental Protection Agency (US EPA) and State Water Resources Control Board (SWRCB) Division of Drinking Water (DDW).

DISINFECTION BY-PRODUCT PRECURSORS

When chlorine is added in the treatment disinfection process, many chlorinated organic compounds are formed as the chlorine reacts with the naturally occurring organic matter (NOM) present in the water. Some of these compounds, referred to as disinfection by-products (DBPs), are suspected of causing cancer in humans. Total Trihalomethanes (TTHMs) and haloacetic acids are regulated. One important strategy for reducing DBPs is to reduce the amount of NOM present in the water, if possible. Watershed management to reduce erosion (which carries organic material from the land into water bodies) and control aquatic plant and algae growth (which generate organic matter) can provide significant reductions in NOM, and therefore DBP formation. Because NOM cannot be measured directly, TOC present in the water is typically used as a surrogate measurement. Bromide in the source waters is of concern because of the reaction with ozone in the treatment disinfection process to produce bromate (regulated in the Stage 1 D/DBP Rule).

TURBIDITY

Turbidity is a nonspecific measure of suspended matter such as clay, silt, organic particulates, plankton, and microorganisms. Turbidity is not a specific public health concern, but other constituents that are of concern can adhere or adsorb onto the surfaces or into the pores of the particulates. Microorganisms in particular have been known to survive disinfection during treatment by essentially hiding within the pores of particulates. The presence of turbidity is a general indicator of surface erosion and runoff into water bodies, resuspension of sediment material from the stream bed, or biological productivity. Following major storms, water quality is degraded by inorganic and organic solids and associated adsorbed contaminants (e.g., metals, nutrients, and agricultural chemicals) that are resuspended or introduced in runoff.

Turbidity is of concern from a watershed protection perspective primarily because it reduces the efficiency of disinfection by shielding microorganisms and other contaminants, and it acts as a vehicle for the transport of contaminants. An increase in raw water turbidity at the treatment plant increases treatment operations (e.g., higher chemical doses, more frequent filter backwashing, higher disinfectant dosages), increases the likelihood of TTHMs and other DBPs generated, and can result in a greater level of risk of pathogens slipping through the treatment process.

SOCs, VOCs, Herbicides, Pesticides, and Metals

SOCs and VOCs represent the largest group of water quality parameters currently regulated. Many VOCs and some SOCs are formulated for or are the result of industrial processes. Pesticides and herbicides are specifically formulated for their toxic effects on animals and plants. From a public health perspective, these organics are identified as being or are suspected of being carcinogens, mutagens, or teratogens. Heavy metals, originating primarily from rocks, minerals, and municipal and industrial wastes, can have toxic effects on human health if of high enough concentration in the water or if found in fish consumed by humans.

Table 3-1 provides an overview of the relationship between these water quality parameter groups and potential contaminant sources in the watershed. The objective of this table is to provide a basic understanding of the water quality concerns associated with the land uses and activities.

Table 3-1: Relationship Between Contaminant Sources and Water Quality Concerns

Watershed Activities	Micro-organisms	DBP Precursors	Turbidity	SOCs, VOCs, & Metals
Forestry Activities		●	●	●
Irrigated Agriculture and Pesticides		●	●	●
Livestock	●	●	●	
Mining			●	●
Recreation	●	●	●	●
Solid and Hazardous Waste	●			●
Urban Runoff and Spills	●	●	●	●
Wastewater	●	●	●	●
Wildfires		●	●	●
Wildlife	●	●	●	

Forestry Activities

Forestry activities are focused on timber harvesting. Livestock grazing, off-road vehicles, and wildfires associated with forest lands are addressed in other sections.

Concern

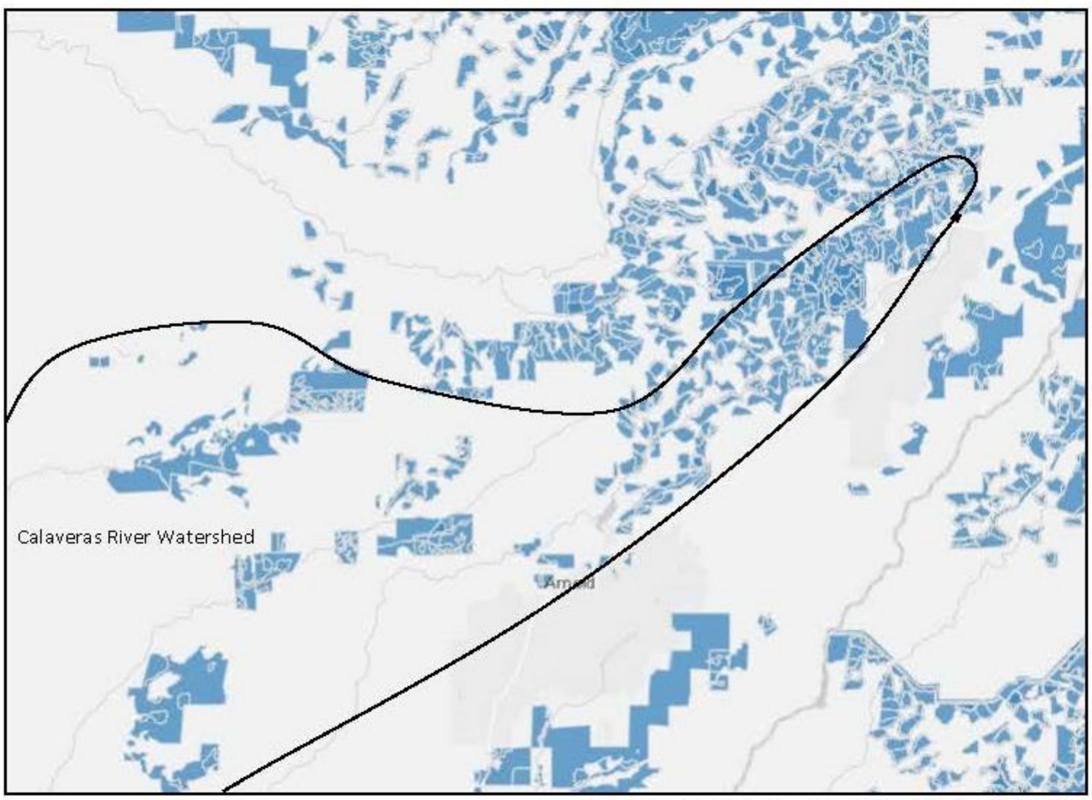
Timber harvest operations have the potential to dramatically impact water quality. Logging and associated road construction may increase the rate of soil erosion, thereby impacting waterways by increasing turbidity and nutrient loading. Applied herbicides can contribute SOCs. In addition, flow volumes from the watershed can be significantly altered and may show dramatic increases immediately following logging, slowly returning to normal over a period of years.

POTENTIAL CONTAMINANT SOURCES

Calaveras County reports 143,000 acres of land in timber preserves with 50,007 thousand board feet harvested on average for years 2016 through 2018. Timber production in Calaveras County is primarily found on Stanislaus National Forest lands. Currently, Sierra Pacific Industries (SPI) is the only private industry that owns land within the Stanislaus National Forest. SPI owns approximately 80,000 acres of forest in the Stanislaus National Forest with about 5,000 acres in the Calaveras River watershed.

According to the State Department of Forestry and Fire Protection (CAL FIRE) there are no new timber harvesting plans (THP) and non-industrial timber management plans initiated within the Calaveras River watershed recently. Figure 3-2 presents timber harvest plan areas in the Calaveras River watershed. This figure provides a sense of the density of THP over time.

A THP is the environmental review document outlining what timber is requested to be harvested, how it will be harvested, and steps taken to prevent damage to the environment. The landowner must replant the area according to the Forest Practice Rules requirements.



Source: USFS

Calaveras River Watershed Sanitary Survey
Figure 3-2
Timber Harvest Plan Areas in Calaveras River Watershed

WATERSHED MANAGEMENT

The U. S. Forest Service (USFS or Forest Service) manages timber harvest lands within the Stanislaus National Forest portion of the watershed. Most timber on Stanislaus National Forest land is harvested on general forest land, with only small amounts and much more restrictive logging occurring in areas with wilderness, near natural, wildlife, and wild and scenic river designations.

The Board of Forestry and Fire Protection implements the Z'berg-Nejedly Forest Practice Act of 1973 by developing forest practice regulations and policy applicable to timber management on state and private timberlands. CAL FIRE monitors logging activities and enforces laws that regulate logging on private lands. Together the Board of Forestry and CAL FIRE work to protect and enhance resources that are not under federal jurisdiction. This includes: major commercial and non-commercial stands of timber, areas reserved for parks and recreation, and lands in private and state ownership that are a part of California's forests.

Timber harvests of two to 1,000 acres are regularly permitted by CAL FIRE. CAL FIRE stipulates conditions under which timber harvest can occur including mitigation for potential water quality impacts such as providing buffer zones near streams, and implementation of best management practices (BMPs). Once a timber harvest plan is approved, the landowners are required to implement erosion control practices. CAL FIRE continues to monitor timber harvest areas for one to three years to assure that erosion control practices are still in place. Timber harvesting that occurs near waterbodies containing anadromous fish populations is monitored for erosion control practices for three years. All owners of private timberland in California must obtain an approved THP before harvesting of commercial timber species is allowed. This applies to all lands that contain commercial timber species, regardless of zoning.

The SWRCB worked with the Board of Forestry and Central Valley Regional Water Quality Control Board (CVRWQCB) to update Waste Discharge Requirements for federal and non-federal lands to provide a General Order for timberland management activities. It waives the requirements to submit a report of waste discharge and obtain waste discharge requirements. On October 8, 2013, amendments to Public Resources Code went into effect and established a new type of timber harvesting permit: Working Forest Management Plan (WFMP). This new permit allows non-federal non-industrial landowners of 10,000 acres or less to harvest timber via a non-expiring permit. After litigation, the Board of Forestry amended the adopted 2017 regulations to reduce the acreage to 10,000 acres or less and address the need for information regarding erosion control in the plan. Amended regulations passed in February 2019. The first WEFP has been submitted and is under review by CAL FIRE and other state agencies.

IRRIGATED AGRICULTURE AND PESTICIDES

CONCERN

The potential risks to water quality associated with agricultural cultivation are increased erosion, loss of top soil, and use of fertilizers, pesticides, and herbicides. Pesticide and herbicide use within the study area is primarily for landscaping, rights of way, forest lands, and agricultural activities.

IRRIGATED AGRICULTURE. The pervious surfaces of agricultural lands absorb contaminants and runoff during precipitation events. However, when soils are saturated or the surface is impervious, storm events result in runoff from these lands conveyed as sheetflow or concentrated flows eroding the ground surface and stream banks. High loadings of suspended solids into waterbodies result in high turbidity levels containing pesticides and herbicides, and DBP precursors. Plowing and grading fields, particularly on windy days, can cause the suspension of particles with atmospheric transport into waterbodies. Soils with poor drainage characteristics may have higher runoff potential than more permeable soils. Drip irrigation systems typically generate little or no runoff. If well managed, drip irrigation minimizes irrigation season pesticide runoff from treated sites.

Water quality contamination associated with illegal marijuana farming is typically found in rural mountainous or foothill areas. Concerns with illegal farms are associated with grading and other earth moving that can cause erosion, liberal use of banned rodenticides for workers sleeping on-site to protect the high value crops, dumped trash and discarded vehicles, human waste, excessive use of pesticides and herbicides, and illegal diverting of surface waters. The concern is primarily with illegal cannabis farms growing in the ground subject to runoff that are not permitted. Legal crops require farmers to report chemical usage to the county as with other crops, and permits are issued to ensure compliance with waste discharge requirements etc. Illegal operations result in SOCs, hydrocarbons, herbicides, and pesticides, and microorganisms making their way to waterbodies through direct deposition and runoff.

PESTICIDES AND HERBICIDES. When herbicides and pesticides are applied, they can enter waterbodies by runoff from the land due to stormwater flows or flood irrigation, overspray, or wind transport during application. These chemicals are also applied aerially by crop dusters. Improper use and over-application of pesticides, as well as over-irrigating, also can cause runoff of sediment and pesticides to surface waters or can seep into groundwater. Sediment, pesticides, and excess nutrients can also affect aquatic habitats by causing eutrophication, turbidity, temperature increases, toxicity, and decreased oxygen.

Pesticide/herbicide use is categorized by season of application, with application occurring either during the irrigation or dormant season. During the dormant season, organophosphate pesticides are carried to surface water by stormwater runoff. Pesticide residues deposited on trees and on the ground migrate with runoff water during rain events. Although practices are available to minimize pesticide drift, once pesticides enter the atmosphere through volatilization, only natural degradation limits their movement and fallout during rainstorms. Pesticides applied during the dormant season, from December through February, are periodically washed off fields by storms large enough to generate runoff. For the San Joaquin River Basin, studies have shown that the amount of pesticide washed off is usually a very small fraction of the amount applied, ranging between 0.05 and 0.13 percent for diazinon and 0.06 to 0.08 percent for chlorpyrifos, but it is sufficient to cause toxicity to aquatic invertebrates.

In addition to the pounds of pesticide applied, other factors affect the amount of pesticide in storm runoff and pesticide loading. Soils with poor drainage characteristics may have higher runoff potential than more permeable soils. Field slope, the presence and type of cover crop, and antecedent moisture conditions also affect transport mechanisms. Irrigation methods affect the magnitude of pesticide loading to a river. With furrow or flood irrigation, tailwater drains from the end of the field and is usually discharged to a drainage channel. In some cases, systems are in place to recycle tailwater to another field, or to blend it with fresh irrigation water and reapply it to another field. Tailwater return flows from flood and furrow irrigation generate the largest loads because large volumes of water are discharged directly. Relative to flood and furrow irrigation, sprinkler irrigation is likely to increase pesticide wash-off from foliage but will generate less tailwater if used appropriately. Drip irrigation systems typically generate little or no runoff. If well managed, drip irrigation minimizes irrigation seasonal pesticide runoff from treated sites.

POTENTIAL CONTAMINANT SOURCES

IRRIGATED AGRICULTURE. Agriculture in the Calaveras River watershed includes a diverse list of crops including field crops, apiaries, fruit and nut crops, livestock, poultry, and wine grapes. Agricultural production in the region is primarily located on lands in San Joaquin County with smaller but increasing areas under production in Stanislaus and Calaveras counties. There are several vineyards in the watershed within the vicinity of the Calaveras River and its tributaries. Agricultural land use in the lower elevations is predominantly rangeland; cattle grazing is discussed under Livestock. Cannabis cultivators are difficult to quantify but the Calaveras County Sheriff estimated there may be approximately 1,000 illicit operations in the county.

The latest crop reports for Calaveras County indicate that the demand and prices for agricultural crops have remained strong. According to the 2019 crop report, after livestock, wine grapes and walnuts are the top commodities in Calaveras County. Table 3-2 presents crop acreages for the entire Calaveras County. San Joaquin County data are not provided because it is one of the largest producing agricultural counties in the nation with a very small areal extent within the Bellota Intake subwatershed.

Table 3-2: Crop Production Acreage - Calaveras County

Crop	2018	2019
Grapes (Wine)	711	711
Walnuts	794	811
Hay, Grain	227	250
Almonds	50	180

Source: Calaveras County, 2020a. Note: acreages are for entire county.

PESTICIDES AND HERBICIDES. Reports of controlled pesticide and herbicide use are submitted to the California Agricultural Commissioner monthly providing chemical use, quantities, etc. Statewide, farmers have reduced pesticide use over time. This shift has been influenced by more stringent regulations from the California Department of Pesticide Regulation (CDPR). Other contributors to the shift towards reduced pesticide use include increased pesticide costs, choices made by the farmers to make economical and safety decisions, a small shift towards organic farming, and efforts made by the local resource conservation districts.

Table 3-3 presents the overall pounds of pesticides used in Calaveras County 2011 through 2019; usage includes lands in the Calaveras River watershed as well as the rest of the county. Pesticide usage varies year to year depending on pest problems, weather, acreage and types of crops planted, economics, and other factors. The extended data in Table 3-3 shows the influence that weather has on pesticide usage. Pesticide usage decreased during the very dry years of 2012 and 2013 and increased during the wetter years of 2011 and 2018.

Table 3-3: Pesticide Quantities in Calaveras County (pounds applied)

2011	2012	2013	2014	2015	2016	2017	2018	2019
78,513	43,814	33,524	61,992	52,834	49,025	52,986	73,868	61,220

Source: CDPR, 2021.
Note: Quantities include adjuvants and are for the entire county.

The top five pesticides used in Calaveras County and the pounds applied are presented in Table 3-4. Glyphosate is the primary ingredient in Round-up and is the most commonly used herbicide in the United States. Banning this chemical was considered by the US EPA but it could not be proved that it was harmful to humans, however it has been proven to kill bees which are important to crop production. Methylated soybean oil is an adjuvant, a substance added to improve herbicidal activity. Sulfur is the primary chemical used for wine grapes; it is applied as a fungicide against powdery mildew.

Table 3-4: Top Five Pesticides Used - 2018

Pesticide	Commodity	Pounds	Acres
Glyphosate, Isopropylamine Salt	Landscape Maintenance	22,968	0
	Rights of Way	3,698	9
	Forest, Timberland	1,912	602
	Grape, Wine	73	28
	Walnut	235	175
	Total	28,886	814
Methylated Soybean Oil	Forest, Timberland	6,884	1,639
	Rights of Way	273	15
	Landscape Maintenance	219	0
	Uncultivated Ag	17	28
	Pastureland	33	30
	Total	7,426	1,712
Glyphosate, Dimethylamine Salt	Forest, Timberland	3,937	1,002
	Rights of Way	10	10
	Total	3,947	1,012
Sulfur	Grape, Wine	7,980	1,586
	Total	7,980	1,586
Glyphosate, Potassium Salt	Landscape Maintenance	1,572	0
	Right of Way	208	70
	Rangeland	133	22
	Grape, Wine	583	322
	Walnut	55	40
	Total	2,551	454
Total Pesticide Usage		**50,790**	**5,578**

Source: CDPR, 2021. Top five pesticides by pounds.

Because of the increasing acreage trend and proximity of almond orchards in the lower watershed to Bellota Intake, pesticides used on almond orchards are identified here. According to CDPR, almond orchards are often treated with insecticides such as Abamectin, petroleum and mineral oils, methoxyfenozide, chlorantraniliprole, and bifenthrinwith with a steady increase in acreage treated with the top chemical Abamectin over the years; it is most used in May. Fenazaquin is a relatively new foliar miticide starting use on almond acreage in 2016 with a rapid increase over time. The biopesticide *Burkholderia* spp. strain A396 is used; bioinsecticides *Bacillus thuringiensis* and *Chromobacterium subtsugae*s strain PRAA4-1 are used; and biofungicide *Bacillus amyloliquefaciens* strain D747 is used, doubling in use between 2017 and 2018. The top five herbicides used in 2018 on almond orchards include glyphosate, oxyfluorfen, glufosinate-ammonium, paraquat dichloride, and saflufenacil. The top five fungicides include fluopyram, azoxystrobin, trifloxystrobin, propiconazole, and copper. The top five fumigants were aluminum phosphide, 1,3-dichloropropene, chloropicrin, methyl bromide, and sulfuryl fluoride. The trending of use of these pesticides in California on almond orchards is graphically depicted in Figure 3-3 (CDPR, 2020).

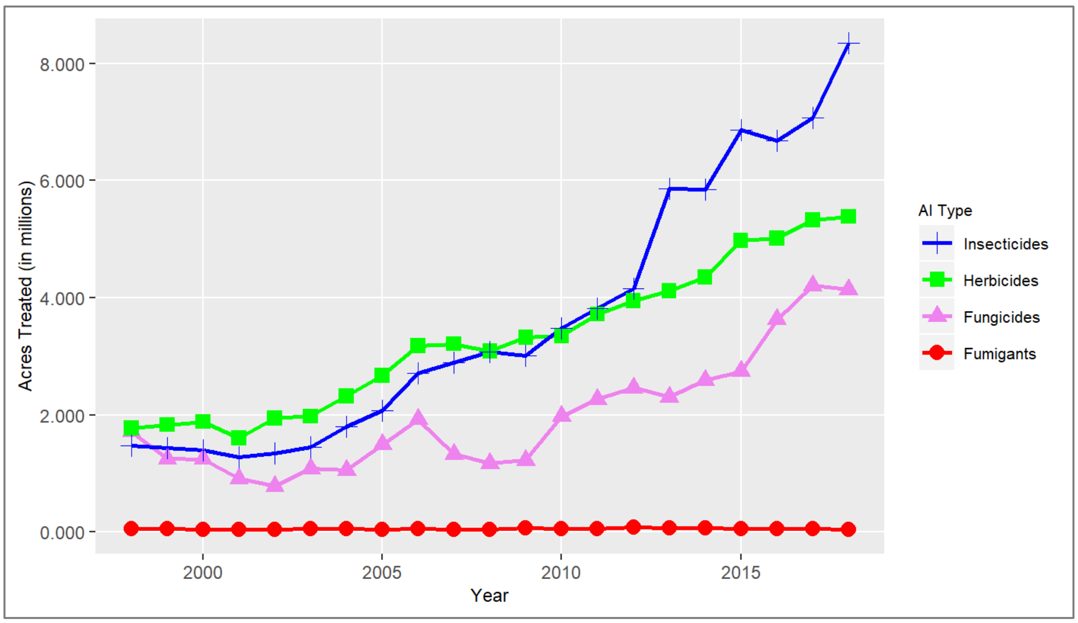


Figure 3-3: Acres of Almonds Treated by All Active Ingredients in the Major Types of Pesticides from 1998 to 2018

WATERSHED MANAGEMENT

Programs established to control nonpoint source pollution from agriculture include joint efforts by local, state, and federal agencies. The SWRCB oversees the statewide nonpoint source program, with assistance from CDPR for pesticide usage. As described under Livestock, the SWRCB regulates agricultural runoff through its nonpoint source program. CDPR protects human health and the environment by regulating pesticide sales and use and by fostering reduced-risk pest management. CDPR requires full use reporting of all agricultural pesticide use and structural pesticides applied by professional applicators. CDPR works closely with California's county agricultural commissioners, who serve as the primary enforcement agents for state pesticide laws and regulations. County agricultural commissioners regulate pesticide use to prevent misapplication or drift, and possible contamination of people or the environment. County agricultural commissioner staff also enforce regulations to protect groundwater and surface water from pesticide contamination.

Farmers must obtain site-specific permits from their county agricultural commissioner to purchase and use many agricultural chemicals. The commissioner must evaluate the proposed application to determine whether it is near a sensitive area, such as wetlands, residential neighborhoods, schools, or organic fields. State law requires commissioners to ensure that applicators take precautions to protect people and the environment. Based on this evaluation, the county agricultural commissioner may deny the permit or require specific use practices to mitigate any hazards. For example, a permit may be contingent upon the method of application, time of day, weather conditions, and use of buffer zones. Part of the commissioner's duty in issuing a permit is to decide the need for a particular pesticide and whether a safer pesticide or better method of application can be used and still prove effective.

Local governments such as the county Department of Agriculture and local resource conservation districts play an active role in influencing practices of agricultural activities. The U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) and the University of California Cooperative Extension Service provide technical and financial services for farmers. NRCS typically provides conservation assistance through a nationwide network of resource conservation districts (RCD) and local offices. Calaveras County does not have a RCD.

The NRCS works to help landowners, as well as federal, state, tribal, and local governments, and community groups, conserve natural resources on private land. The NRCS has three strategies to implement their goals of: high quality, productive soils; clean and abundant water; healthy plant and animal communities; clean air; an adequate energy supply; and working farms and ranchlands.

- Cooperative conservation: seeking and promoting cooperative efforts to achieve conservation goals.
- Watershed approach: providing information and assistance to encourage and enable locally-led, watershed-scale conservation.
- Market-based approach: facilitating the growth of market-based opportunities that encourage the private sector to invest in conservation on private lands.

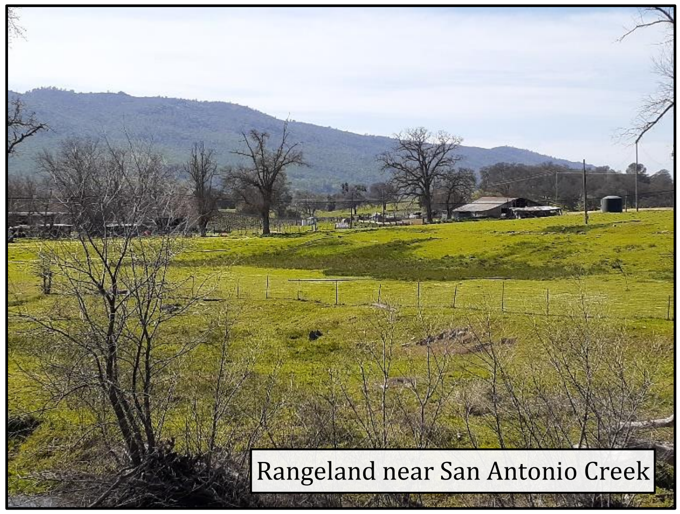
In 2016, Calaveras County began the process of establishing requirements to regulate the growing of medical marijuana/cannabis and approved a temporary ordinance. The Calaveras County Board of Supervisors adopted an ordinance regulating cannabis cultivation on July 28, 2020 (Chapter 17.95). These regulations allow for limited regulated cannabis cultivation and require applicants to comply with SWRCB's 2019 General Waste Discharge Requirements for Discharges of Waste associated with Cannabis Cultivation Activities (Resolution No. 2019-0001- DWQ).

LIVESTOCK AND POULTRY

CONCERN

Rangeland cattle and poultry are addressed together because of the risk of microbial contaminants. Pathogens are more difficult to treat than pesticides and herbicides and there is a public health risk associated with pathogens. Animal waste includes ammonia, nitrates, salts, pathogens, and pharmaceuticals such as ceftiofur, penicillin, and sulfa drugs (CDFA, 2015). Nitrogen and phosphorous can contribute to the eutrophication of waterbodies and excessive algal growth; increased nutrient levels also increase treatment costs. Within the Calaveras River watershed, the Jenny Lind WTP uses ozone as a primary disinfectant which significantly lowers the risk of a *Cryptosporidium* outbreak.

RANGELAND GRAZING. Livestock can contribute microbial contaminants to a waterbody when feces are deposited directly into the water or when runoff carries feces into the water; calves younger than six months appear to be the most likely to shed *Cryptosporidium* oocysts. In addition to microbial contamination, livestock can increase erosion causing particulate, turbidity, and DBP precursor problems if they are allowed to overgraze an area and remove the vegetative cover, compact soils, or are given direct access to a waterbody. Reduced vegetative cover and compaction from animal trails can reduce stormwater infiltration resulting in increased runoff, which increases soil erosion. Increased sedimentation can cause high turbidity reaching treatment plants. Suspended soil particles can absorb and transport other pollutant to the intakes.



Rangeland near San Antonio Creek

Contamination risks of rangeland grazing are associated with two primary activities: cattle concentrating at waterbodies and storm events delivering runoff to waterbodies. Livestock with access to waterbodies can directly deposit manure and its associated contaminants in the streams and can disturb the shoreline and riparian vegetation resulting in erosion during precipitation events. Cattle access streams and reservoirs when there are no water improvements to encourage them to drink elsewhere, and water stations can be expensive to provide in rangelands with limited water access as an alternative. The risk of contamination is greater without water provisions.

Risks of loading viable *Cryptosporidium parvum* oocysts into waterbodies from rangeland cattle are greatest during storm events because sheet flow from grazed areas transports sediment, along with organic matter, nutrients, and pathogenic microorganisms from the manure. Check dams on small water courses create watering spots for grazing cattle which can overflow during rainfall events, releasing pathogens to waterbodies. In addition, if irrigated pasture is not properly managed, irrigation water could run off the site and into waterways.

POULTRY. Runoff from poultry operations is prohibited and is less likely to occur than with rangeland grazing because poultry are usually housed. Poultry includes chickens, turkeys, ducks, geese, guinea fowl, pheasant, pigeons, and ostrich.

POTENTIAL CONTAMINANT SOURCES

Land use in the lower elevations of the Calaveras River watershed (which could impact the Jenny Lind WTP and Dr. Joe Waidhofer WTP) is predominantly non-irrigated land used for cattle grazing. In 2019, Calaveras County had 198,000 acres of rangeland with 2,000 acres of irrigated pasture

(Calaveras County, 2020a). Rangeland cattle typically include raising cows for breeding and raising steers for sale.

Livestock grazing in the upper watershed began in the area around the 1850's after the gold rush caused in a boom in the cattle industry. Ranchers established summer ranges on meadow lands in the high Sierras. These cattlemen used the low country open range during winter, and mid and higher country had ideal pasture and meadows for grazing during the summer. The pattern of rotating cattle up and down throughout the seasons persists to this day. The Stanislaus National Forest Reserve was established in 1905 and with it came leased allotments. Cattle graze in low densities throughout the watershed, depending on the terrain and vegetation. Ranchers protect grazing areas in order to maintain permit status, the long term health of their herd, and the availability of a healthy grazing environment.

Cattle appear to have either direct access to streams in the watershed and/or are grazing on lands that drain to waterbodies that convey water to water treatment plant intakes. Grazing historically occurred around New Hogan Reservoir from November through May but the U.S. Army Corps of Engineers (USACOE) eliminated most grazing on its lands. Grazing still occurs on lands adjacent to and with direct access to the North Fork Calaveras River on private lands upstream of the confluence of the North Fork and South Fork as well as along the tributaries to the South Fork Calaveras River such as San Antonio Creek and San Domingo Creek.

As presented in Table 3.5, cattle numbers in Calaveras County have increased since the 2012 - 2016 drought ended. These data represent the entire county, not just the study area watershed.

Table 3-5: Cattle in Calaveras County

	2016	2017	2018	2019	2020
Beef Cows	7,800	8,500	10,600	10,300	10,500

Source: CDFA, 2021. California Agricultural Statistics Review, 2016 through 2020.

The SWRCB starting registering poultry operations in California in 2016. Calaveras County has two facilities listed but only one is within the watershed off Southworth Road south of Burson. No other poultry operations were observed during the development of this survey. According to the CVRWQCB, it is recognized that there are more facilities in the region but the new program has relied on voluntary registration.

WATERSHED MANAGEMENT

RANGELAND GRAZING. Runoff from grazed land is considered a non-point source of pollution and requires compliance with the SWRCB's Non-Point Source Program, a program under the Porter-Cologne Water Quality Control Act requiring permits for anyone discharging waste that could affect water quality in the State. Typical BMPs to keep cattle from waterbodies include the provision of salt licks located away from waterbodies, dedicated watering containers, and fencing of streams. Grazing provides the benefit of reducing fire fuels. Fuels management can greatly reduce the impact of wildland fires in the watershed.

Grazing is extensive on federal lands owned by the Forest Service and U. S. Bureau of Land Management. Grazing on federal lands is governed by the Water Quality Management Plan for

National Forest System Lands in California. This plan utilizes range management BMPs including range analysis and planning, grazing permits, and rangeland improvements.

Forest Service initiated a water quality monitoring pilot program in response to concerns regarding cattle grazing and water quality. Forest Service study investigated microbial contamination, nutrients, and temperature, as well as overall livestock impacts, such as streambank alteration. The Forest Service monitored creeks upstream and downstream of recreation sites and cattle grazing sites. The 2010 study found that the coliform data were below EPA and CVRWQCB standards in all the recreation sites. Forest Service expanded the program in conjunction with the University of California at Davis and produced a report on the results of the analysis. The conclusions were that cattle grazing, recreation, and provisioning of clean water can be compatible goals on national forest lands.

The Rangeland Water Quality Management Program developed by UC Cooperative Extension, Cattlemen's Association, and USDA's Natural Resources Conservation Service, continues to be used as a voluntary management program for private grazing lands. The training supports ranchers to develop and implement water quality management plans and BMPs on their lands.

POULTRY. As of 2016, commercial poultry operations are regulated under the RWQCB's Confined Animal Facilities program and are also subject to waste discharge requirements. The Poultry General Order regulates wastes generated by poultry facilities but includes manure, wash water, and stormwater runoff that has contact with feed or manure. The Poultry General Order regulates commercial operations involving more than 2,000 pounds of live poultry for more than 12 weeks in any 12 month period. Backyard and other small operations are not included. The order has two tiers of requirements based on the potential threat to water quality. Facilities that primarily conduct their operations indoors, do not generate process wastewater, and do not store uncovered manure outdoors are considered Low Threat Operations. Some pasture poultry operations may also be considered Low Threat Operations. Facilities that generate wastewater or that have a significant amount of manure exposed to the elements are considered Full Coverage Operations and must comply with the full range of requirements in the Poultry General Order. Low Threat Operations have significantly fewer monitoring and reporting requirements.

According to the CVRWQCB, there have been no complaints or problems associated with poultry raising facilities in Calaveras County. In general, poultry operations are better managed for water quality conditions because the animals are housed. They do not tend to generate the waste volumes requiring on-site drainage controls as with dairies or feedlots.

MINING

CONCERN

Active, inactive, abandoned, and unknown mining operations can contribute elevated levels of mercury, arsenic, copper, and other metals to waterbodies. Instream suction dredge mining is currently prohibited and is not discussed here. The risk with active mines is associated with accidental discharges. Sand and gravel resource extraction can result in elevated levels of turbidity and sedimentation if berms separating mining activities from waterbodies are breached or if fuels from equipment leak.

Abandoned mines pose the greatest risk to water quality by contributing high levels of metals from exposed soils and tailings transported through runoff. Abandoned mines are not only hazards to the public, but if accessed by the public typically have extensive trash left behind, including cans and flashlight and lantern batteries.

There is little known about the capability and risks of unknown mines to contribute contaminated runoff and sediment. Historical mining operations had little regard for environmental impacts and the sites did not require reclamation plans when operations ceased as they do presently.

POTENTIAL CONTAMINANT SOURCES

Most of the mines within the watershed are inactive historic gold mines in the foothills and higher elevations. Historically, the resources mined in Calaveras County include copper, gold, limestone, and limestone products. Many of the old workings and tailings piles have drastically altered the river's course and flow. In more recent years, asbestos, gold, industrial minerals, limestone, and sand and gravel have been the most active segments of the county's mineral industry.

Within the watershed, placer and hard rock mining has occurred along the lower Calaveras River, from the confluence with Cosgrove Creek below New Hogan Reservoir to the South Gulch area below Jenny Lind WTP (within the Dr. Joe Waidhofer WTP [JWWTP] watershed). The disturbed lands around South Gulch are extensive and are from historical and active mining operations. Acres of mine tailings can be found northwest of Milton, along Milton Road.

Active and idle mines within the Calaveras River watershed are listed in Table 3-6. The State Department of Conservation, Office of Mine Reclamation periodically publishes a list of active, idle, and closed mines regulated under the Surface Mining and Reclamation Act of 1975 that meet provisions set forth under California's Public Resources Code.

Table 3-6: Active Mines – Calaveras River Watershed

Mine Name	Commodity	Proximate Waterbody
E. I. G. Mine	Pumice	San Domingo Creek
All Rock-Exempt	Rock	Calaveritas Creek
Hogan Quarry	Stone	Upstream of Jenny Lind Intake
Teichert-Reed Reclaimed	Sand and Gravel	Upstream of Bellota Intake
Jenny Lind Tailing Pile Removal	Sand and Gravel	Upstream of Bellota Intake
Jenny Lind Aggregate Quarry	Sand & Gravel	Upstream of Bellota Intake
Robbie Ranch Gravel	Sand & Gravel	Upstream of Bellota Intake
Snyder Clay Pit (Idle)	Clay	New Hogan Reservoir
Valley Springs Clay Pit	Clay	New Hogan Reservoir
Chili Gulch Quarry	Rock	New Hogan Reservoir
John Hertzig Sand & Gravel	Sand and Gravel	New Hogan Reservoir

Source: CDOC, 2021; proximity to waterbodies approximated by author

The Calaveras Cement Company on Pool Station Road near San Andreas and Hogan Quarry downstream of New Hogan Dam have CVRWQCB permits (i.e., Waste Discharge Requirements). Calaveras Cement Company mines limestone and the site drains to the South Fork Calaveras River.

Hogan Quarry is a hard rock aggregate mining and processing facility. There are no unpermitted facilities in the watershed.

WATERSHED MANAGEMENT

ACTIVE AND INACTIVE MINES. In Calaveras County, all mineral extraction operations require mining use permit approval prior to commencement of operations. Calaveras County then examines project specific impacts from the operation. Active mines are usually allowed only inert or nonhazardous waste releases; mining operations can meet these conditions by controlling the acidity of their discharges and by implementing other management practices.

The Surface Mining and Reclamation Act of 1975 (SMARA) regulates surface mining operations to minimize environmental impacts and ensure that mined lands are reclaimed to a usable condition. Annual reporting is required of all mines under the State Mining and Geology Board's authority.

The CVRWQCB Mining Program oversees discharge of mining waste from active and inactive mines. Discharges from active mines are regulated through the issuance of waste discharge requirements and will usually include all surface impoundments, tailing ponds, and waste piles. Regulations have prescriptive and performance standards for waste containment, monitoring, and closure. Inactive and abandoned mines that are threatening or impacting surface and groundwater are regulated by the SWRCB laws and regulations for closure of mine sites and cleanup.

METHYL MERCURY. In 2010, SWRCB began a process to develop a statewide mercury control program for reservoirs. The three main goals of the program are as follows.

1. Reduce fish methyl mercury concentrations in reservoirs determined to be mercury-impaired
2. Have a control program in place for reservoirs in the future determined to be mercury impaired.
3. Protect reservoirs not currently mercury impaired from becoming mercury impaired.

Each reservoir listed as mercury impaired will eventually have its own plan with the SWRCB focusing first on the greatest contributors of mercury to waterbodies within the State. An update to this process since the last WSS update is the adoption of a resolution identifying three new beneficial uses associated with tribal and subsistence fishing and mercury provisions for fish tissue water quality objectives. It was noted that the mercury water quality objectives in the California Toxics Rule do not protect wildlife or people that consume fish contaminated with methylmercury. The resolution was approved in 2017 as titled: *Part 2 of the Water Quality Control Plan for Inland Surface Waters, Enclosed Bays, and Estuaries of California – Tribal and Subsistence Fishing Beneficial Uses and Mercury Provisions*. The provisions include, in addition to many other items, the change from directly measuring mercury in surface waters to assess the accumulation of the mercury found in the tissue of fish living in the water.

New Hogan Reservoir was listed under Clean Water Act Section 303(d) as a mercury impaired reservoir. This reservoir is listed in the SWRCB's draft Phase I Statewide Mercury Control Program to address mercury in reservoirs. Phase I will include pilot tests to manage water chemistry in reservoirs (e.g., oxidant addition to reservoir bottom waters, sediment removal or encapsulation, etc.) and to manage fishers to reduce bioaccumulation (e.g., intensive fishing, changes to fish stocking practices). The mercury control program is also intended to address the cleanup of mine sites upstream of mercury-impaired reservoirs, and work with California Air Resources Board to reduce atmospheric deposition of mercury.

RECREATION

CONCERN

Recreational use of a waterbody poses a wide range of water quality risks, depending on the specific activity, proximity to intakes, and loadings. For example, body contact activities introduce microorganisms; microorganisms are of greater concern from houseboat waste because of the accidental release of large volumes of waste directly into a waterbody. Power boating contributes VOCs and allows boaters to access remote areas of a reservoir with no restroom facilities. Shoreline access can increase erosion, causing turbidity, particulate contributions, and DBP precursors. Marinas can have accidental discharges into waterbodies as a result of resort and marina operations; these loadings would likely be much greater than for individual boats, but less frequently spilled. Activities such as the refueling of boats, storage of fuel, pumping houseboat wastes, launching of boats, and maintenance of facilities (including cleaning and washing of boats) can result in pollutants being discharged to a waterbody.

Illegal dumping could include food waste, hazardous and other materials. Illegal camping generally results in the improper disposal of fecal waste.

POTENTIAL CONTAMINANT SOURCES

Recreation is a significant activity in the Calaveras River watershed which includes access to Stanislaus National Forest and Calaveras Big Trees State Park. There are several public and private owned reservoirs in the watershed (i.e., New Hogan, White Pines Lake, and Emery Reservoir), with the heaviest use at New Hogan Reservoir. Recreational opportunities at New Hogan Reservoir include swimming, boating, fishing, waterskiing, and non-water contact activities such as camping, hiking, picnicking, wine tasting, and sightseeing. Recreational use, with body contact, of Calaveras River and its tributaries occurs throughout the length of the river, concentrated at access points. A discussion of recreational activities associated with specific sites in the watershed is provided along with a discussion of unauthorized activities. Because the Stanislaus National Forest has minimal land within the Calaveras River watershed, it is not discussed here.

CALAVERAS BIG TREES STATE PARK. Calaveras Big Trees State Park, operated by the California State Department of Parks and Recreation, is located within both the Stanislaus River and Calaveras River watersheds. North Grove is the most heavily visited area in the park with the park visitor center, multiple trails and interpretive sites, and cabins. It is located adjacent to and on both sides of Highway 4. The park has several campgrounds; North Grove campground and two group campgrounds are all within the Calaveras River watershed located near the park entrance. The group campgrounds are north of Highway 4. North Grove has 70 campsites for tents and recreational vehicles (RV). Different facilities open at different times during the year, but the park is closed from December to February and the restrooms are closed November through April. Much of the park was closed during the 2020 stay-at-home order. North Grove campground is located on Big Trees Creek which drains across Highway 4 to White Pines Lake. No swimming is allowed in Big Trees Creek. Other activities available at the park include hiking, cross country skiing, and snowshoeing.

The North Grove campground, visitor center, ranger office, day use area, and Jack Knight Hall is served by a septic tank and leachfield. The park also has vault toilets. There are six pit toilets available in the environmental (tent) campsites. An RV sanitation station is located near the park entrance. The North Grove Wastewater Treatment Plant is one of eight wastewater treatment facilities within the Calaveras Big Trees State Park. The plant receives waste from the campgrounds, RV/trailer dump stations, and the visitor center. The effluent collection system includes a 20,000-gal septic tank and 3,400 linear feet of piping. Collected wastewater is sent to a clearwell where it can be directed to a pump station and then to a leachfield, or sent to the sprayfield disposal area. The site drains to San Antonio Creek and White Pines Lake, upstream of Sheep Ranch WTP.

WHITE PINES LAKE. White Pines Lake is on San Antonio Creek near Arnold and is the headwaters for the Sheep Ranch WTP. Calaveras County Water District owns White Pines Lake and a band of property around the reservoir, 95.4 acres in total. CCWD leases 80 acres of its property to White Pines Park and to Friends of the Logging Museum. The reservoir was once surrounded by a lumber mill; Sierra Nevada Logging Museum is located by the reservoir. CCWD also leases portions of the White Pines property to the Courtright Emerson Ballpark and to the local Moose Lodge.

Volunteers operate White Pines Community Park as a private park (through White Pines Park Committee). The Park has fishing, 40 picnic tables, 25 barbecues, softball field, beach, and a playground. There is no motorized boating but hand launched fishing boats and canoes are allowed. Both body contact and non-body contact (e.g., boating) recreation are permitted. Low speed boating (no motors), kayaking, and canoeing are allowed on the reservoir with access available at a public boat launch. White Pines Park has no marina services or boat fuel. The 60 parking spaces are typically full all summer and on weekends parking spills out into the adjacent neighborhood. The Arnold Rim Trail leads south from the reservoir 10.5 miles to Sheep Ranch Road near Avery.

NEW HOGAN RESERVOIR. New Hogan Reservoir is located in the oak and brush covered foothills of the Sierra Nevada. When full, the reservoir has 50 miles of shoreline which extends nearly eight miles upstream to the confluence of the North and South Forks of the Calaveras River. The reservoir has multiple areas of day and overnight use, including camping, boating, waterskiing, hiking and mountain bike trails, a disc golf course, equestrian trails, and swimming. Wrinkle Cove Day Use Area, at the northwest end of the reservoir is a popular swimming area. The U.S. Army Corps of Engineers (US ACE) allows pets in recreation areas, and posts park rules in public areas. Boat launching is available at four public boat ramps. No marina services or boat fuel are available. Hunting of turkey, quail, dove, and waterfowl with a bow or shotgun is allowed on most of the US ACE lands, except the northwest side of the reservoir.


New Hogan Reservoir fishing

Camping and picnicking are allowed in designated areas. Picnic sites are located in Fiddleneck Day Use Area and at the New Hogan Dam Observation Point near the Park Headquarters. The area is also a staging area for an eight mile equestrian trail on a scenic loop that winds along the reservoir and through the foothill chaparral.

The three developed campgrounds include approximately 250 campsites with toilet facilities, both permanent and portable. Acorn East and Acorn West have flush toilets, while Oak Knoll is more primitive. A group campground is also available at Coyote Point. Thirty boat-in campsites at Deer Flat are available on a first-come first-serve basis from May through September. There is a full-scale golf course to the northwest (La Contenta). These golf course lands drain to the Calaveras River below the dam and upstream of the Jenny Lind intake.

The New Hogan Lake Recreation Area has vault, chemical, and flush toilets. The chemical toilets are pumped regularly. The pit toilets are self-contained and are pumped regularly. Sewage from the flush toilets is piped to holding tanks. The liquid is pumped out to settling/evaporation ponds. This facility operates under a Waste Discharge Requirements (WDR) permit.

LESS FORMAL RECREATION AREAS. There are numerous access points allowing public access to the water along the North Fork and South Fork Calaveras River and its major tributaries Jesus Maria Creek, Calaveritas Creek, and San Antonio Creek. The Arnold Rim Trail by White Pines is open year round.

UNAUTHORIZED USES. Unauthorized activities that may be potential contaminant sources include: illegal dumping, illegal drug manufacture and manufacturing waste disposal, unauthorized discharge into a surface water, and unsanctioned recreational activities (e.g., off-road vehicle use or illegal camping).

No significant illegal or unauthorized activities are known to occur at the reservoirs in the watershed; activities that take place are well controlled. Within Calaveras Big Trees State Park occasional dumping of trash does occur and is cleaned up by park maintenance staff. Off-highway vehicle (OHV) use is not allowed and its vehicles are prevented from entering the State Park. Occasionally an unauthorized woodcutter is encountered. The rangers patrol all areas of the park frequently.

The Forest Service has identified unmanaged recreation, especially impacts from motor vehicles, as one of the key threats facing the nation's forests today. In addition, OHV impacts have created unplanned roads and trails, erosion, watershed and habitat degradation, and impacted cultural resources sites.

WATERSHED MANAGEMENT

Calaveras Big Trees State Park is managed by the California State Parks. The US ACE rangers and Calaveras County Sheriff's Department deputies patrol all areas of New Hogan Lake Recreation Area. Unauthorized activities are stopped at the entrances or are identified and stopped during patrols.

White Pines Park is managed by a volunteer organization. CCWD, however, owns the land and ensures that water quality is not jeopardized. Body contact is not allowed in Big Trees Creek in Calaveras Big Trees State Park, greatly reducing the risk of pathogen contamination to Sheep Ranch WTP. Body contact is not allowed in White Pines Lake but it is not enforced.

SOLID AND HAZARDOUS WASTE DISPOSAL

CONCERN

Waste disposal facilities may result in groundwater contamination (which may seep to surface water) even after a site has been closed. Therefore, both open and closed waste disposal facilities were investigated.

Authorized municipal solid waste disposal sites are permitted and monitored and are unlikely to be a significant source of contamination under normal operation. However, improper maintenance, negligent operation, or natural disasters, such as a fire followed by rainfall, may lead to the release of leachate containing bacteria, pathogens, metals, or other contaminants. Solid waste from the treatment dewatering process (filter wash water and sludge lagoons) at water treatment plants and wastewater treatment plants is stored in ponds adjacent to the treatment facilities for off-site disposal or land application. These lagoons are designed to have adequate capacity; capacity exceedance is infrequent and associated with extreme precipitation events. Runoff from composting facilities composting green waste can contain nutrients and TOC associated with stored materials in stages of decomposition. Stormwater permits are required for composting facilities.

Underground storage tanks (UST) and other spills, leaks, investigations and cleanup sites all pose a threat to water quality. While the majority of gasoline and chemical spills will usually be of greatest concern for groundwater quality, runoff and groundwater plumes from contaminated sites can also impact surface waters. Precipitation may wash superficial surface spills into nearby drainages, which may eventually flow into larger streams, rivers, reservoirs, etc. Moreover, contaminated groundwater plumes may flow to lower elevations (from the spill site) and re-emerge, contributing contaminated water to large waterbodies such as reservoirs.

POTENTIAL CONTAMINANT SOURCES

LANDFILLS. The San Andreas transfer station, located off Highway 49 between San Andreas and Mokelumne Hill, is used for the consolidation of waste before transfer to solid waste disposal sites located outside the watershed area. Separate bins are available for recycling. Yard waste, tires and appliances with Freon must be segregated for recycling and are not allowed to be dumped with household trash. No other solid or hazardous waste disposal facilities are located in the Calaveras River watershed.

UNDERGROUND STORAGE TANKS. There are half as many leaking underground storage tank (LUST) open clean-up sites in the watershed than identified in the 2016 WSS. The open (active and inactive) and closed LUSTs within the Calaveras River watershed are presented in Table 3-7. Open cases include site assessment, remediation, and monitoring.

Table 3-7: Leaking Underground Storage Sites

Community	Open/Active	Open/Inactive	Closed
Arnold	0	0	17
Avery	0	0	1
Camp Connell	0	0	3
Dorrington	0	0	1
Hathaway Pines	0	0	2
Jenny Lind	0	0	3
Mokelumne Hill	1	0	1
Mountain Ranch	0	0	3
San Andreas	1	1	22
Sheep Ranch	0	0	4
Telegraph City	1	0	0
Valley Springs	0	0	10
White Pines	0	0	1

Source: SWRCB, 2021b

WATERSHED MANAGEMENT

The California Integrated Waste Management Board (CIWMB), under the California Environmental Protection Agency, manages landfills within California. The CIWMB is the state agency designated to oversee, manage, and track California's 92 million tons of waste generated each year. Landfills are also subject to CVRWQCB waste discharge requirements. The CIWMB provides funds to clean up solid waste disposal sites and co-disposal sites (those accepting both hazardous waste substances and nonhazardous waste). These funds are available where the responsible party cannot be identified or is unable or unwilling to pay for a timely remediation, and where cleanup is needed to protect public health and safety or the environment.

Underground storage tanks are permitted and regulated by the environmental health departments for Calaveras County and Tuolumne County. The RWQCB typically handles cases in which a leaking storage tank is involved. Cases are monitored closely for remediation activities and are not closed until the leak is properly remediated.

The CVRWQCB requires a permit to install a UST. BMPs should be in place by the UST owners to ensure the safety of the tank. Such BMPs include secondary containment devices, monitoring wells and proper maintenance. Many of these sites are former industrial facilities and dry cleaners, where chlorinated solvents were spilled, or have leaked into the soil or groundwater.

The Certified Unified Program Agency (CUPA) was established by the State to improve the coordination of hazardous materials management. The following agencies are identified as the representative CUPA in the watershed.

- Calaveras County Environmental Health Department
- San Joaquin County Environmental Health Department
- Stanislaus County Environmental Resources

The county CUPAs consolidates, coordinates, and makes consistent the administrative requirements for the following hazardous waste and hazardous materials programs.

- Hazardous Materials Disclosure
- California Accidental Release Prevention Program
- Underground Storage Tank Program
- Aboveground Petroleum Storage Tanks
- Hazardous Waste Generator

URBAN RUNOFF AND SPILLS

CONCERN


Highway 49 south of Mokelumne Hill

Stormwater runoff from paved highways and streets, vehicle emissions, vehicle maintenance wastes, outdoor washing, and parking lots contain many pollutants associated with automobiles such as hydrocarbons, heavy metals (e.g., lead, cadmium, and copper), asbestos, and rubber. Urban runoff from landscaped areas and impervious surfaces contribute pesticides, herbicides, and nutrients; sediment; trash; bacteria and pathogens; and metals such as copper, zinc, and nickel. Runoff drains into storm drains, which convey untreated water into a local stream, eventually making its way to the Calaveras River or reservoirs.

Sources of fecal contamination in urban runoff include domestic and wild animals, in addition to human sources from illegal camping, illicit connections, or dumping to the storm drain system, septic system leaks, or sewage spills. Since fecal coliforms are used as indicators of fecal contamination, its presence (as evidenced by those communities that monitor runoff) indicates that urban runoff typically carries a significant amount of fecal material into waterbodies. The actual amount of pathogens (or risk to human health) from urban runoff cannot be extrapolated from indicator organism data.

Automobile, truck, watercraft, and marina accidents can result in spilled cargo content or vehicle fuel spills to waterbodies. Leaked or spilled hazardous materials, petroleum products (gasoline, motor oil), or other fluids can introduce SOCs, heavy metals, and hydrocarbons into a waterbody from runoff, vehicles driving into waterbodies, watercraft malfunctioning or sinking, etc. Hazardous waste spills pose a direct or potentially direct threat to water quality. Sewage spills from sewer overflows and “milk trucks” result in pathogen contamination, including bacteria, viruses, and protozoa. Transported hazardous materials could include fuel, pesticides, solvents, and a variety of other materials.

POTENTIAL CONTAMINANT SOURCES

Drainage directly to the Calaveras River, reservoirs, and tributaries is of greatest concern near intakes because of the lack of blending and time to dilute before the contaminants reach the WTPs. Runoff concerns, and spills and accidental releases are discussed here.

National Pollutant Discharge Elimination System (NPDES) stormwater permittees must comply with NPDES stormwater discharge permit requirements issued individually to each facility or for construction activities. Permittees include businesses producing construction materials, refuse systems, and construction permits for residences. The industrial permittees are generally located in the lower watershed which drains to New Hogan Reservoir. NPDES permits are discussed under Watershed Management.

Hazardous materials spills include sewer overflows, fuel spills from vehicle and boating accidents, and other spills reported to the State Office of Emergency Services. Four California State Highways traverse the Calaveras River watershed: Highway 49 (north-south), and the west-east alignments of Highway 4, Highway 26, and a short stretch of Highway 12. These four highways are major thoroughfares through the Sierra Nevada, but primarily serving inter- and intra-county traffic.

As shown in Figure 2-1, Highway 4 enters the watershed north of Copperopolis, leaves the watershed at the north end of the City of Angels Camp, then enters again and follows the watershed divide between the Calaveras River and Stanislaus River watersheds between Red Apple Drive and Camp Connell. Depending on where a spill occurs, the spill on Highway 4 could impact Calaveras River tributaries or drain to the south out of the watershed. To the east of the watershed, Highway 4 is closed often from November through April along the summit of Ebbetts Pass. Highway 4 is not plowed east of the Mount Reba turnoff near Alpine Lake. A spill along Highway 4 could drain to San Domingo Creek along most of its alignment in the watershed, and possibly San Antonio Creek and While Pines Lake at the eastern end of the watershed.

Highway 26 enters the watershed in the west at Bellota in San Joaquin County, near the intake for the DJW WTP. The highway runs parallel to the Calaveras River. It travels east into Calaveras County through Rancho Calaveras, Valley Springs, and Paloma; the highway then follows the drainage divide between the Calaveras River and Mokelumne River watersheds between Paloma, the southern end of Mokelumne Hill, and Glencoe. Depending on where a spill occurs on Highway 26, it could impact the North Fork Calaveras River or drain to the north out of the watershed.

Highway 12 enters the watershed at Valley Springs and travels east along Highway 26. When Highway 26 veers north towards Glencoe, Highway 12 continues east towards San Andreas where it ends at the junction with Highway 49, just after it crosses the North Fork of the Calaveras River. Highway 49 enters the watershed from the north at Mokelumne Hill and travels south crossing the North Fork Calaveras River, to the community of San Andreas, then crossing Calaveritas, San Antonio, and San Domingo creeks before leaving the watershed at the north end of the City of Angels Camp.

Most of the hazardous materials spills, however, are reported on local streets. Spills are reported to the California Emergency Management Agency (Cal EMA) which records the spill type, quantity, and location, and whether a waterbody was affected. Table 3-8 provides the number of reported hazardous material spills in Calaveras County within the Calaveras River watershed during the previous five years.

Table 3-8: Hazardous Material Spills within the Calaveras River Watershed

Year	Reported Spills
2016	4
2017	11
2018	3
2019	11
2020	4
Average	**7**

Source: COES, 2021

2017 was a very wet year with numerous incidents of storm surges causing sewer overflows and other spills. One normally dry creek was reported to have had a bridge and sewer pipe washed out. In 2019 the North Fork Calaveras River water levels were so high that there were several vehicles reported in creeks. During the planning period, there were several vehicle accidents causing diesel spills, one vacuum truck spilling sewage, and several reports of septic system failures. The majority of incidences reported were sewer overflows from blocked lines. There were no spills reported within the watershed in San Joaquin County or Stanislaus County.

WATERSHED MANAGEMENT

STORMWATER RUNOFF. Stormwater and dry weather runoff in the Calaveras River watershed is regulated through the NPDES federal and stormwater permitting process. The NPDES program is mandated by the Federal Clean Water Act and administered and enforced in California by the SWRCB through the RWQCBs. The NPDES stormwater program regulates some stormwater discharges from three potential sources: municipal separate storm sewer systems (MS4s), construction activities, and industrial activities.

The SWRCB Municipal Stormwater Permitting Program regulates storm water discharges from municipal separate storm sewer systems (MS4) that discharge into waters of the United States. The RWQCB issues Waste Discharge Requirements and NPDES permits for the discharge of stormwater runoff from MS4s. The permits are reissued approximately every five years.

The NPDES permits require large and medium municipalities to develop stormwater management plans and conduct monitoring of stormwater discharges and receiving waters. The permits also require programs to control runoff from construction sites, industrial facilities, and municipal operations; eliminate or reduce the frequency of non-stormwater discharges to the stormwater system; educate the public on stormwater pollution prevention, and better control and treat urban runoff from new developments. Since 2003, small communities have been required to develop stormwater management plans, but do not have to conduct monitoring. Small communities are defined as having a population of at least 10,000, a population density of at least 1,000 persons per square mile, and lying within an urbanized area.

The NPDES stormwater permit for industrial activities was effective in 2015. Features include electronic filing requirements, implementation of stormwater pollution prevention plan structural and nonstructural BMPs, design storm standards, monitoring requirements, exceedance response action process. In 2020, the SWRCB modified the Industrial Stormwater General Permit to provide additional guidance for compliance and allow stormwater dischargers in areas identified in an emergency proclamation that are impacted by wildfires to document that the facilities may include higher levels of a pollutant in the stormwater discharges that are unrelated to the facility's industrial activities. The Construction permit was also modified to provide additional guidance for compliance and document higher pollutant levels in stormwater discharges unrelated to construction activities.

The CVRWQCB determined that within Calaveras County selected community areas were designated as regulated MS4s and Calaveras County is required to comply with the statewide General Permit that was adopted by the SWRCB for "Storm Water Discharges from Small Municipal Separate Storm Sewer Systems." The MS4s include publicly-owned and maintained roadside ditches, culverts, channels, and related systems for the collection and conveyance of stormwater runoff. Consistent with these requirements, Calaveras County prepared a Stormwater Management Plan that identifies potential sources of stormwater pollution from within the county and includes a comprehensive program to reduce identified pollutant discharges. This program includes plans for the implementation of best management practices designed to reduce the discharge of pollutants to the maximum extent practicable.

The County's General Plan now includes consideration of State-mandated requirements for the control of stormwater runoff discharge rates, for the conservation of natural areas, and for fostering development that will minimize adverse impacts on water quality and associated water resources. The SWRCB required that the County adopt an ordinance prohibiting the discharge of virtually all "non-stormwater" into the County storm drain system. Previously, the County's Grading Ordinance simply required compliance with the fairly generalized requirements that are contained in the California Building Code. The new Grading Ordinance includes these requirements plus additional measures designed, among other things, to better control off-site sediment discharges. The Ordinance references a "Grading, Drainage, Erosion, and Sediment Control Design Manual" that includes more detailed design guidelines and procedures needed to carry out the purposes of the Ordinance. The new Ordinance also designated the Department of Public Works as the single entity with direct responsibility for all grading work. In addition, the Department of Public Works submits annual reports to the CVRWQCB summarizing regulatory compliance status and describing the progress made in completing identified control measures.

SPILLS. Typically, water treatment plant operators are notified of hazardous materials spills or other significant events by the State Office of Emergency Services Spill Prevention and Response, or County health services, public works department, or office of emergency services. A county may be notified by the sheriff's dispatch center, California Department of Fish and Wildlife, Caltrans, or by its own road maintenance or flood control staff. As discussed under Solid and Hazardous Waste, the CUPA for each county is responsible for coordinating the accidental release prevention program and is contacted if there is a spill.

At Calaveras Big Trees State Park, if a spill occurs on Highway 4, the fire department is contacted. If there is a spill in the park, the following agencies are contacted: Cal EMA, Calaveras County Environmental Health Department, and CVRWQCB.

A spill in White Pines Lake or in the community park would be immediately reported to CCWD, which has a maintenance crew stationed nearby. At New Hogan Lake, when a spill occurs the following agencies are contacted: Calaveras County, Cal EMA, CCWD, and SEWD.

WASTEWATER

CONCERN

Sanitation facilities collect, treat, and dispose of human waste and can pose a variety of water quality risks when they fail. Failures of treatment plants and onsite wastewater treatment (OWTS) systems (e.g., septic tank/leachfield systems) may result in the introduction of disease-causing pathogenic organisms such as bacteria, parasitic cysts, and viruses (directly or indirectly through soils) to creeks that drain to the Calaveras River, its tributaries, and reservoirs. Also of concern is the risk of increased nutrient loading, particularly nitrogen, to the waterbodies which can contribute to DBP production.

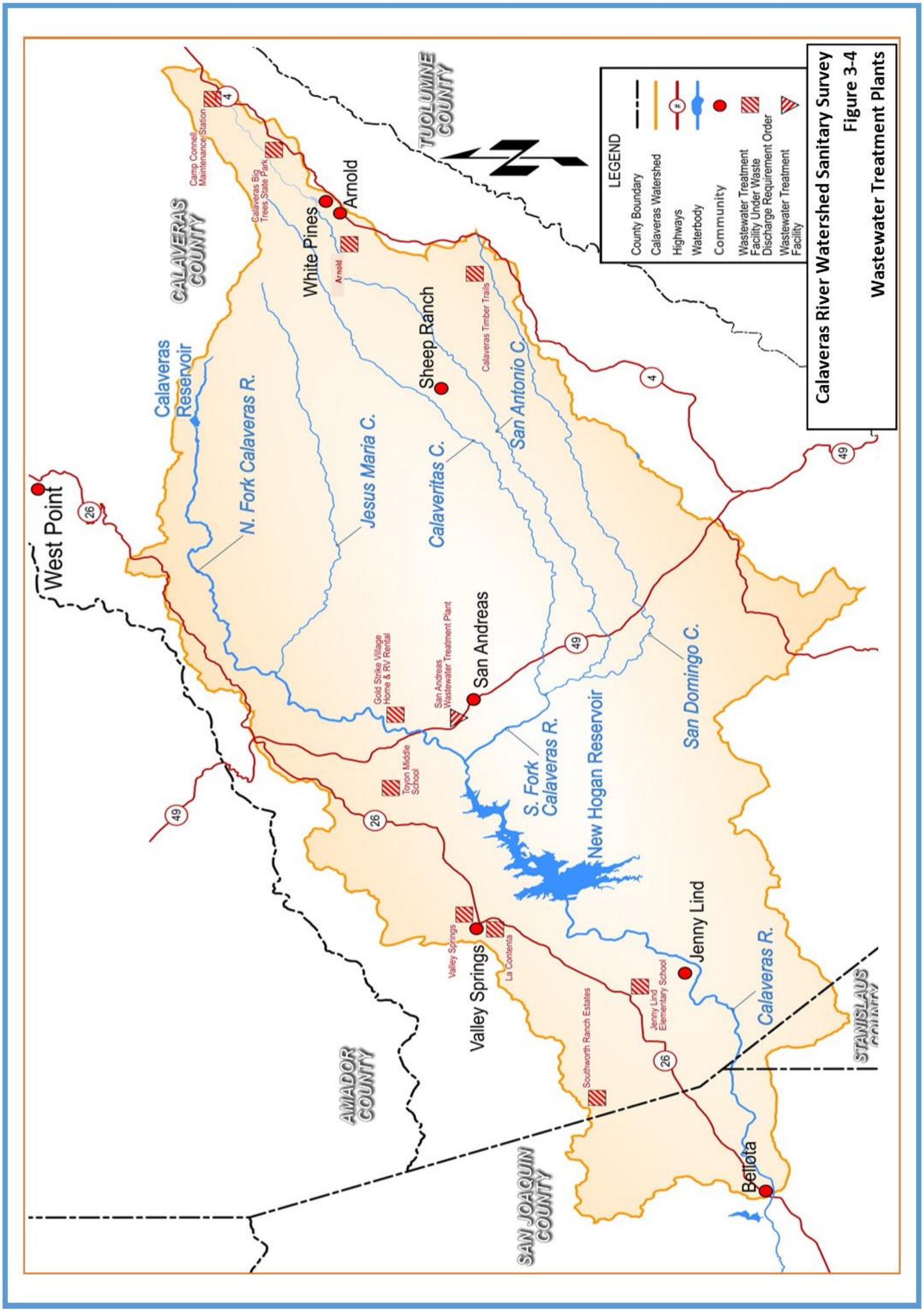
Sanitary sewer overflows often contain high levels of suspended solids, pathogenic organisms, nutrients, oxygen demanding organic compounds, oil and grease, and other wastes.

OWTSs can contribute to the contamination of groundwater. However, a greater risk in the Calaveras River watershed is improperly located, designed, constructed, or maintained systems proximate to surface waters. In addition to the pathogenic organisms and nutrient loading discussed above, improperly functioning systems may contribute metals, pesticides, herbicides, SOCs, and organic matter from leachfields due to improper disposal of household chemicals.

POTENTIAL CONTAMINANT SOURCES

Wastewater discharges are typically considered a “point source” discharge, permitted by CVRWQCB. If the effluent is discharged to surface water, the facility is subject to a NPDES permit. If the effluent is discharged to land via ponds or sprayfields, it is regulated by WDR. Onsite wastewater treatment systems, which are located throughout the watershed, are regulated by the CVRWQCB and the county environmental health departments, as discussed in depth in this section under Watershed Management. Figure 3-4 shows the location of surface water dischargers.

One wastewater treatment plant (WWTP), San Andreas WWTP, holds a NPDES permit to discharge to surface water (as well as land disposal); it is listed in Table 3-9 and is owned and operated by San Andreas Sanitary District. It serves a population of approximately 2,200 residents in the community of San Andreas. Treatment facilities include a grit removal chamber, mechanical screens for solids removal, parshall flume for flow metering, pre-aeration basin, primary and secondary clarifiers, recirculating trickling filter, sodium hypochlorite contact chamber, sodium bisulfite dechlorination unit, heated unmixed anaerobic digester, sludge drying beds, three post-secondary effluent polishing ponds, and a six million gallon (mgal) effluent storage reservoir. The treatment facilities were


Calaveras River Watershed Sanitary Survey
Figure 3-4
Wastewater Treatment Plants
LEGEND
County Boundary
Calaveras Watershed
Highways
Waterbody
Community
Wastewater Treatment Facility Under Waste Discharge Requirement Order
Wastewater Treatment Facility
CALAVERAS COUNTY
TUOLUMNE COUNTY
AMADOR COUNTY
SAN JOAQUIN COUNTY
STANISLAUS COUNTY
West Point
Arnold
White Pines
Sheep Ranch
San Andreas
Valley Springs
Jenny Lind
Bellota
Calaveras Reservoir
N. Fork Calaveras R.
Jesus Maria C.
Calaveritas C.
San Antonio C.
San Domingo C.
S. Fork Calaveras R.
New Hogan Reservoir
Calaveras R.
Camp Connell Maintenance Station
Calaveras Big Trees State Park
Arnold
Calaveras Timber Trails
Gold Strike Village Home & RV Rental
San Andreas Wastewater Treatment Plant
Toyon Middle School
Valley Springs
La Contenta
Jenny Lind Elementary School
Southworth Ranch Estates
4
26
49

upgraded in 2020. Upgrades include the replacement of a 60-year old aerobic digester with a new structure, a new blower building and equipment, odor controls, and improvements to the solids handling facilities, SCADA, and storage pond.

Table 3-9: Surface Water WWTP Dischargers in Calaveras River Watershed

Facility Name	Owner	Community/Waterbody	NPDES No.
San Andreas Wastewater Treatment Plant	San Andreas Sanitary District	San Andreas/Murray & San Andreas Cr to North Fork Calaveras River	CA0079464

Source: SWRCB, 2021a

Discharge to waterbodies is prohibited from May 1 through October 31. Surface drainage is to the San Andreas and Murray creeks; however, the evaporation and percolation area drains to San Andreas Creek only. San Andreas and Murray creeks are tributaries to the North Fork of the Calaveras River. Effluent is land applied onto evaporation/percolation trenches from May 1 through October 31 using a series of pipelines, evaporation, transpiration and percolation ditches after wastewater has undergone tertiary treatment. The WWTP received 18 violations in the past five years. These violations were for lack of leachate collection system, vegetation in ponds, monitoring or reporting violations, and cyanide and coliform exceedances.

WASTEWATER TREATMENT DISCHARGERS – LAND DISPOSAL. Wastewater treatment plants that do not dispose of the effluent to waterbodies typically use land disposal methods. These include spraying fields, leachfields, holding ponds, and the reuse of tertiary treated wastewater in irrigation systems, particularly golf courses. These facilities are required to comply with WDR orders and do not need NPDES point discharge permits. The Calaveras River watershed facilities with WDR are listed in Table 3-10; these facilities have been described in previous WSSs. Most violations in the previous five years were associated with the heavy precipitation during January and February 2017.


La Contenta Golf Course

SANITARY SEWER OVERFLOWS. Potential causes of sanitary sewer overflows (SSO) include grease, root, and debris blockages, sewer line flood damage, manhole structure failures, vandalism, pump station mechanical failures, power outages, storm or groundwater inflow/infiltration, lack of capacity, and/or contractor causes blockages.

A record of SSO is maintained by the SWRCB. Overflows listed in individual SSO reports contain data related on each incident where sewage is discharged from the sanitary sewer system due to a failure (e.g., sewer pipe blockage or pump failure). Table 3-11 provides a summary of SSOs within the watershed from 2016 to 2020 and the number of SSO incidents.

Table 3-10: Land Disposal Dischargers in the Calaveras River Watershed

Facility Name	Owner	Community	WDR Order
Big Trees County Houses WWTP	CCWD	Camp Connell	R5-1994-0357
Calaveras Big Trees State Park	Ca Dept Parks & Rec	Arnold	R5-2006-0043
Calaveras Timber Trails WWTF	Calaveras Timber Trails	Avery	98-006
Camp Connell Maintenance Station WWTF	Ca Dept of Transportation	Camp Connell	90-297
Gold Strike Village MHP	Robert Bradley	San Andreas	88-033
Jenny Lind Elementary School Spray Fields	Calaveras Unified School District	Jenny Lind	92-075
La Contenta WWTP & RF	CCWD	Valley Springs	R5-2013-0145
New Hogan WWTP	USACOE	Valley Springs	98-075
Sierra Ridge WWTP	Rite of Passage	San Andreas	01-056
Southworth Ranch Estates WWTF	CCWD	Valley Springs/ Wallace	90-258
Toyon Middle School	Ca Calaveras Unified School District	San Andreas	97-074
Valley Springs WWTF	Valley Springs Sanitary District	Valley Springs	R5-2005-0066

Source: SWRCB, 2021a.

Table 3-11: Sanitary Sewer System Overflows in Collection Systems (2016 to 2020)

Agency/Collection System	Total Number of SSO Locations	Total Volume of SSOs (gallons)	Total Volume Recovered (gallons)
CCWD/Arnold CS	1	2,500	0
CCWD/La Contenta CS	1	200	200
CDPR/ Calaveras Big Trees State Park CS	1	200	0
San Andreas SD/San Andreas CS	20	2,550	1,945
Valley Springs SD/Valley Springs CS	0	0	0

Source: SWRCB, 2021a.

ONSITE WASTEWATER TREATMENT SYSTEMS. Outside of the wastewater collection and treatment systems described above, most of the residential and commercial uses in the watershed are on onsite wastewater treatment systems (OWTS), commonly called septic systems, with leachfields and/or septic tanks. These smaller communities include Milton, Jenny Lind, Rancho Calaveras, Calaveritas, Mountain Ranch, Sheep Ranch, and Lakemont Pines, in addition to areas within Arnold, La Contenta, and Valley Springs that are not on a collection system. The western County has had the highest failure rates of septic systems, especially near Valley Springs and Rancho Calaveras.

Engineered systems pump the liquids to an area with better drainage. As septic systems age, they tend to fail more frequently. Properly operated systems can experience problems during prolonged precipitation events. Of more concern is a plugged leachfield or tank or nonworking pump which can send untreated sewage directly into a waterbody. Septic system siting can be problematic, particularly in the higher elevations because there is less soil depth and less separation to groundwater. Limestone and volcanic mudflow subsurface formations are problematic because of the difficulty percolating.

The Calaveras County Environmental Health Department permits individual on-site sewage disposal systems on parcels that have the area, soils, and other characteristics that permit installation of such disposal facilities without threatening surface or groundwater quality. These are only permitted where community sewer services are not available and cannot be provided. There are no known plans to replace septic systems with sewage collection service in the watershed in the near future.

WATERSHED MANAGEMENT

Federal and state laws protect water quality from wastewater discharges, as well as the point and nonpoint sources. All treated wastewater in California that is reclaimed for reuse as recycled water must comply with Title 22. On-site wastewater treatment systems are regulated by the SWRCB as well as each county.

FEDERAL AND STATE LAWS FOR POINT AND NONPOINT WASTEWATER DISCHARGES. As discussed under stormwater, the federal Clean Water Act requires states to adopt water quality standards and to submit those standards for approval by the US EPA. The Porter-Cologne Water Quality Control Act is the principal state law governing water quality regulation in California. The Porter-Cologne Act established a comprehensive program to protect water quality and the beneficial uses of water and established the SWRCB and nine RWQCBs which are charged with implementing its provisions, and which have primary responsibility for protecting water quality in California. The SWRCB provides program guidance and oversight, allocates funds, and reviews RWQCB decisions. The RWQCBs have primary responsibility for individual permitting, inspection, and enforcement actions within each of nine hydrologic regions. The Calaveras River falls under the jurisdiction of the CVRWQCB.

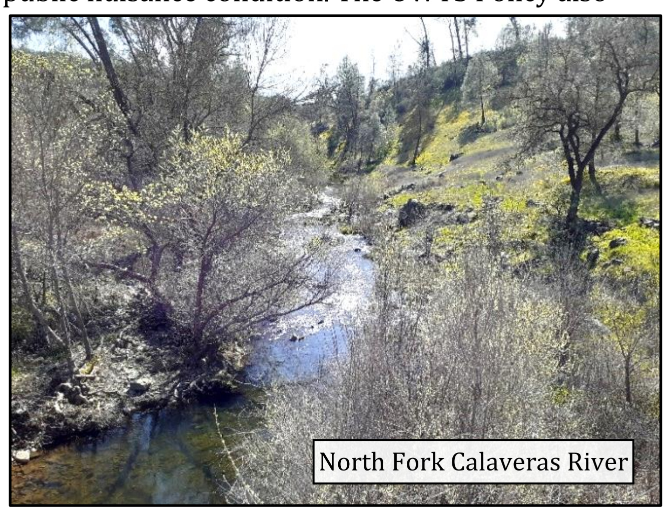
The SWRCB and the RWQCBs preserve and enhance the quality of the State's waters through the development of water quality control plans and the issuance of waste discharge requirements. The RWQCBs regulate point source discharges (i.e., discharges from a discrete conveyance) primarily through issuance of NPDES and waste discharge requirement permits. NPDES permits serve as waste discharge requirements for surface water discharges.

Anyone discharging or proposing to discharge materials to land in a manner that allows infiltration into soil and percolation to groundwater (other than to a community sanitary sewer system regulated by an NPDES permit) must file a report of waste discharge to the local RWQCB (or receive a waiver). Following receipt of a report of waste discharge, the RWQCB issues WDRs that prescribe how the discharge is to be managed.

An NPDES permit is required for municipal, industrial, and construction discharges of wastes to surface waters. Typically, NPDES permits are issued for a five-year term, and they are generally issued by the RWQCBs. An individual permit (i.e., covering one facility) is tailored for a specific discharge, based on information contained in the application (e.g., type of activity, nature of discharge, and receiving water quality). A general permit is developed and issued to cover multiple facilities within a specific category.

The beneficial uses and receiving water objectives to protect those uses are established in the Water Quality Control Plan for the Sacramento River and San Joaquin River Basins, known as the Basin Plan. The CVRWQCB establishes effluent limitations for wastewater dischargers based on the beneficial uses and the receiving water body's water quality objectives. Effluent limitations are specific to each discharge and vary throughout the Central Valley. If a discharge is to an ephemeral stream or a stream that the CVRWQCB determines does not have any assimilative capacity for a contaminant, the discharger's effluent must meet the receiving water quality objectives. If the receiving water has dilution capacity available, the CVRWQCB establishes effluent limitations that allow for a mixing zone and effluent dilution in the receiving water. The CVRWQCB establishes effluent limits for several contaminants in waste discharge permits. However, the Basin Plan does not contain water quality objectives for key drinking water constituents of concern (e.g., disinfection byproduct precursors, pathogens, and nutrients) or the current objectives are not based on drinking water concerns (salinity, chloride). Therefore, current reporting provides limited effluent quality data for many such constituents because the dischargers are not required to conduct monitoring.

STATE AND LOCAL REGULATIONS FOR ON-SITE WASTEWATER TREATMENT SYSTEMS. The SWRCB adopted Resolution 2012-0032 setting policy for the siting, design, operation, and maintenance of OWTS (AB 885). The OWTS Policy sets standards for OWTS that are constructed or replaced, that are subject to a major repair, that pool or discharge waste to the surface of the ground, and that have affected, or will affect, groundwater or surface water to a degree that makes it unfit for drinking water or other uses, or cause a health or other public nuisance condition. The OWTS Policy also includes minimum operating requirements for OWTS that may include siting, construction, and performance requirements; requirements for OWTS near certain waters listed as impaired under Section 303(d) of the Clean Water Act; requirements authorizing local agency implementation of the requirements; corrective action requirements; minimum monitoring requirements; exemption criteria; requirements for determining when an existing OWTS is subject to major repair, and a conditional waiver of waste discharge requirements. The regulations allow local


North Fork Calaveras River

control over managing the systems and provide some funding for low interest loans to property owners needing help to meet the requirements. If the current OWTS is in good operating condition and is not near an "impaired water body", the policy has little effect on property owners. Woods Creek east of Columbia in Tuolumne County is the only impaired waterbody on the OWTS policy list; it drains to the Tuolumne River.

The Calaveras County Environmental Health Department is working on a Local Area Management Plan to comply with the implementation of OWTS policies and regulations. The Calaveras County Draft General Plan specifies new development of one dwelling unit per one acre-plus (no denser) are allowed to have an OWTS, if feasible. Higher densities must be connected to public sewage collection systems. Calaveras County does not require that a septic system be inspected during the sale of a property. However, most lending institutions require that a septic system be pumped out and inspected to obtain a mortgage.

WILDFIRES

CONCERN

Wildfires result in a loss of surface cover and forest duff, such as needles and small branches, which exposes soil to the direct impact of raindrops, which then reduces the infiltration capacity of the soils, increasing runoff. With the loss of vegetation, rainfall does not collect and run off along established depressions, but it dissipates rapidly as sheet flow. In addition, fires in chaparral vegetation can produce hydrophobic soils. Hydrophobic soils decrease permeability of soils and increase runoff. Wildfires contribute large loadings of sediment and organic matter in surface runoff to waterbodies during the rainy seasons following the fire.

Sediment is a major carrier and catalyst for pesticides, organic residues, nutrients, and pathogenic organisms. Fire derived ash can increase pH, alkalinity, and nutrients. The increase in turbidity at the treatment plants from fine particles which have not settled to the bottom of waterways during transport result in increased treatment operations (e.g., more filter backwashing, higher disinfectant dosages), increased likelihood of TTHMs and other DBPs generated, and a greater level of risk of pathogens slipping through the treatment process. Nutrient loads into water bodies, particularly phosphorus and nitrogen, have also been reported to increase after wildfires.

In addition, water yields can be drastically impacted. Immediately following large fire events, runoff peaks can increase significantly and can occur much earlier. Future overall yields can be lower, depending on the nature of the fire and watershed characteristics. At moderately high altitudes, this occurs because snowmelt is greatly accelerated due to the removal or reduction of shade. It is released too rapidly to be stored in the soil, meadows, or in reservoirs. Post fire logging practices can impact water quality through the application of herbicides to control brush and log removal increasing erosion.

POTENTIAL CONTAMINANT SOURCES

According to CAL FIRE, the area features a range of challenging topography, fuels, and weather. The grasslands of the rolling western plains routinely experience extreme summer heat, and significant wind events during spring and fall months. The brush fields lay over broad expanses of steep hillsides and atop narrow ridgelines between deepening river canyons, with topography making access difficult. The brush transitions into mixed oak and conifer zones as the elevation increases and the canyon depth and width increase with high hazard brush and timber fuels. This mid-elevation area also experiences high summer temperatures and is most affected by normal diurnal winds associated with the canyon topography. The higher elevation zone features dense stands of conifer timber, with accumulations of ground and ladder fuels. Temperatures are routinely moderated due to the elevation, however, wind events in the fall can contribute to challenging fire conditions. Most of Calaveras County is designated as having a very high or high fire risk rating.

Another fire concern is the increase in tree mortality rates due in part to more frequent droughts and bark beetle infestation. Dead and dying trees, in particular, Ponderosa, Pinyon, and sugar pines, raise the risk of faster moving and more intense forest fires.

Table 3-12 lists fires that have occurred in the watershed in the last five years based on CAL FIRE incident reports. The tributary or reservoir downstream of the fire burn area is approximated.

Table 3-12: Fires in Calaveras River Watershed (2016 to 2020)

Year	Fire Name	Tributary/Reservoir	Started	Acres
2020	Walker Fire	Bear Cr/New Hogan	June 16	1,455
2019	Lynette Fire	Cosgrove Cr/Jenny Lind Intake	Sept 22	67
2019	Whiskey Fire	Bear Cr/New Hogan	July 18	27
2018	South Fire	South Gulch/Bellota Intake	August 6	290
2017	Maria Fire	Jesus Maria Cr/New Hogan	July 17	117
2017	Gold Fire	San Andreas Cr/New Hogan	July 5	22
2017	Lombardi Fire	Cosgrove Cr/Jenny Lind Intake	April 28	15
2016	Willow Fire	Willow Cr/New Hogan	August 28	450
2016	Pacheco Fire	South Gulch/Bellota Intake	July 12	341

Source: CAL FIRE Incident Report (CAL FIRE, 2021). Tributary/reservoirs were identified by author and are approximate.

The 2015 Butte fire, addressed in the 2016 WSS, had significant impacts to the watershed because of the extensive burn perimeter. According to CCWD, pretreatment facilities were added to the JLWTP due to the fire. These impacts will likely be experienced for many years as the vegetation reestablishes. Following the Butte Fire, CCWD implemented a pretreatment project with FEMA and COES to minimize future wildfire related water quality and biomass issues (CCWD, 2021).

WATERSHED MANAGEMENT

Areas of the state are designed as State Responsibility Areas (CAL FIRE is the primary responder for nonstructural fires outside of Forest Service land), Federal Responsibility Areas (Forest Service has primary jurisdiction for fires in the Stanislaus National Forest), or Local Responsibility Areas (county or city fire departments have primary jurisdiction).

Eleven fire protection districts, a public utility district, one city fire department, and the Calaveras County Fire Department are organized to fight fires in the county. Calaveras County has agreements with seven of the fire protection districts in which an exchange of services, emergency response, and financial support is delineated. Calaveras County Fire and Emergency Services is the primary responder for structure fires unless a community has a fire agency. Calaveras Consolidated Fire Protection District is the principal fire agency in the western portion of the county serving the communities of Valley Springs, Milton, Rancho Calaveras, La Contenta, and Jenny Lind within the watershed. Central Calaveras Fire District is a primarily volunteer department with limited paid staff serving the communities of Mountain Ranch and Sheep Ranch within the watershed. San Andreas Fire Protection District serves the San Andreas community and vicinity.

CAL FIRE Tuolumne-Calaveras Unit updated its Pre-Fire Management Plan. The report included assessment summaries of each battalion in the region including a discussion of assets at risk, fuels and weather, and management activities undertaken by the unit to prevent fire damage to the area. Coordination of fuel reduction efforts in the Calaveras District of the Stanislaus National Forest continues to be a high priority because several large subdivisions within the greater Arnold area are immediately adjacent to USFS lands. The CAL FIRE Emergency Watershed Protection and the Forest Service Burn Area Emergency Rehabilitation teams begin rehabilitation evaluations once a fire is contained. The teams review both the suppression impacts, such as the fire lines constructed by hand crews and dozers, and the fire impacts to determine the extent of repair and rehabilitation needed. After a wildland fire, CAL FIRE assists with hydroseeding, mulching, and other slope stabilization techniques. CAL FIRE attempts to restore the disturbed area. Erosion mitigation response conducted after a wildfire depends on how much vegetation was removed, soil type, steepness of slope, and other factors.

Five of the six largest fires in modern history burned at the same time during the 2020 fire season. A consortium of state agencies released: "California's Wildfire and Forest Resilience Action Plan", in January 2021 to address the increased size and intensity of wildfires throughout the state. This plan is intended to accelerate efforts to restore the health and resilience of forests, grasslands, and natural places, improve fire safety of communities, and sustain the economic vitality of rural forested areas. Active management to achieve these goals include increased forest management, expanded use of prescribed fires, create economic opportunities for the use of forest materials that store carbon and reduce emissions, streamline permitting for vegetation treatment, scale up forest thinning, managing wildfires, and promote sustainable land use, among other items. For example, the report states that the Forest Service will increase annual fuel treatments across its California forests from 250,000 acres a year to 500,000 acres by 2025. Consistent with this program, prescribed burnings have been scheduled in the county for 2021 just outside of the watershed.

WILDLIFE

CONCERN

Wild animal populations are a potential threat to water quality because they may contribute pathogenic organisms such as *Giardia* and *Cryptosporidium*, bacteria, and viruses to the water supply. Wild animals congregate near bodies of water, similar to domestic animals, and can contribute to increased nutrients (nitrogen and phosphorous), microorganisms (bacteria, viruses, and protozoa), and increased erosion of sediment from compaction and disturbance of soils. Birds, in particular, can be a significant source of pathogens to waterbodies because of the direct nature of their deposits, and a tendency to roost in large numbers on water surfaces, and if there is a large year round population as opposed to migratory population. The more expensive testing required to determine whether detected coliform levels are from human or animal sources is usually not conducted.

POTENTIAL CONTAMINANT SOURCES

The grasslands of the watershed provide productive habitat for hundreds of vertebrate and invertebrate species while the woodland vegetation supports a wide variety of game species. Common bird species include acorn woodpeckers, common crows, California quail, doves, hawks, and eagles. Mammals include bats, gray foxes, coyotes, deer, raccoons, and rodents. Squirrels, deer mice, voles and pocket gophers can be found in the grasslands.

Mammals include foxes, coyotes, deer, raccoons, bear, mountain lion, bobcat, wild boar, squirrel, and rabbit. Deer are the most prevalent large mammal. In Calaveras County there are resident deer and migratory deer that move from its winter range in central Calaveras County to its summer range in Alpine County; Mountain Ranch is in a migration zone. Raccoons, skunks, opossums, weasels, muskrats and black-tailed deer favor the riparian corridors. In the forested lands of the upper watershed, habitat supports wildlife such as bears, martens, gray foxes, mountain lions, weasels, coyotes, spotted skunks, flying and gray squirrels, opossums, ringtail cats, and other species.

New Hogan Reservoir is home to fox, blacktail deer, coyote, turkey, mountain lion, bobcat, and wintering home for bald eagles. Visitors to Calaveras Big Trees State Park have observed raccoon, fox, porcupine, chipmunk, flying squirrel, black bear, bobcat, and coyote.

Waterfowl at reservoirs is of particular concern. Canada geese are becoming resident (non-migratory) and a single goose can defecate up to 1.5 pounds per day. Their fecal matter may contribute pathogens and nutrients. Boating on the reservoir and seasonal mixing can stir up settled fecal deposits.

Canada Geese at White Pines Lake

WATERSHED MANAGEMENT

Watershed management of wild animals occurs through the California Department of Fish and Wildlife, county animal control officers, and Forest Service. The presence of wildlife is a high risk to water quality because they difficult to manage to prevent contamination of drinking water supplies.

Managing Canada geese is difficult because there are federal protections. Border collies are effective in chasing geese as a management control but are not a practical solution. Signage discouraging people from feeding them aids in educating the public about the problem. Replanting grass areas with tall fescue or ground covers reduces their food source while studies have shown that geese were less likely to walk to food that was placed beyond 39 yards from the water line. In addition, increasing bank slope or placing large stones around the banks reduces the attraction.

GROWTH AND URBANIZATION

The majority of the Calaveras River watershed is sparsely populated, with several small towns located along historic mining communities established during the Gold Rush period of early California history along the routes of highways 49, 26, and 4. These towns are separated by large landholdings of agricultural lands and forests, with scattered rural residential homes on large lots, and subdivisions. The following communities are in the watershed: Jenny Lind, Rancho Calaveras, Valley Springs, the Calaveras County seat of San Andreas, Mokelumne Hill (south side), Mountain Ranch, Arnold on north side of the highway, and White Pines.

The Calaveras River watershed includes no incorporated cities. Population estimates for the previous five years are provided in Table 3-13 for the entire county. These population estimates from the California Department of Finance report the population of Calaveras County as approximately 44,286, a 1.1 percent decrease from 2016. There are 2.38 people per household in Calaveras County (CDOF, 2021).

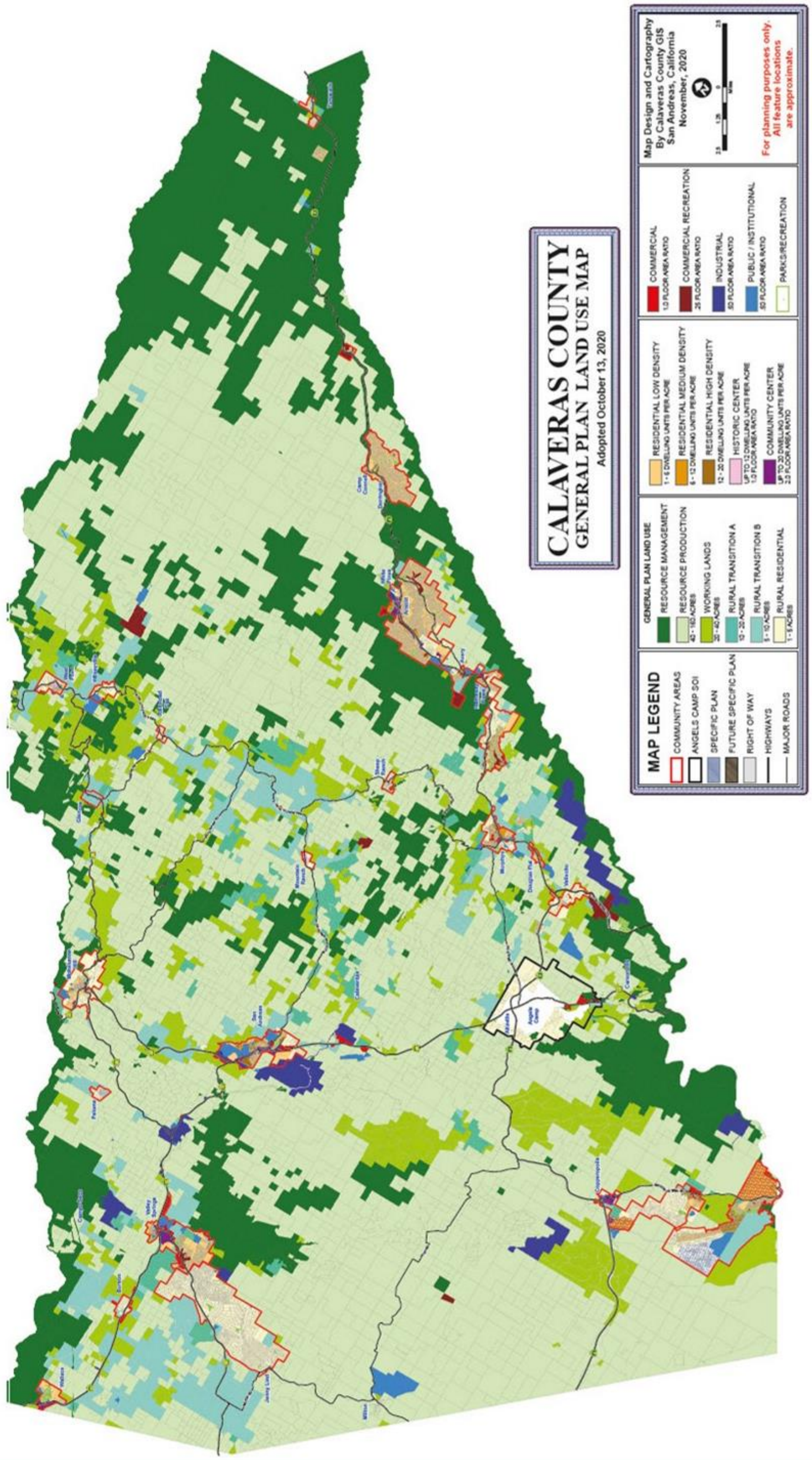
Table 3-13 Population of Calaveras County

	2016	2017	2018	2019	2020	Percent Change 2016 to 2020
Calaveras	44,763	44,656	44,572	44,403	44,286	-1.1

Source: DOF, 2021. Note: This is for the entire county; population in the watershed is not available.

Although it is difficult to obtain precise population estimates for the individual unincorporated communities, various sources provided the following estimates. The largest community in the watershed is Rancho Calaveras with a population of 5,325 residents followed by Valley Springs at 3,553, San Andreas at 2,783, and Mountain Ranch at 1,628.

The Calaveras County General Plan was recently updated; the land use map is presented on Figure 3-5. According to the general plan, the population is expected to increase to 48,038 by 2040. According to the general plan, this may require the addition of 1,012 residential units (Calaveras County, 2020b).



Calaveras River Watershed Sanitary Survey
Figure 3-5
Calaveras County General Plan Land Use Element

SECTION 4 WATER QUALITY

This section presents a review of available water quality data for the study period of 2016 through 2020. Section 4 is organized as follows:

- Review of drinking water regulations with a focus on the SWTR, Interim Enhanced Surface Water Treatment Rule (IESWTR), and the LT2ESWTR.
- Water quality data for the study period 2016 through 2020 are presented for each of the participating public water systems.

DRINKING WATER REGULATIONS

The Safe Drinking Water Act (SDWA) was enacted by the United States Congress in 1974. The SDWA authorized the United States Environmental Protection Agency (USEPA) to set standards for contaminants in drinking water supplies. The SDWA was amended in 1986 and again in 1996. Under the SDWA, states are given primacy to adopt and implement drinking water regulations that are no less stringent than the federal regulations and to enforce those regulations. For California, the DDW is the primacy agency in with this authority.

SURFACE WATER TREATMENT REQUIREMENTS

The SWTR was promulgated in 1989 to control the levels of turbidity, *Giardia lamblia*, viruses, *Legionella*, and heterotrophic plate count (HPC) bacteria. Compliance with the SWTR is demonstrated by meeting specific turbidity and disinfection performance requirements. Surface water treatment plants are required to achieve 3-log (99.9 percent) reduction of *Giardia* and 4-log (99.99 percent) reduction of viruses. A conventional filtration plant in compliance with the turbidity performance standards is given credit for physical removal of 2.5 logs *Giardia* and 2.0 log virus. The additional 0.5-log *Giardia* reduction and 2-log virus reduction must be achieved through disinfection. A direct filtration plant in compliance with the turbidity performance standards is given credit for physical removal of 2 logs *Giardia* and 1 log virus. The additional 1 log *Giardia* reduction and 3-log virus reduction must be achieved through disinfection. Compliance with the disinfection requirements is demonstrated by monitoring CT where C is the concentration of disinfectant and T is the contact time for the disinfectant, and CT is the product of the two. The calculated CT is compared to CT values required to achieve a certain log inactivation credit.

Beyond the minimum SWTR requirements described above, DDW staff can impose additional treatment requirements (via permit) when the quality of the raw water poses higher microbial risk according (based on monthly total coliform results) to the criteria presented in Table 4-1.

EPA promulgated the Interim Enhanced Surface Water Treatment Rule (IESWTR) in 1998 (effective in California in January 2008). The IESWTR applied to surface water systems (and groundwater under the direct influence of surface water) serving greater than 10,000 population. The IESWTR lowered the turbidity performance requirement in the 1989 SWTR for the combined filter effluent from 0.5 NTU to 0.3 NTU for conventional and direct filtration plants and required that utilities monitor and record the turbidity for individual filters. In addition, the IESWTR added (1) a requirement that utilities achieve 2-log removal of *Cryptosporidium*, with compliance demonstrated by meeting the turbidity performance requirement, (2) requirements for disinfection profiling and benchmarking, and (3) a requirement that all new finished water storage facilities be covered.

Table 4-1. Coliform Triggers for Increased *Giardia* and Virus Reduction[1]

Median Monthly Total Coliform (MPN/100 mL)	*Giardia* Cyst (Log reduction required)	Virus (Log reduction required)
<1000	3	4
>1000 – 10,000	4	5
>10,000 – 100,000	5	6

In January 2002 EPA published the final Long-term 1 ESWTR (LT1ESWTR). The LT1ESWTR applied the requirements of the IESWTR to systems serving less than 10,000 population. The LT1ESWTR went into effect in California in July 2013.

The Long term 2 Enhanced Surface Water Treatment Rule (LT2ESWTR) was promulgated in January 2006 and was effective in California in July 2013. The LT2ESWTR required 2 years of monthly source water monitoring for *Cryptosporidium*. Depending upon the concentration of *Cryptosporidium*, utilities were placed into one of four bins, which corresponded to levels of risk. Table 4-2 presents the schedule for the first and second round of monthly source water *Cryptosporidium* monitoring.

Table 4-2. LT2ESWTR Source Water Monitoring Schedule

	Population Served			
	≥ 100,000	50,000 to 99,999	10,000 to 49,999	< 10,000*
Begin first round of source water monitoring	Oct 2006	Apr 2007	Apr 2008	Oct 2008
Submit Bin Classification	Mar 2009	Sept 2009	Sept 2010	Sept 2012
Begin second round of source water monitoring	Apr 2015	Oct 2015	Oct 2016	Apr 2019

*Required to monitor every two weeks for *E. coli*, results may trigger *Cryptosporidium* monitoring.

Table 4-3 presents the various bin classifications adopted in the LT2ESWTR. If the monitoring results indicated placement in Bin 1, no additional treatment for *Cryptosporidium* was required beyond the 2-log removal credit given to plants that meet the turbidity removal requirements. Placement in Bins 2 through 4 required increasing levels of *Cryptosporidium* reduction. EPA developed a microbial toolbox that assigned credit for *Cryptosporidium* reduction for various treatment options.

[1] *Surface Water Treatment Staff Guidance Manual*, Office of Drinking Water, Department of Health Services, Appendix B, Tables B-1 and B-2. May 15, 1991.

Table 4-3. LT2ESWTR Bin Classification

Cryptosporidium (oocysts/L)	Bin	Additional Treatment Required for Conventional Filtration Plant
<0.075	1	No additional treatment
>0.075 and <1.0	2	1 log treatment*
>1.0 and <3.0	3	2 log treatment**
>3.0	4	2.5 log treatment**

*Using any technology or combination of technologies from microbial toolbox.
** At least 1 log must be achieved using ozone, chlorine dioxide, UV light, membranes, bag/cartridge filters, or bank filtration.

A system is exempt from the source water *Cryptosporidium* monitoring if it provides at least 5.5 log *Cryptosporidium* treatment.

REGULATION OF DISINFECTION BY-PRODUCTS (DBPS)

DBPs have been regulated since the adoption of the 1979 trihalomethanes (THM) standard. In 1998, EPA promulgated the Stage 1 Disinfectants/Disinfection By-Products (D/DBP) Rule, which lowered the MCL for THMs from 0.10 mg/L to 0.080 mg/L and established new MCLs for haloacetic acids (HAA) at 0.060 mg/L, bromate at 0.010 mg/L (for systems using ozone), and chlorite at 1.0 mg/L (for systems using chlorine dioxide). The Stage 1 D/DBP Rule also established Maximum Residual Disinfectant Levels (MRDLs) for disinfectants including chlorine, chloramines, and chlorine dioxide, and included requirements for "enhanced coagulation" for the removal of natural organic matter in surface water filtration plants that use conventional treatment. Compliance with the enhanced coagulation requirement is met by achieving specific levels of Total Organic Carbon (TOC) removal for a given raw water quality.

To determine compliance with the enhanced coagulation requirements, each monthly set of paired TOC samples (raw water and combined filter effluent) is used to determine the removal percentage achieved, as follows:

$$TOC\ Removal\ Achieved = \left\lfloor \frac{Raw\ Water\ TOC - Treated\ Water\ TOC}{Raw\ Water\ TOC} \right\rfloor \times 100$$

The required TOC removal varies with the quality of the source water, as shown in Table 4-4.

After determining the TOC removal achieved and finding the Step 1 TOC removal required from Table 4-4, the compliance ratio is calculated as follows:

$$Compliance\ Ratio = \frac{TOC\ Removal\ Achieved}{TOC\ Removal\ Required}$$

Each month, a compliance ratio is determined. Each month's compliance ratio is averaged with the compliance ratios for the previous 11 months to calculate a rolling 12-month average. If the rolling

12-month average of compliance ratios is 1.0 or greater, the requirement is met. This calculation must be done each quarter.

Table 4-4. Step 1 TOC Removal Requirements

Source Water TOC (mg/L)	Source Water Alkalinity (mg/L as $CaCO_3$)		
	0 to 60	**>60 to 120**	**>120**
>2.0 to 4.0	35%	25%	15%
>4.0 to 8.0	45%	35%	25%
>8.0	50%	40%	30%

There are "alternative compliance criteria" which can be used to exempt a system from the DBP precursor treatment technique requirements. In any month that one or more of the following six conditions are met, a monthly compliance ratio value of 1.0 can be assigned (in lieu of the value calculated above) when determining compliance.

1. The source water TOC is <2.0 mg/L.
2. The treated water TOC is <2.0 mg/L.
3. The source water Specific UV Absorbance (SUVA), prior to any treatment, is ≤2.0 L/mg-m.
4. The treated water SUVA is ≤2.0 L/mg-m.
5. The raw water TOC is <4.0 mg/L, the raw water alkalinity is >60 mg/L (as $CaCO_3$), the TTHMs are <40 µg/L and the HAA5 is <30 µg/L.
6. The TTHMs are <40 µg/L and the HAA5 is <30 µg/L with only chlorine for disinfection.

Both source water and treated water SUVA must be measured upstream of any oxidant addition, including chlorine. Further, both UV-254 and Dissolved Organic Carbon (DOC) used in the SUVA calculation are measured after the water has been filtered through 0.45-µm filter paper.

If the system cannot meet the Step 1 TOC removal levels, the system can apply to DDW for a "Step 2" alternative TOC removal requirement. The Step 2 application must be made within three (3) months of determining that Step 1 removals cannot be achieved.

In its application for the "Step 2" alternate TOC removal, the system must provide data from bench or pilot testing. The Step 2 removal requirements are determined as follows:

1. Bench- or pilot-scale testing of enhanced coagulation is conducted using representative water samples and adding 10 mg/L increments of alum (or 5.4 mg/L of ferric chloride) until the pH is reduced to a level less than or equal to the Step 2 target pH values shown in Table 4-5.

Table 4-5. Step 2 Enhanced Coagulation Target pH Values

Raw Water Alkalinity (mg/L as $CaCO_3$)	Target pH
0 to 60	5.5
>60 to 120	6.3
>120 to 240	7.0
>240	7.5

2. The "Step 2" dose is the least of the following two doses:
    a. The dose resulting in the Step 2 target pH value shown in Table 4-5, or
    b. The dose above which the next higher dose results in less than 0.3 mg/L of additional TOC removal (this is called the Point of Diminishing Returns).
3. The percent TOC removal achieved with the "Step 2" dose is then defined as the minimum TOC removal required by the plant.
4. Once approved by DDW, this Step 2 TOC removal requirement supersedes the minimum TOC removal requirement (Step 1) shown in Table 4-4.
5. If no incremental increase of 10 mg/L alum (or 5.4 mg/L ferric chloride) results in greater than 0.3 mg/L incremental TOC removal, then the water is deemed to contain TOC not amenable to enhanced coagulation. Under those conditions, the system may apply to DDW for a waiver of enhanced coagulation requirements.

On January 4, 2006, EPA promulgated the Stage 2 D/DBP Rule (effective in California in June 2012). The Stage 2 D/DBP Rule did not change the MCLs, the MRDLs, or the enhanced coagulation requirements from the Stage 1 D/DBP Rule. However, it did change the manner in which compliance with the MCLs for THMs and HAA5 is determined, requiring compliance at each sampling location rather than across the entire distribution system (referred to as a Locational Running Annual Average or LRAA). The Rule contained a new requirement where systems conducted an Initial Distribution System Evaluation that would be used to identify sample locations anticipated to produce higher levels of DBPs.

ADDITIONAL DRINKING WATER REGULATIONS

In addition to the regulations described above, EPA and DDW have established health-based regulations for a number of inorganic chemicals (metals, minerals), organic chemicals (volatile and synthetic organic chemicals), radionuclides (man-made and naturally occurring), and non-health based secondary standards for constituents that can impact the taste, odor, and/or color of drinking water.

FUTURE DRINKING WATER REGULATIONS

The following presents a discussion of potential future drinking water regulations within the next five-year period.

CONTAMINANT CANDIDATE LIST. Every five years, EPA is required to publish a list of currently unregulated contaminants that "are not subject to any proposed or promulgated NPDWRs [National Primary Drinking Water Regulation], are known or anticipated to occur in public water systems and may require regulation under the SDWA" (referred to as the Contaminant Candidate List or CCL). Every five years, EPA is also required to determine whether or not to regulate at least five contaminants from the CCL.

The fourth CCL (CCL4)[2] was published in November 2016 and contained two Per- and polyfluoroalkyl substances (PFAS): PFOA and PFOS. In March 2020, EPA published for a 60-day public comment period a proposed Regulatory Determination to establish drinking water regulations for PFOA and PFOS. EPA indicated there was sufficient occurrence data and health effects information to develop regulations for these two constituents. Public comments were due by June 10, 2020. As of the end of December 2020, EPA's Regulatory Determination was at the Office of Management and Budget (OMB), and the final Regulatory Determination had not been published in the *Federal Register*.[3]

Under the SDWA, once the final Regulatory Determination is published in the *Federal Register*, EPA will have 24 months to propose a Maximum Contaminant Level Goal (MCLG) and a National Primary Drinking Water Regulation (NPDWR) for public review and comment. Following that deadline, EPA will then have 18 months to publish the final MCLG and NPDWR.

UNREGULATED CONTAMINANT MONITORING RULE (UCMR). The UCMR monitoring program develops occurrence information for unregulated contaminants (from the CCLs) that may require regulation in the future. The final UCMR4 was published in the *Federal Register* on December 20, 2016. Included in the UCMR4 were cyanotoxins, metals, pesticides, brominated haloacetic acids, alcohols, and semivolatile organic chemicals. Monitoring was conducted between 2018 and 2020.
On July 16, 2019 EPA held a public meeting on development of the UCMR5. At that time, EPA anticipated proposing the UCMR5 in the summer of 2020 and publishing the final UCMR5 in late 2021. Monitoring would occur during 2023 through 2025.[4]

Under existing EPA regulations, all systems serving more than 10,000 people must participate in the UCMR monitoring program, while only a representative number of systems serving a population of 10,000 or fewer persons must monitor. The 2018 American Water Infrastructure Act (AWIA) amended this requirement and subject to the availability of appropriations and sufficient laboratory capacity, UCMR monitoring programs will now include all systems serving between 3,300 and 10,000 persons and include a representative number of systems serving a population less than 3,300.

[2] On October 4, 2018 EPA published a request for nominations for microbials and chemicals to include in CCL5. In a legal settlement with the Waterkeeper Alliance and others, EPA is expected to publish the final CCL5 by July 18, 2022.

[3] The final Regulatory Determination was signed for publication by the EPA Administrator on January 15, 2021. When the new Biden Administration took office on January 20, 2021 a Regulatory Freeze was issued that included regulations signed but not yet published in the *Federal Register*. Following EPA review, on March 3, 2021, the final Regulatory Determination to regulate PFOA and PFOS was published in the *Federal Register*.

[4] The proposed UCMR5 was published March 11, 2021 in the *Federal Register*. Public comments were due by May 10, 2021. The proposed monitoring includes 29 PFAS and lithium. EPA is proposing that PFAS would be measured using EPA Methods 533 and 537.1. EPA anticipates the monitoring would occur during 2023 to 2025. Monitoring would be one year of quarterly monitoring for surface water and groundwater under the direct influence of surface water systems, and two samples (5 to 7 months apart) in a 12-month period for groundwater systems.

CYANOBACTERIA. Cyanobacteria (also known as blue green algae) occur throughout the world. Some species of cyanobacteria can produce toxins. Factors that affect cyanobacteria blooms include light intensity, sunlight duration, nutrient availability, water temperature, pH and water stability.

In June 2015 EPA issued 10-day Health Advisories (HA) for two cyanotoxins: microcystin and cylindrospermopsin presented in Table 4-6.

Table 4-6. EPA 10-day Cyanotoxin HA Values (μg/L)[5]

Algal Toxin	10-Day HA <6 years of Age	10-Day HA >6 Years of Age	Health Effect
Microcystin	0.3	1.6	Liver Toxicity
Cylindrospermopsin	0.7	3	Liver & Kidney Toxicity

EPA staff describe the 10-day HAs as the "concentration in drinking water at or below which no adverse non-carcinogenic effects are expected for a ten-day exposure."

SIX-YEAR REVIEW OF REGULATIONS. The SDWA requires that every six years, EPA review primary drinking water regulations to determine whether they should be revised. In January 2017 EPA published the results from the third six-year review of contaminants. The outcome of that review was that EPA considered eight National Primary Drinking Water Regulations as candidates for regulatory revision (chlorite, *Cryptosporidium*, haloacetic acids, heterotrophic bacteria, *Giardia lamblia*, *Legionella*, total trihalomethanes, and viruses). These constituents are currently regulated under the Long-term 2 Enhanced Surface Water Treatment Rule (LT2ESWTR) and the Stage 2 Disinfection Byproduct Rule (DBP) and are referred to as Microbial/Disinfection Byproduct (M/DBP) regulations. The January 2017 *Federal Register* publication did not propose specific revisions to any current regulation, but rather began the process. On October 14th and 15th, 2020, EPA held a public meeting to obtain input on possible revisions to the eight M/DBP regulations. Additional public meetings will be held during 2021.[6]

REVIEW OF WATER QUALITY DATA

There are two public water agencies (SEWD and CCWD) participating in this WSS update of the Calaveras River watershed. CCWD owns and operates two treatment plants, Sheep Ranch and Jenny Lind, that divert water from the Calaveras River watershed as their raw water supplies. Raw water and treated water quality data were collected for the study period 2016 through 2020 and are

[5] On February 4, 2021 DDW submitted a formal request to the Office of Environmental Health Hazard Assessment (OEHHA) to develop recommended Notification Levels (NLs) for microcystins, cylindrospermopsin, anatoxin-a, and saxitoxin. On May 3, 2021 OEHHA submitted recommended NLs for the four cyanotoxins to DDW.

[6] During 2021 EPA intends to continue to seek input on potential rule revisions through a series of seven (7) public meetings. The first two public meetings are in May and June as follows: May 20, 2021 – topic "Disinfectant Residual Levels and Opportunistic Pathogens (including *Legionella*), June 24, 2021 – topic "Regulated and Unregulated Disinfection Byproducts." Additional tentative dates in 2021 are July 14th, August 10th, September 1st, September 29th, and November 9th.

summarized here. SEWD's Dr Joe Waidhofer (DJW) WTP can use raw water from the Calaveras River and the Stanislaus River.

SHEEP RANCH WTP

Sheep Ranch WTP serves a rural population of 89 residents in the community of Sheep Ranch through 48 connections. The source water for the Sheep Ranch WTP is Big Trees Creek, upstream of White Pines Lake, rediverted from San Antonio Creek downstream of the lake. White Pines Lake is owned and operated by CCWD. The lake is primarily used for flood control and recreation (fishing, hiking, picnics).

Water is diverted from San Antonio Creek at a box diversion structure, where water flows over a weir and into an intake pipeline. The raw water then flows by gravity to the WTP and/or the Rite of Passage Athletic Training Center (Fricot Pipeline) for irrigation. To begin treatment, a coagulant is added prior to filtration. The chemical is mixed in-line with a static mixer. The water then flows through a 4-foot-diameter, vertical pressure dual-media filter. Sodium hypochlorite is injected for disinfection into the filter effluent and the water flows directly to a 0.078 MG storage tank. The storage tank provides the detention time needed for disinfection contact time (CT) credit. When turbidity reaches 10 NTU, the this triggers a shutdown of the WTP. The post-treatment storage tank can provide five (5) to ten (10) day supply of drinking water.

SHEEP RANCH WTP RAW WATER QUALITY. Figure 4-1 presents weekly total coliform results for the influent to Sheep Ranch WTP. During 2016 through 2020, the total coliform results ranged from ND to >2,419 MPN/100 mL, with an average of 825 MPN/100 mL. During the study period there were 80 samples with results greater than 1,000 MPN/100 mL (compared to 38 samples greater than 1,000 MPN/100 mL during 2011 to 2015). Figure 4-2 presents the weekly *E. coli* results. The results ranged from ND to >2,419 MPN/100 mL, with an average of 38 MPN/100 mL.

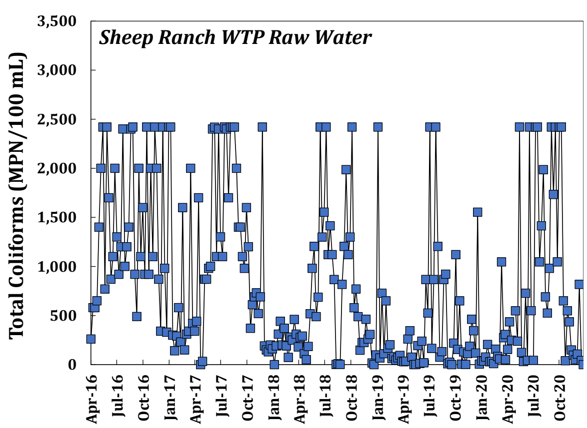


Figure 4-1 Sheep Ranch Total Coliforms (2016 to 2020)

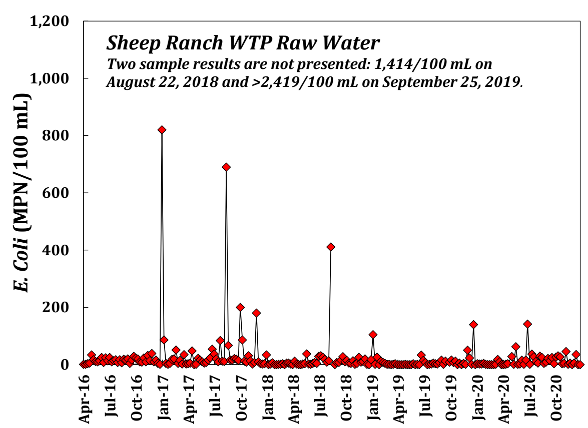


Figure 4-2 Sheep Ranch *E. coli* (2016 to 2020)

CCWD conducted the second round of LT2ESWTR source water monitoring beginning in October 2017 (monitoring for *E. coli* every two weeks). The mean *E. coli* trigger was not exceeded for a flowing stream and no *Cryptosporidium* monitoring was required.

Figure 4-3 presents raw water turbidity results for Sheep Ranch WTP. While the frequency can vary, in general turbidity is measured three days per week. The range of turbidity results was 0.4 NTU to 103 NTU (maximum turbidity is not shown in Figure 4-3), with an average of 2.1 NTU. These results were generally consistent with the raw water turbidity values recorded during 2011 through 2015. Figure 4-4 presents the pH results during 2016 through 2020. The pH results ranged from a low of 6 to a high of 9.4, with an average pH of 7.6. During the fall of 2018 and winter of 2019 there was a clear increase in pH.

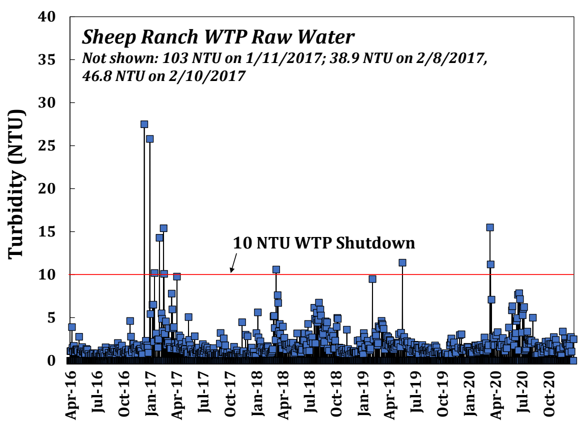


Figure 4-3 Sheep Ranch Turbidity (2016 to 2020)

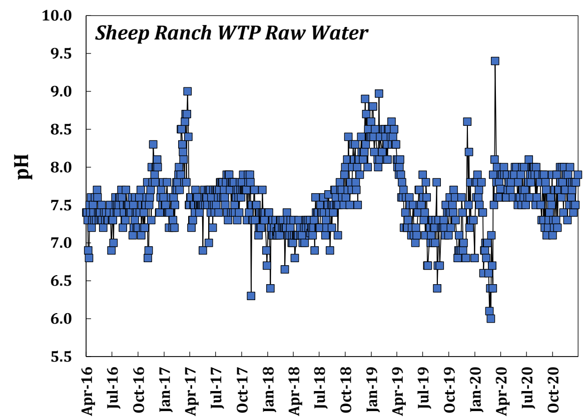


Figure 4-4 Sheep Ranch pH (2016 to 2020)

Figures 4-5 and 4-6 present the monthly TOC and alkalinity results, respectively. Raw water TOC ranged from 0.4 mg/L to 5.7 mg/L, with an average of 1.18 mg/L. Treated water TOC ranged from 0.3 to 1.8 mg/L, with an average of 0.8 mg/L. Alkalinity ranged from 10 mg/L to 40 mg/L as $CaCO_3$, with an average of 28 mg/L as $CaCO_3$. The majority of the raw water TOC results were around 2 mg/L or less. There were two months where the TOC was measured between 3 and 4 mg/L, and one month had a result of 5.7 mg/L.

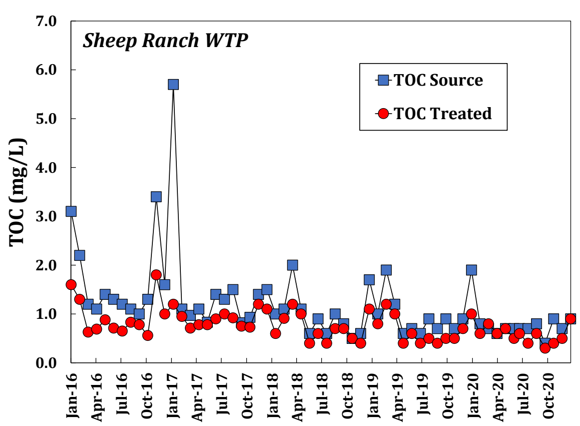


Figure 4-5 Sheep Ranch TOC (2016 to 2020)

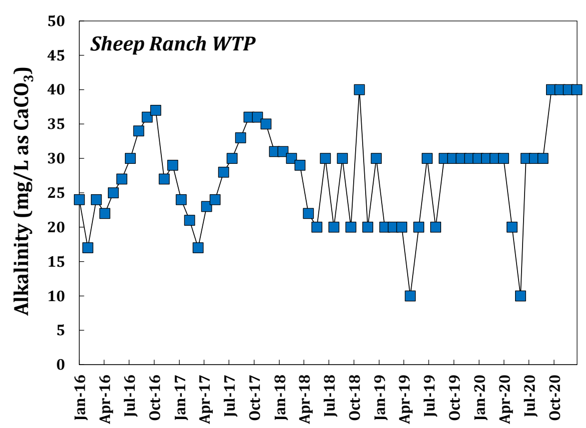


Figure 4-6 Sheep Ranch Alkalinity (2016 to 2020)

SHEEP RANCH WTP TREATED WATER QUALITY. Figures 4-7 and 4-8 present the results for THMs and HAA5s, respectively. All results are below the respective MCLs. The THMs ranged from 25 µg/L to 38 µg/L, and the HAA5s ranged from 24 µg/L to 35 µg/L.

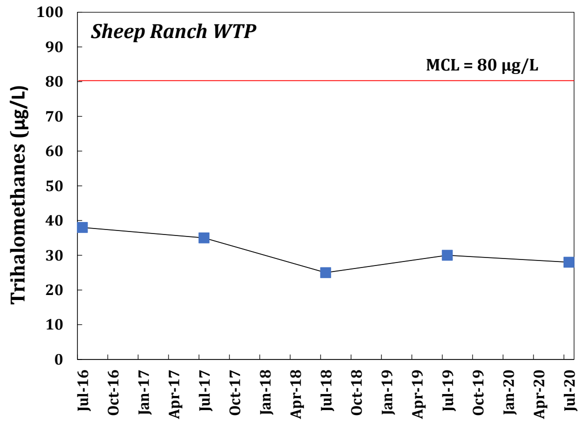


Figure 4-7 Sheep Ranch THMs (2016 to 2020)

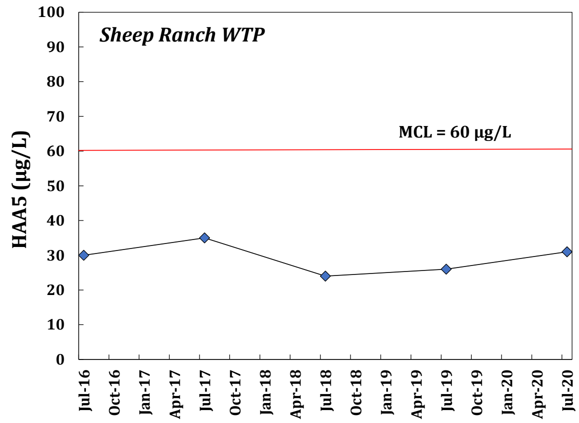


Figure 4-8 Sheep Ranch HAA5s (2016 to 2020)

SHEEP RANCH TITLE 22 MONITORING. Raw and treated water Title 22 monitoring results are presented in Appendix B, Tables B-1 and B-2, respectively. Low levels of aluminum were detected in the raw water. All other results for inorganic chemicals (IOCs) were ND. All of the raw water results for VOCs were ND. For the SOC monitoring, results for 1,2,3-trichloropropane and glyphosate were ND. The raw water results for iron ranged from 150 to 900 µg/L, with an average of 314 µg/L. The manganese results ranged from ND to 50 µg/L with an average of 10 µg/L. The average raw water alkalinity was approximately 28 mg/L as $CaCO_3$, and the average hardness was 18 mg/L. Color results ranged from ND to 100 color units, with an average of approximately 10. Raw water odor results ranged from ND to 8 TON, with an average of approximately 1 TON. In treated water, all results for IOCs and VOCs were ND. Iron and manages results were ND in the treated water. Color results were ND in the treated water and the maximum odor result was 1 TON.

JENNY LIND WTP

The Jenny Lind WTP is located along the Calaveras River, approximately three miles south of Valley Springs. The WTP serves a population of 9,860, through 3,858 connections, and has a capacity of 6 MGD. The raw water intake (infiltration gallery) is located in the Calaveras River, approximately one mile south of New Hogan Reservoir in Rancho Calaveras.

Raw water from the intake is pumped to two ozone contactors. Ozone can be added to either chamber in each contactor. Sodium permanganate is added for iron and manganese removal and a coagulant is added to the ozone contactor effluent and mixed through an in-line, static mixer. A streaming current detector is used to control the coagulant addition rate. From the static mixer, the water enters the bottom of an upflow adsorption clarifier. In the adsorption clarifier, the water passes through a bed of buoyant adsorption media that provide three treatment processes: coagulation, flocculation, and clarification. The adsorption clarifier effluent flows into a mixed media filter containing anthracite, sand, and garnet. Sodium hypochlorite is added to the filter effluent, and zinc orthophosphate is added for corrosion control in the distribution system. The treated water is gravity-fed to the clearwell (0.245-MG capacity). Water from the clearwell is pumped to a 2-MG storage tank.

JENNY LIND WTP RAW WATER QUALITY. The raw water supply is sampled weekly for total coliforms and *E. coli*. Figure 4-9 presents the total coliform results. The total coliform results ranged from 43 MPN/100 mL to >2,419 MPN/100 mL, with an average of 790 MPN/100 mL. During 2016 (the last year of California's multi-year drought) the majority of total coliform sample results were elevated. During other years, total coliform levels were not consistently elevated, however, there were occasional elevated results together with periods of much lower results. Figure 4-10 presents the weekly *E. coli* results. The *E. coli* results ranged from ND to 313 MPN/100 mL, with an average of 15 MPN/100 mL. The *E. coli* results were similar to the previous five-year study period.

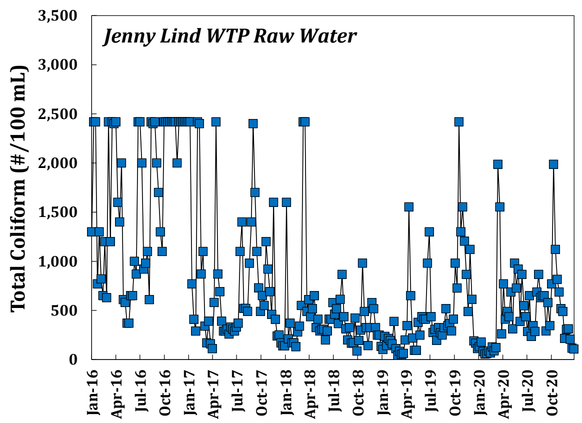


Figure 4-9 Jenny Lind Total Coliforms (2016 to 2020)

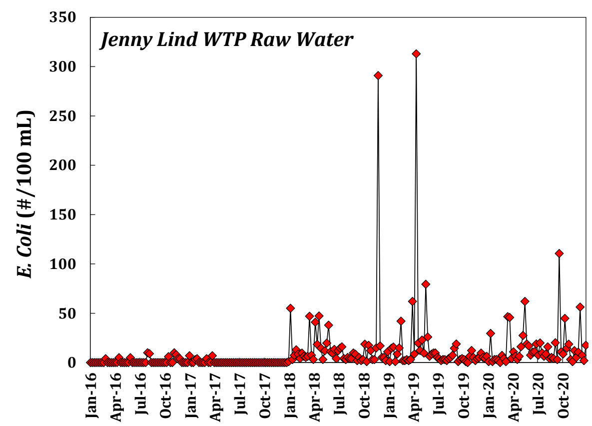


Figure 4-10 Jenny Lind *E. coli* (2016 to 2020)

CCWD conducted the second round of monthly *Cryptosporidium* monitoring from October 2016 through September 2018. During the monthly monitoring two oocysts were detected and the maximum 12-month mean was 0.042 oocysts/L, which corresponds to Bin 1, no additional treatment required for *Cryptosporidium*. All UCMR4 cyanotoxins results were ND.

In early April 2019, an algal bloom was observed in New Hogan reservoir. Low levels of microcystin were detected in two locations of the reservoir. By mid-June 2019 the bloom had dissipated. In September 2019 CCWD collected samples from the Calaveras River, the gravel covering the Jenny Lind WTP intake along the river bottom, and the plant influent and effluent for cyanobacteria and cyanotoxins. All cyanotoxin results were ND, with the exception that low levels of microcystin and anatoxin-a were detected in the river bottom sample.

Figure 4-11 presents the daily raw water turbidity for 2016 through 2020. The turbidity ranged from 0.4 NTU to approximately 25 NTU, with an average 2.8 NTU. These results are similar to the previous five-year study period with the exception there were a handful of periods where the raw water experienced turbidity spikes for an extended period. Figure 4-12 presents the daily pH for the raw water to Jenny Lind WTP. The raw water pH ranged from 6.7 to 8.4, with an average of 7.3.

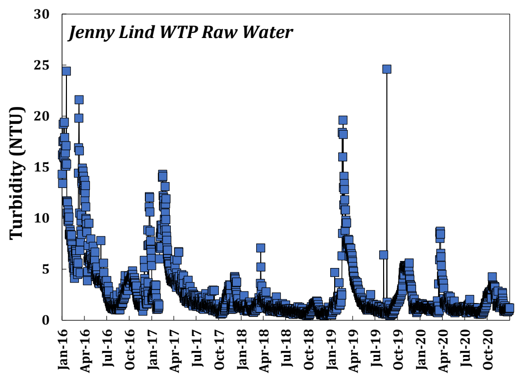


Figure 4-11 Jenny Lind Turbidity (2016 to 2020)

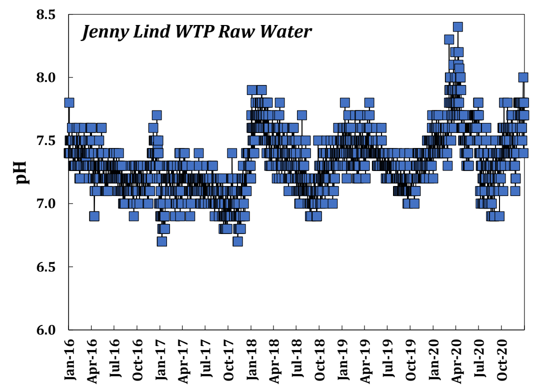


Figure 4-12 Jenny Lind pH (2016 to 2020)

Figures 4-13 and 4-14 present the monthly raw and treated water TOC and alkalinity results, respectively. The source water TOC ranged from 1.5 mg/L to 5.1 mg/L, with an average of 3.2 mg/L. The treated water TOC ranged from 1.5 to 3.5 mg/L with an average of 2.2 mg/L. As indicated in Figure 4-13 beginning in the fall of 2016, the TOC has generally decreased from a maximum of 5.1 mg/L to 2.9 mg/L in December 2020. The monthly raw water alkalinity results ranged from 47 mg/L to 84 mg/L as $CaCO_3$, with an average of 65 mg/L as $CaCO_3$.

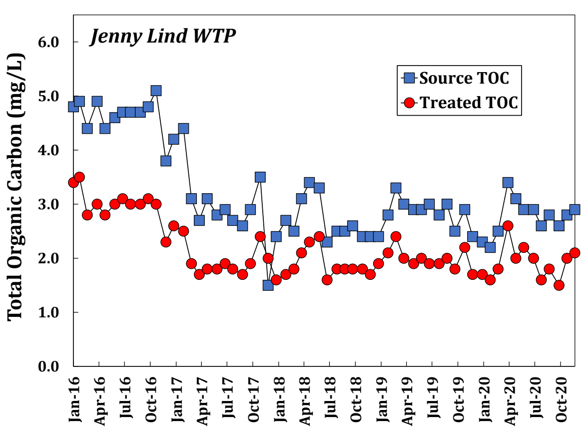


Figure 4-13 Jenny Lind TOC (2016 to 2020)

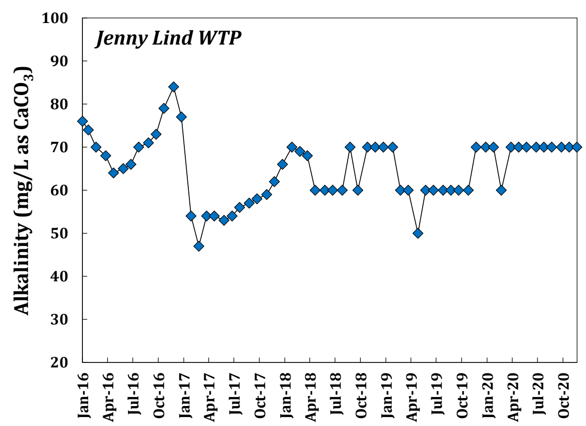


Figure 4-14 Jenny Lind Raw Water Alkalinity (2016 to 2020)

JENNY LIND WTP TREATED WATER QUALITY. For the Jenny Lind WTP, CCWD collects monthly DBP compliance samples at four distribution system locations. Figures 4-15 and 4-16 present the monthly THMs and the quarterly THM LRAAs, respectively. The individual monthly THM samples ranged from 18 μg/L to 90 μg/L. The LRAAs ranged from 31 μg/L to 73 μg/L.

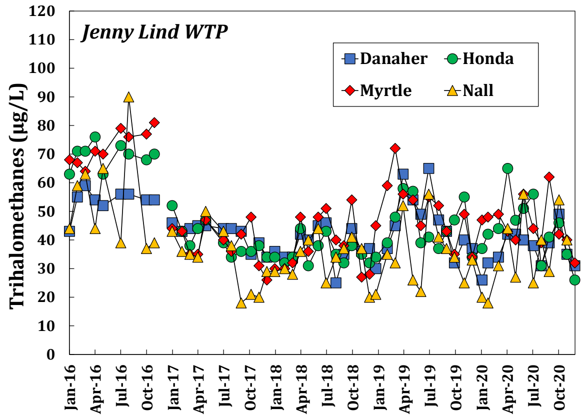


Figure 4-15 Jenny Lind Monthly THMs (2016 to 2020)

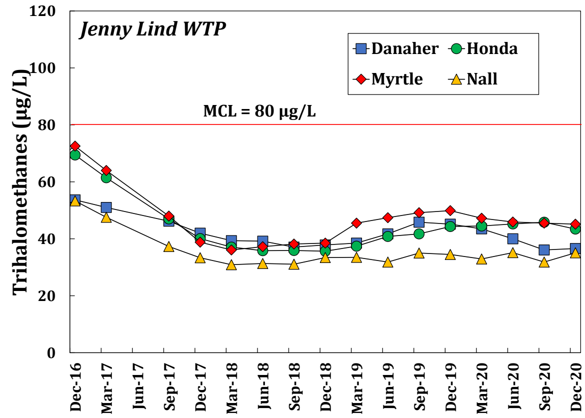


Figure 4-16 Jenny Lind THM LRAAs (2016 to 2020)

Figures 4-17 and 4-18 present the individual monthly HAA5 results and the HAA5 LRAAs, respectively. The individual monthly HAA5 results ranged from 9 µg/L to 68 µg/L. The LRAAs ranged from 28 µg/L to 53 µg/L.

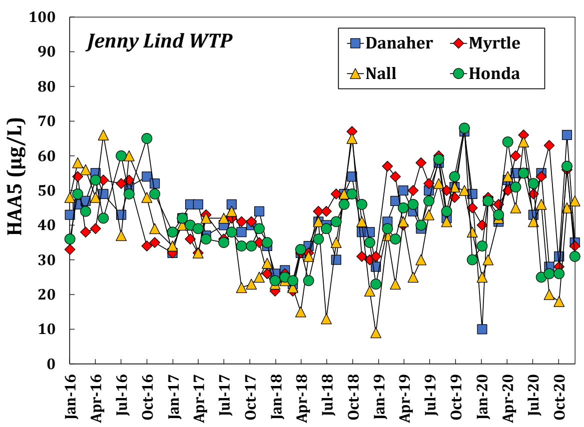


Figure 4-17 Jenny Lind Monthly HAA5s (2016 to 2020)

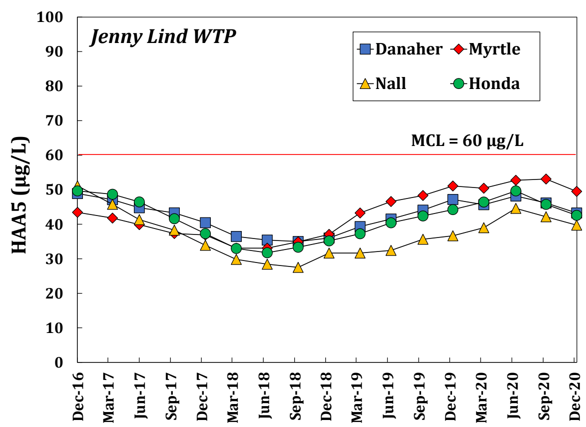


Figure 4-18 Jenny Lind HAA5 LRAAs (2016 to 2020)

Because ozone is used at the Jenny Lind WTP, monthly bromate samples are collected in the treated water. All of the monthly bromate results for 2016 through 2020 were ND.

JENNY LIND WTP TITLE 22 MONITORING. Appendix B, Tables B-3 and B-4 present the 2016 to 2020 results for raw and treated water Title 22 monitoring for the Jenny Lind WTP. Results for all regulated VOCs and SOCs (1,2,3-trichloropropane and glyphosphate) were ND. Gross alpha result was ND. Low levels of aluminum and nitrate were detected in the raw water, the results for all other IOCs were ND. Manganese was detected in the raw water above the secondary MCL, however the average treated water manganese concentration was well below the secondary MCL. Color results in the raw water ranged from ND to 30 with an average of approximately 11 color units. Color results were ND in the treated water. The average raw water alkalinity was approximately 65 mg/L as $CaCO_3$, and the average hardness was 79 mg/L.

DR. JOE WAIDHOFER (DJW) WTP

SEWD provides treated surface water from the DJW WTP to the City of Stockton, California Water Service Company, and the San Joaquin County Lincoln Village and Colonial Heights Maintenance Districts. The DJW WTP has two water sources, the Calaveras River at Bellota Weir Intake and the Stanislaus River at Goodwin Tunnel Inlet, downstream of Tulloch Reservoir.

During 2016 through 2020, source supply data was available for 58 out of the 60 months. Calaveras River provided 100 percent of the supply from September 2016 through April 2017, and again during February 2019 and November 2020. During other months, the raw water supply was either 100 percent from the Stanislaus River (26 months) or a blend of Calaveras River, Stanislaus River, and groundwater (22 months).

In 2019 SEWD put a new 73-acre (120 MG storage capacity) raw water reservoir into service on site at the WTP. Raw water can be stored in the five on-site reservoirs (total storage capacity of 240 MG) and during high turbidity events, the WTP can rely on the raw water reservoirs for both pre-sedimentation and water supply. The DJW WTP has a rated capacity of 65 MGD.

Water entering the WTP is first pre-chlorinated with chlorine gas for disinfection and alum and polymer are added to the raw water. The water then passes through a rapid mix step, flocculation basins, and sedimentation basins or plate settlers (depending on treatment train).

Settled water is routed to dual-media (granular activated carbon [GAC] and sand) filters. Filter-aid polymer is added to the water prior to filtration. Filter backwash water flows to the raw water reservoirs for groundwater recharge and reuse. Filter effluent flows through the finished water conduit, where sodium hydroxide is added to adjust the pH for corrosion control. Chlorine gas is added again at this point for final disinfection. The water then flows to two buried, finished water reservoirs, from which the water is pumped into the distribution system.

DJW WTP RAW WATER QUALITY. In December 2015 SEWD increased microbial monitoring of the raw water from weekly to five days per week. Figure 4-19 presents the raw water total coliform results from January 2016 through December 2020. Total coliform counts ranged from 20 MPN/100 mL to 19,863 MPN/100 mL, with an average of 991 MPN/100 mL and a median of 727 MPN/100 mL. The average and median total coliform results are consistent with the results from the previous five-year WSS, however, during 2016 through 2020 there were a handful of elevated results. Figure 4-20 presents the total coliform results from 2016 through 2020 without ten (10) results that were greater than 6,000 MPN/100 mL. From this figure, there appears to be a consistent increase in total coliforms during the summer months of each year (the increase was much less pronounced during 2020).

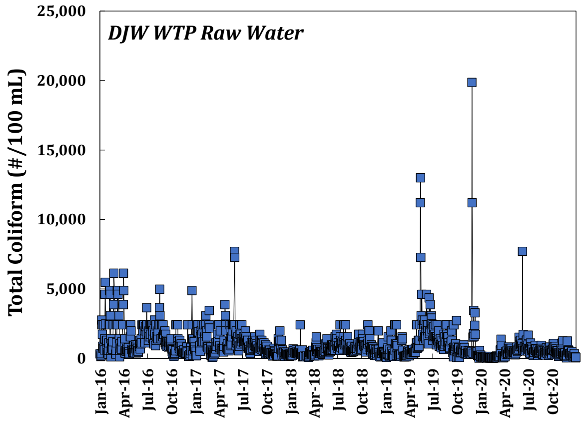


Figure 4-19 DJW WTP Total Coliforms (2016 to 2020)

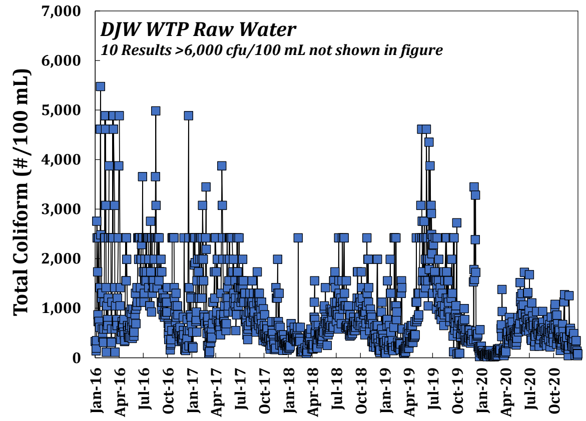


Figure 4-20 DJW WTP Total Coliforms Without 10 Results >6,000/100 mL (2016 to 2020)

Figure 4-21 presents the *E. coli* results for 2016 through 2020. The *E. coli* results do not indicate the same pattern as the total coliform results. The *E. coli* results are fairly consistent throughout the study period with occasional elevated counts (typically in January and February). The *E.coli* results ranged from ND to 770 MPN/100 mL, with an average of 23 MPN/100 mL. The total coliform and *E. coli* results are consistent with the results during the previous five-year WSS.

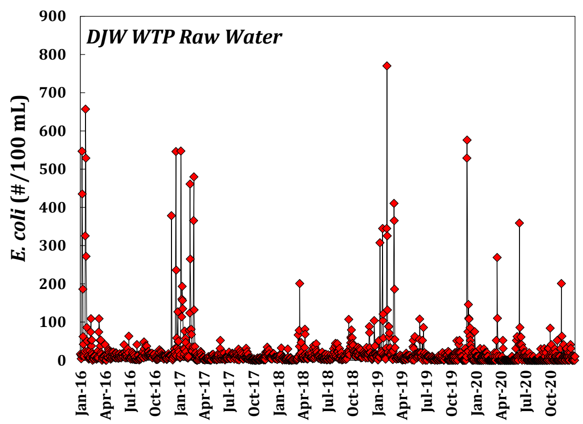


Figure 4-21 DJW WTP *E. Coli* (2016 to 2020)

SEWD conducted the initial two years of source water *Cryptosporidium* monitoring from October 2006 through September 2008. Using all results from three sample locations (1) plant influent, (2) Calaveras River and the (3) Stanislaus River, SEWD calculated a maximum 12-month concentration of 0.054 oocysts/L (and a Bin 1 classification). After reviewing the two years of results USEPA, however, used only the results from the plant influent sample location to calculate an average of 0.075 oocysts/L, placing SEWD in Bin 2. Placement in Bin 2 required 1 additional log reduction of *Cryptosporidium*. To demonstrate achieving the required extra log reduction, DDW included the following requirement in SEWD's Operating Permit Amendment No. 03-10-11PA-005:

> *"SEWD shall continue to review monthly IFE turbidity data to determine compliance with the <0.1 NTU requirement in at least 95% of the maximum daily readings and watch for any upward trends. If any filter shows increasing values, diagnose the filter and the instrumentation to determine the cause of the unusual results and implement corrective actions to assure continuous compliance with the criteria that allow the SEWD to claim the additional log of Cryptosporidium treatment..."*

SEWD conducted the second round of two years of monthly source water *Cryptosporidium* monitoring from April 2015 through March 2017. A single *Cryptosporidium* oocyst was detected during the monitoring period, all other results were ND. The highest 12-month average of

Cryptosporidium detected was 0.008/L, corresponding to Bin 1, and no additional *Cryptosporidium* treatment is required. However, DDW indicated that the DJW WTP should remain in Bin 2 (Justin Hopkins, personal communication, April 27, 2020).

Figure 4-22 presents daily raw water turbidity. Between January 2016 and December 2020, the raw water turbidity ranged from 0.8 NTU to 25 NTU with an average of 4.5 NTU. Figure 4-23 presents the daily raw water hardness. The raw water hardness ranged from 13 mg/L to 115 mg/L, with an average of 44 mg/L. The increases in hardness presented in Figure 4-23 appears to be closely related to periods when the Calaveras River was the only source supplying the WTP or was a significant amount of the blend of source waters.

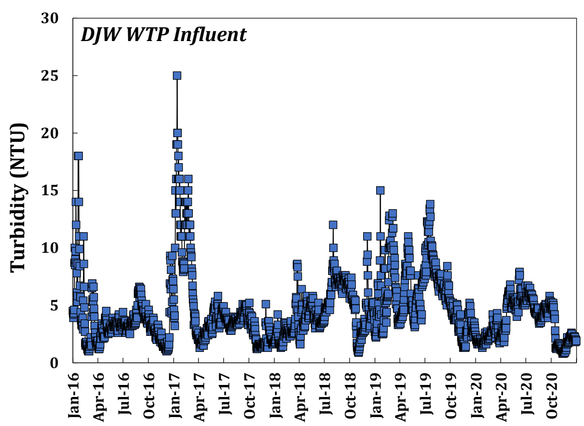


Figure 4-22 DJW WTP Daily Turbidity (2016 to 2020)

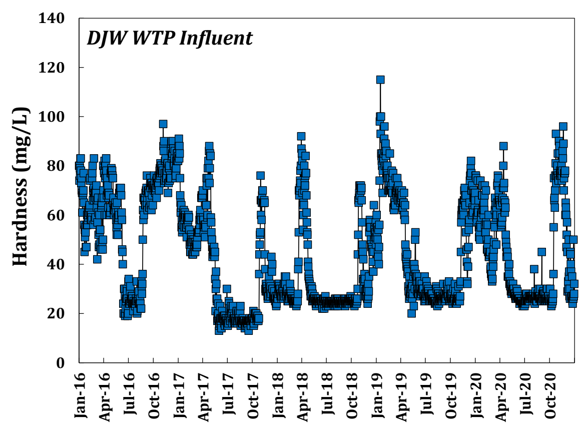


Figure 4-23 DJW WTP Daily Hardness (2016 to 2020)

Figure 4-24 presents the daily temperature in the raw water to the DJW WTP. The temperature readings ranged from 9.0 to 27 °C, with an average of approximately 18 °C. During the previous five-year study, there was a slight increase over time in the maximum temperature recorded each year in the DJW WTP influent likely due to the ongoing drought. During 2016 through 2020, the maximum temperature was consistent with the maximum temperature measured during 2015.

Figure 4-25 presents the daily raw water measurements of color. The color results ranged from 10 to 110 color units, with an average of approximately 31 color units during the study period. As can be seen in Figure 4-25 there were periods of elevated color during the winter/spring period of all five years (although, the increase in color was much less during 2020). Color in raw water can be due to metals, organic matter or algae.

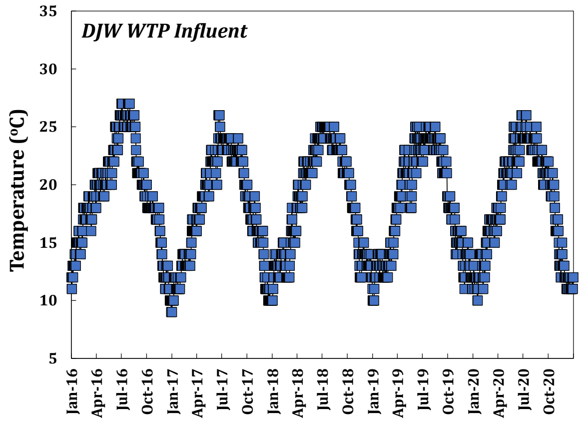


Figure 4-24 DJW WTP Daily Temperature (2016 to 2020)

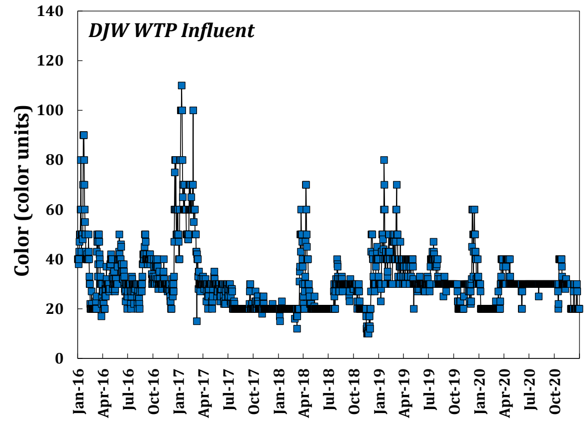


Figure 4-25 DJW WTP Daily Color (2016 to 2020)

Figure 4-26 present the monthly raw and treated water TOC results. During the study period the source water TOC ranged from 1.4 mg/L to 7.8 mg/L, with an average of 3.1 mg/L. The treated water TOC ranged from 0.6 to 3.6 mg/L, with an average of 1.7 mg/L. Figure 4-27 presents the monthly alkalinity. The alkalinity ranged from 20 to 90 mg/L as $CaCO_3$.

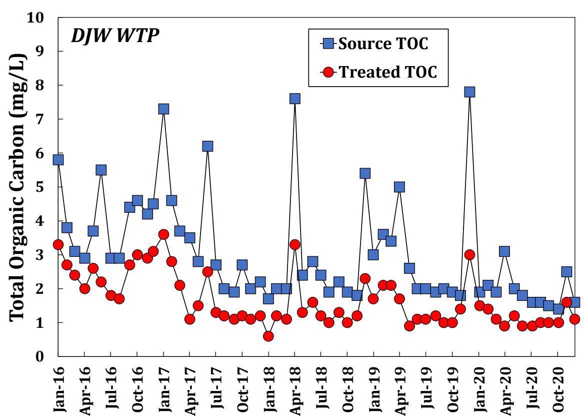


Figure 4-26 DJW WTP TOC (2016 to 2020)

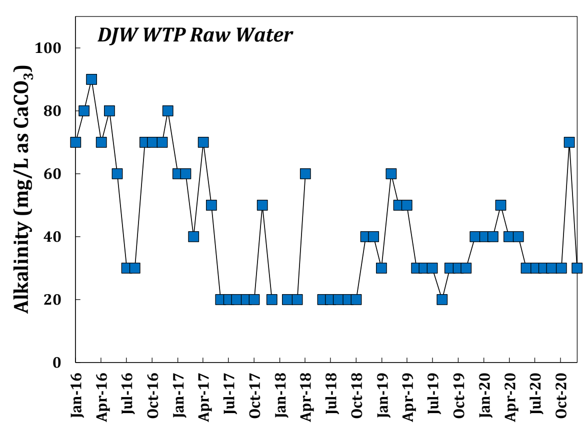


Figure 4-27 DJW WTP Alkalinity (2016 to 2020)

DJW WTP Finished Water Quality. SEWD collects quarterly THM and HAA5 samples from the treated water effluent at the DJW WTP. Figures 4-28 and 4-29 present the THM and HAA5 results, respectively. The results presented in these figures are the individual quarterly results as well as the LRAAs. All sample results during the study period were below the respective MCLs. The individual quarterly THM results ranged from 21 µg/L to 57 µg/L and the LRAA ranged from 31 µg/L to 43 µg/L. The individual quarterly HAA5 results ranged from 9 µg/L to 54 µg/L and the LRAA ranged from 10 µg/L to 26 µg/L.

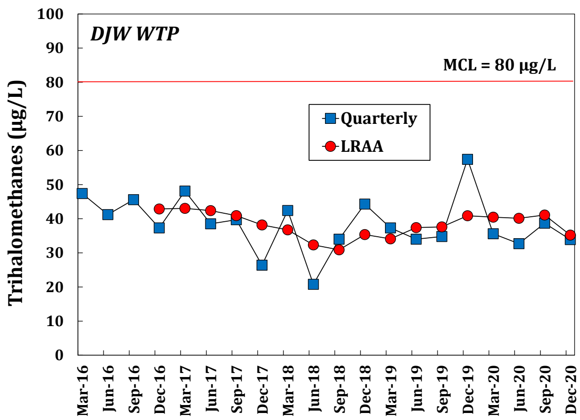


Figure 4-28 DJW WTP Effluent THMs (2016 to 2020)

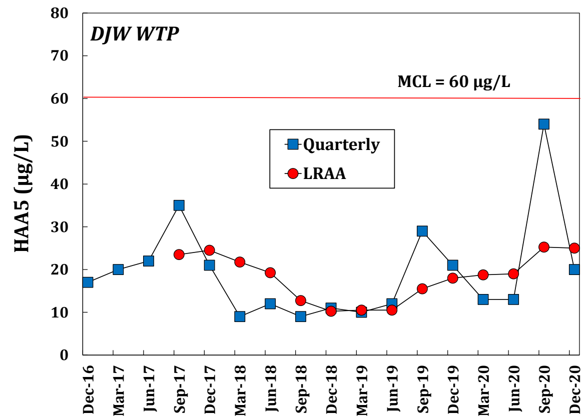


Figure 4-29 DJW WTP Effluent HAA5s (2016 to 2020)

DJW WTP TITLE 22. Appendix B, Table B-5 present the results of Title 22 monitoring for the DJW WTP Calaveras River Bellota intake. Table B-6 presents Title 22 monitoring results for finished water at the DJW WTP. During 2016 to 2020 there were no VOCs or SOCs detected. Low levels of aluminum, barium, nickel, and nitrate were detected in the raw water. All finished water levels were either well below the MCL or ND. Low levels of iron and manganese were detected in the raw water, while finished water results were all ND. The average raw water alkalinity was 58 mg/L as $CaCO_3$, and the average hardness was 66 mg/L.

SECTION 5 CONCLUSIONS AND RECOMMENDATIONS

Public water systems using surface water supplies maintain multiple barriers in order to provide safe drinking water to their customers. Protecting source waters is the initial barrier. The second barrier is the provision of adequate treatment designed to handle and treat raw water to provide safe drinking water. A WSS provides the opportunity every five years to conduct an assessment of these barriers and to make course corrections, if needed. This section presents a summary of key conclusions from the analysis and a list of recommendations.

POTENTIAL CONTAMINANT SOURCES

Based on the analysis of potential contaminant sources in Section 3, Table 5-1 presents the potential risk to raw water quality for the three intakes.

Table 5-1 Risk Associated with Contaminant Sources

Watershed Activities	Potential Risk
Forestry	Low
Irrigated Agriculture and Pesticide Use	Low
Livestock	Medium
Mining	Low
Recreation	Medium
Solid and Hazardous Wastes	Low
Urban Runoff & Spills	Low
Wastewater	Medium
Wildfires	High
Wildlife	High

Level of potential risk associated with observed land uses and activities. Risk primarily based on treatability concerns (e.g., pathogens being a higher risk than particulates) as well as the potential for the contaminant to enter waterbodies.

A brief overview is provided of potential contaminant sources in the Calaveras River watershed. The most significant contaminant sources are those associated with pathogens.

FORESTRY: Forestry activities in the Calaveras River watershed pose a low risk primarily due to minimal pathogen contributions.

IRRIGATED AGRICULTURE AND PESTICIDE USE: Monitoring data do not indicate adverse impacts to water quality in the Calaveras River watershed.

CATTLE GRAZING: Cattle graze in the lower and middle watersheds of the Calaveras River and are considered a medium threat for the Jenny Lind WTP and DJW WTP in particular. The USACOE has eliminated most of the grazing on lands surrounding New Hogan Reservoir, but cattle graze on private lands draining to the North and South forks and their tributaries. Sources of the elevated coliform and *E.coli* levels may include livestock.

MINING: Calaveras River watershed has a number of inactive gold, copper, and limestone mines and several active hard rock mines. Based on a review of monitoring results for dissolved metals, there is no evidence to suggest an adverse impact of these mines on water quality.

RECREATION: Recreational use, including body contact recreation, occurs throughout the Calaveras River watershed. Body contact recreation and recreation without sanitation facilities poses a risk to water quality through the contribution of fecal contamination, including pathogens. Body contact occurs at New Hogan Reservoir, White Pines Lake, and along the river.

SOLID AND HAZARDOUS WASTES: There are half as many leaking underground storage sites as noted in the 2016 WSS due to cleanup activities. There is a low risk of solid and hazardous wastes to adversely impact water quality in the Calaveras River Watershed.

URBAN RUNOFF AND SPILLS: There is little evidence of urban runoff causing adverse impacts to water quality. There are three highways that traverse the watershed, but they are mostly inter- and intra-county traffic and do not serve as major transportation corridors in the State.

WASTEWATER: San Andreas WWTP discharges to the North Fork of the Calaveras River upstream of New Hogan reservoir (except from May 1 through October 31 of each year). The facility has significantly reduced the number of violation notices from the Regional Board during the past five years. There is a medium risk to water quality due to sanitary system overflows and aging on-site wastewater treatment systems in the watershed. It is difficult to determine water quality impacts from aging OWTSs but increased precipitation events may cause leaking systems to fail, resulting in increased coliform and *E. coli* levels to waterbodies.

WILDFIRES: During the study period there were nine recorded fires within the watershed. The Walker Fire in 2020 was the most significant, burning 1,455 acres that drain to New Hogan Reservoir. The Butte fire in 2015 will continue to impact water quality for years. This fire, addressed in the 2016 WSS, burned 70,868 acres of land draining primarily to the North Fork Calaveras River, Jesus Maria Creek, Calaveritas Creek, and San Antonio Creek. The Calaveras River watershed has a high risk to water quality from wildfires in the future due to more frequent and longer dry periods. Fire aftermath can result in large loadings of sediment and organic matter in surface water runoff, particularly during "first flush" rain events, leading to increased turbidity, coliform, *E.coli*, and TOC levels.

WILDLIFE: The large area of undeveloped/forested land in the watershed and large numbers of wild animals and migratory birds can be of concern. Waterfowl at New Hogan Reservoir and White Pines Lake are of concern as Canada Geese have become non-migratory and tend to deposit a high volume of waste near waterbodies. Wildlife is rated as a medium risk to surface water supplies due to the presence of Canada Geese and the difficulty in managing all wildlife in the watershed. The relatively consistent high coliform levels at Sheep Ranch WTP (with lower average levels in the January - March periods) may indicate a constant source that is not impacted by precipitation. Wildfire events and resultant sediment (ash) runoff remain some of the largest risks to water supply quality in the Calaveras River watershed.

WATER QUALITY FINDINGS

During the five-year study period, 2016 was the last year of a five-year drought. This was followed by elevated precipitation events in January and February of 2017, all years following the devastating Butte fire of 2015. The effects of fire and precipitation patterns is evident in the water quality data summarized here with higher levels of turbidity and *E.coli* during winter of 2017; and overall high coliforms and TOC in 2016 and the first half of 2017. High precipitation, particularly on fire burned lands, increases contaminant loading to waterbodies through increased runoff. Sheep Ranch WTP does not have the benefit of a large reservoir to buffer events and had to shut down due to turbidity events several times in 2017 and annually each early spring (except for 2016).

SHEEP RANCH WTP

MICROBIAL – during 2016 to 2020, there was an average total coliform concentration of approximately 825 MPN/100 mL (about twice the average during the previous five-year period). Elevated coliform results during 2016 and 2017 were more frequent than during 2018 through 2020. For *E. coli*, the results are similar to the results presented in the 2016 WSS and do not indicate a degradation in water quality.

TURBIDITY – there were a few events (days) during 2016 to 2020 when raw water turbidity exceeded 10 NTU and the WTP automatically shut down. These events occurred primarily during winter/spring periods and were likely caused by storm water runoff. The majority of raw turbidity results were less than 5 NTU and the treatment plant should be able to produce water meeting the surface water turbidity performance requirements. There is no indication of a trend or increasing turbidity in the raw water.

TOC/ALKALINITY – Raw water TOC ranged from 0.4 mg/L to 5.7 mg/L, with an average of 1.18 mg/L. Treated water TOC ranged from 0.3 to 1.8 mg/L, with an average of 0.8 mg/L. Alkalinity ranged from 10 mg/L to 40 mg/L as $CaCO_3$, with an average of 28 mg/L as $CaCO_3$. Compliance with the enhanced coagulation requirements is maintained through meeting the required TOC reduction or use of alternative compliance criteria.

PH – the raw water pH for Sheep Ranch WTP also indicated variability as results ranged from 6 to approximately 9.4. Beginning in the fall of 2018 and continuing through January and February 2019 there is a steady increase in pH. During spring 2019, the pH began to gradually decrease. It is not clear what caused the rise and then fall of pH.

DBPS – the treatment plant effluent results were consistently below the MCLs for THMs and HAA5 during 2016 to 2020.

TITLE 22 –All results for regulated VOCs and SOCs were ND. There were no detected levels of concern for metals, general mineral, or physical parameters.

JENNY LIND WTP

MICROBIAL – there were a number of elevated total coliforms during 2016, compared to the four years 2017 through 2020. A similar number of elevated *E. coli* results was not observed. The Calaveras River at Jenny Lind intake has had issues with algae atop gravel pack of streambed, especially in dry hydrologic conditions or drought, which reduces intakes to WTP (e.g., Bentick mat and cyanotoxins). These water quality issues are difficult to resolve or treat when pulling water from Calaveras River, and often impact system processes, although no discernible impacts on treated water were observed.

TURBIDITY – The turbidity ranged from 0.4 NTU to approximately 25 NTU, with an average 2.8 NTU. These results are similar to the previous five-year study period with the exception there were a handful of periods where the raw water experienced turbidity spikes for an extended period.

TOC/ALKALINITY – The source water TOC ranged from 1.5 mg/L to 5.1 mg/L, with an average of 3.2 mg/L. The treated water TOC ranged from 1.5 to 3.5 mg/L with an average of 2.2 mg/L. As indicated in Figure 4-13 beginning in the fall of 2016, the TOC has generally decreased from a maximum of 5.1 mg/L to 2.9 mg/L in December 2020. The monthly raw water alkalinity results ranged from 47 mg/L to 84 mg/L as $CaCO_3$, with an average of 65 mg/L as $CaCO_3$.

DBPS – The individual monthly THM samples ranged from 18 µg/L to 90 µg/L. The maximum quarterly result was observed during the third quarter of 2016. Results have generally decreased since then. The THM LRAAs ranged from 31 µg/L to 73 µg/L. The individual monthly HAA5 results ranged from 9 µg/L to 68 µg/L. The HAA5 LRAAs ranged from 28 µg/L to 53 µg/L.

Title 22 – results for all regulated VOCs and SOCs were ND. Low levels of a few IOCs were detected, but all results were well below the MCLs. Manganese was detected above the secondary MCL in raw water, while the average treated water manganese concentration was well below the secondary MCL.

DJW WTP

MICROBIAL – Total coliform counts ranged from 20 MPN/100 mL to 19,863 MPN/100 mL, with an average of 991 MPN/100 mL. There appears to be a consistent increase in total coliforms during the summer months of each year (the increase was much less pronounced during 2020). The *E.coli* results ranged from ND to 770 MPN/100 mL, with an average of 23 MPN/100 mL. The *E. coli* results are fairly consistent throughout the study period with occasional elevated counts (typically in January and February).

TURBIDITY – the raw water turbidity ranged from 0.8 NTU to 25 NTU with an average of 4.5 NTU, turbidity spikes appear to be associated with periods of elevated precipitation.

TOC/ALKALINITY – the source water TOC ranged from 1.4 mg/L to 7.8 mg/L, with an average of 3.1 mg/L. The treated water TOC ranged from 0.6 to 3.6 mg/L, with an average of 1.7 mg/L. The alkalinity ranged from 20 to 90 mg/L as $CaCO_3$.

DBPs – levels of TTHMs and HAA5 in the effluent of the DJW WTP were well below the respective MCLs.

Title 22 – no VOCs or SOCs were detected. While low levels of a few IOCs were detected, results for all other regulated IOCs were ND.

RECOMMENDATIONS

The following recommendations reflect areas where SCRG member agencies have some ability to control source water quality within the Calaveras River watershed.

- The water districts should continually review data for the presence of pathogens associated with failing or leaking OWTSs. Continue working with Calaveras County Environmental Health Department to be notified of any reports of spills or leakage. Work with the County to solicit funding sources to cover the cost of additional monitoring, oversight, and replacement of aging wastewater systems near watershed waterbodies. Work with the County to encourage homeowners to notify the County of any problems with their own OWTS or any leaking systems they may discover.

- Recommend that CCWD post signs stating that White Pines Lake releases to drinking water sources in the watershed, and it is important to keep dogs and babies in diapers out of the reservoir. Goose abatement techniques should be investigated.
- SEWD and CCWD should work with USACOE to encourage monitoring of total coliform and *E. coli* on a regular basis in beach areas and near the outlet of the New Hogan reservoir. Work with USACOE to develop total coliform and *E. coli* triggers that would indicate a halt to body contact recreation.
- Fuel reduction efforts by other agencies should be supported whenever possible to reduce the impact of wildfires in the watershed.
- SEWD and CCWD should continue the current raw water monitoring programs for turbidity, total coliforms, and *E. coli*.
- SCRG participating agencies in both the Calaveras and Stanislaus River watersheds should consider developing a joint monitoring and communication plan with locations throughout the watersheds to identify potential occurrence of algal blooms.
- Related to the above recommendation, in 2021 it is anticipated that DDW will issue Notification Levels for up to four cyanotoxins. SCRG agencies for both the Calaveras and Stanislaus River watersheds should consider developing a joint cyanotoxin monitoring and response plan for the entire watershed. Components of such a plan could include visual inspections for presence of algal blooms, routine monitoring for presence of algal cells and nutrients, triggers to begin raw water monitoring for presence of algal toxins. Combined with developing these plans, agencies should evaluate the effectiveness of their current treatment processes to remove or destroy cyanotoxins.
- While SEWD and CCWD maintained accurate and accessible records, they along with the other members of the SCRG should consider purchasing an off the shelf data management packages. Such a data management package could be a viable tool to use as a centralized water quality database. Contract laboratories can upload water quality results directly into these software packages for the public water system's access and use. Electronic databases would allow agency staff to conduct an annual review of data for trends and unusual results (possibly outliers) and can provide engineering and operations staff with easily accessible data.

APPENDICES

APPENDIX A

REFERENCES

APPENDIX A REFERENCES

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APPENDIX B

TITLE 22 MONITORING RESULTS (2016 TO 2020)

Table B-1: Title 22 Analysis of Raw Water for the Sheep Ranch Water Treatment Plant

INORGANICS			SHEEP RANCH WATER TREATMENT PLANT - RAW WATER						
Constituent	**MCL**	**Units**	**Samples**	**Average**	**Min**	**Max**	**Date**		
Aluminum	1000	µg/L	5	13.8	ND	69	Apr. 2016	-	Apr. 2020
Antimony	6	µg/L	5	ND	ND	ND	Apr. 2016	-	Apr. 2020
Arsenic	10	µg/L	5	ND	ND	ND	Apr. 2016	-	Apr. 2020
Asbestos	7	MFL	1	ND	ND	ND	Jan. 2017		
Barium	1000	µg/L	5	ND	ND	ND	Apr. 2016	-	Apr. 2020
Beryllium	4	µg/L	5	ND	ND	ND	Apr. 2016	-	Apr. 2020
Cadmium	5	µg/L	5	ND	ND	ND	Apr. 2016	-	Apr. 2020
Fluoride (Source)	2	mg/L	5	ND	ND	ND	Apr. 2016	-	Apr. 2020
Mercury	2	µg/L	5	ND	ND	ND	Apr. 2016	-	Apr. 2020
Nickel	100	µg/L	5	ND	ND	ND	Apr. 2016	-	Apr. 2020
Nitrate (As N)	10	mg/L	5	ND	ND	ND	Apr. 2016	-	Apr. 2020
Nitrate + Nitrite (As N)	10000	µg/L	5	ND	ND	ND	Apr. 2016	-	Apr. 2020
Nitrite (As N)	1000	µg/L	5	ND	ND	ND	Apr. 2016	-	Apr. 2020
Perchlorate	6	µg/L	5	ND	ND	ND	Oct. 2016	-	Jun. 2020
Selenium	50	µg/L	5	ND	ND	ND	Apr. 2016	-	Apr. 2020
Thallium	2	µg/L	5	ND	ND	ND	Apr. 2016	-	Apr. 2020
Total Chromium	50	µg/L	5	ND	ND	ND	Apr. 2016	-	Apr. 2020

VOLATILE ORGANIC CHEMICALS (VOCs)			SHEEP RANCH WATER TREATMENT PLANT - RAW WATER						
Constituent	**MCL**	**Units**	**Samples**	**Average**	**Min**	**Max**	**Date**		
1,1,1-Trichloroethane	200	µg/L	5	ND	ND	ND	Apr. 2016	-	Apr. 2020
1,1,2,2-Tetrachloroethane	1	µg/L	5	ND	ND	ND	Apr. 2016	-	Apr. 2020
1,1,2-Trichloroethane	5	µg/L	5	ND	ND	ND	Apr. 2016	-	Apr. 2020
1,1-Dichloroethane	5	µg/L	5	ND	ND	ND	Apr. 2016	-	Apr. 2020
1,1-Dichloroethylene	6	µg/L	5	ND	ND	ND	Apr. 2016	-	Apr. 2020
1,2,3-Trichlorobenzene	0.005	µg/L	5	ND	ND	ND	Apr. 2016	-	Apr. 2020
1,2,4-Trichlorobenzene	5	µg/L	5	ND	ND	ND	Apr. 2016	-	Apr. 2020
1,2-Dichlorobenzene	600	µg/L	5	ND	ND	ND	Apr. 2016	-	Apr. 2020
1,2-Dichloroethane	0.5	µg/L	5	ND	ND	ND	Apr. 2016	-	Apr. 2020
1,2-Dichloropropane	5	µg/L	5	ND	ND	ND	Apr. 2016	-	Apr. 2020
1,3-Dichloropropene (Total)	0.5	µg/L	5	ND	ND	ND	Apr. 2016	-	Apr. 2020
1,4-Dichlorobenzene	5	µg/L	5	ND	ND	ND	Apr. 2016	-	Apr. 2020
Benzene	1	µg/L	5	ND	ND	ND	Apr. 2016	-	Apr. 2020
Carbon Tetrachloride	0.5	µg/L	5	ND	ND	ND	Apr. 2016	-	Apr. 2020
Cis-1,2-Dichloroethylene	6	µg/L	5	ND	ND	ND	Apr. 2016	-	Apr. 2020
Dichloromethane	5	µg/L	5	ND	ND	ND	Apr. 2016	-	Apr. 2020
Ethylbenzene	300	µg/L	5	ND	ND	ND	Apr. 2016	-	Apr. 2020
Methyl tert-Butyl Ether	13	µg/L	5	ND	ND	ND	Apr. 2016	-	Apr. 2020
Monochlorobenzene	70	µg/L	5	ND	ND	ND	Apr. 2016	-	Apr. 2020
Styrene	100	µg/L	5	ND	ND	ND	Apr. 2016	-	Apr. 2020
Tetrachloroethylene	5	µg/L	5	ND	ND	ND	Apr. 2016	-	Apr. 2020
Toluene	150	µg/L	5	ND	ND	ND	Apr. 2016	-	Apr. 2020
Trans-1,2-Dichloroethylene	10	µg/L	5	ND	ND	ND	Apr. 2016	-	Apr. 2020
Trichloroethylene	5	µg/L	5	ND	ND	ND	Apr. 2016	-	Apr. 2020
Trichlorofluoroethane (Freon 113)	1200	µg/L	5	ND	ND	ND	Apr. 2016	-	Apr. 2020
Trichlorofluoromethane	150	µg/L	5	ND	ND	ND	Apr. 2016	-	Apr. 2020
Vinyl Chloride	0.5	µg/L	5	ND	ND	ND	Apr. 2016	-	Apr. 2020
Xylenes	1750	µg/L	5	ND	ND	ND	Apr. 2016	-	Apr. 2020

NON-VOLATILE SYNTHETIC ORGANIC CHEMICALS (SOCS)			SHEEP RANCH WATER TREATMENT PLANT - RAW WATER						
Constituent	**MCL**	**Units**	**Samples**	**Average**	**Min**	**Max**	**Date**		
1,2,3-Trichloropropane	0.005	µg/L	5	ND	ND	ND	Jan. 2018	-	Dec. 2018
Glyphosate	700	µg/L	4	ND	ND	ND	Mar. 2018	-	Jun. 2019

SECONDARY STANDARDS			SHEEP RANCH WATER TREATMENT PLANT - RAW WATER						
Constituent	**MCL**	**Units**	**Samples**	**Average**	**Min**	**Max**	**Date**		
Aluminum	200	µg/L	5	13.8	ND	69	Apr. 2016	-	Apr. 2020
Chloride	250	mg/L	5	1.78	1	3	Apr. 2016	-	Apr. 2020
Color	15	Units	86	9.77	ND	100	Feb. 2016	-	Dec. 2020
Copper	1000	µg/L	5	ND	ND	ND	Apr. 2016	-	Apr. 2020
Iron	300	µg/L	5	314	150	900	Apr. 2016	-	Apr. 2020
Manganese	50	µg/L	5	10	ND	50	Apr. 2016	-	Apr. 2020
MBAS	0.5	mg/L	5	ND	ND	ND	Apr. 2016	-	Apr. 2020
Methyl tert-Butyl Ether	5	µg/L	5	ND	ND	ND	Apr. 2016	-	Apr. 2020
Odor	3	TON	86	0.98	ND	8	Feb. 2016	-	Dec. 2020
Silver	100	µg/L	5	ND	ND	ND	Apr. 2016	-	Apr. 2020
Specific Conductance	900	µS/cm	5	52.6	46	63	Apr. 2016	-	Apr. 2020
Sulfate	250	mg/L	5	0.76	ND	1.3	Apr. 2016	-	Apr. 2020
Total Dissolved Solids	500	mg/L	5	27.2	ND	49	Apr. 2016	-	Apr. 2020
Turbidity	5	NTU	5	1.01	0.48	1.9	Apr. 2016	-	Apr. 2020
Zinc	5000	µg/L	5	146	50	200	Apr. 2016	-	Apr. 2020

MONITORING ASSOCIATED WITH SECONDARY STANDARDS			SHEEP RANCH WATER TREATMENT PLANT - RAW WATER						
Constituent	**MCL**	**Units**	**Samples**	**Average**	**Min**	**Max**	**Date**		
Bicarbonate Alkalinity	-	mg/L	34	33.3	20	60	Apr. 2016	-	Dec. 2020
Calcium	-	mg/L	5	4.68	4	5.2	Apr. 2016	-	Apr. 2020
Carbonate Alkalinity	-	mg/L	34	ND	ND	ND	Apr. 2016	-	Dec. 2020
Hydroxide Alkalinity	-	mg/L	34	ND	ND	ND	Apr. 2016	-	Dec. 2020
Magnesium	-	mg/L	5	1.48	1	2	Apr. 2016	-	Apr. 2020
pH	-	-	5	7.64	7.5	8.1	Apr. 2016	-	Apr. 2020
Sodium	-	mg/L	5	3.72	2	8	Apr. 2016	-	Apr. 2020
Total Alkalinity	-	mg/L	48	27.9	10	50	Jan. 2016	-	Dec. 2020
Total Hardness	-	mg/L	5	18.0	14.1	20.7	Apr. 2016	-	Apr. 2020

Table B-2: Title 22 Analysis of Treated Water for the Sheep Ranch Water Treatment Plant

INORGANICS			SHEEP RANCH WATER TREATMENT PLANT TREATED WATER						
Constituent	**MCL**	**Units**	**Samples**	**Average**	**Min**	**Max**	**Date**		
Aluminum	1000	µg/L	5	ND	ND	ND	Feb. 2017	-	Apr. 2020
Antimony	6	µg/L	5	ND	ND	ND	Feb. 2017	-	Apr. 2020
Arsenic	10	µg/L	5	ND	ND	ND	Feb. 2017	-	Apr. 2020
Barium	1000	µg/L	5	ND	ND	ND	Feb. 2017	-	Apr. 2020
Beryllium	4	µg/L	5	ND	ND	ND	Feb. 2017	-	Apr. 2020
Cadmium	5	µg/L	5	ND	ND	ND	Feb. 2017	-	Apr. 2020
Fluoride (Source)	2	mg/L	5	ND	ND	ND	Feb. 2017	-	Apr. 2020
Mercury	2	µg/L	5	ND	ND	ND	Feb. 2017	-	Apr. 2020
Nickel	100	µg/L	5	ND	ND	ND	Feb. 2017	-	Apr. 2020
Nitrate (As N)	10	mg/L	5	ND	ND	ND	Feb. 2017	-	Apr. 2020
Nitrate + Nitrite (As N)	10000	µg/L	5	ND	ND	ND	Feb. 2017	-	Apr. 2020
Nitrite (As N)	1000	µg/L	5	ND	ND	ND	Feb. 2017	-	Apr. 2020
Selenium	50	µg/L	5	ND	ND	ND	Feb. 2017	-	Apr. 2020
Thallium	2	µg/L	5	ND	ND	ND	Feb. 2017	-	Apr. 2020
Total Chromium	50	µg/L	5	ND	ND	ND	Feb. 2017	-	Apr. 2020

VOLATILE ORGANIC CHEMICALS (VOCs)			SHEEP RANCH WATER TREATMENT PLANT TREATED WATER						
Constituent	**MCL**	**Units**	**Samples**	**Average**	**Min**	**Max**	**Date**		
1,1,1-Trichloroethane	200	µg/L	3	ND	ND	ND	Feb. 2017	-	Apr. 2018
1,1,2,2-Tetrachloroethane	1	µg/L	3	ND	ND	ND	Feb. 2017	-	Apr. 2018
1,1,2-Trichloroethane	5	µg/L	3	ND	ND	ND	Feb. 2017	-	Apr. 2018
1,1-Dichloroethane	5	µg/L	3	ND	ND	ND	Feb. 2017	-	Apr. 2018
1,1-Dichloroethylene	6	µg/L	3	ND	ND	ND	Feb. 2017	-	Apr. 2018
1,2,3-Trichlorobenzene	0.005	µg/L	3	ND	ND	ND	Feb. 2017	-	Apr. 2018
1,2,4-Trichlorobenzene	5	µg/L	3	ND	ND	ND	Feb. 2017	-	Apr. 2018
1,2-Dichlorobenzene	600	µg/L	3	ND	ND	ND	Feb. 2017	-	Apr. 2018
1,2-Dichloroethane	0.5	µg/L	3	ND	ND	ND	Feb. 2017	-	Apr. 2018
1,2-Dichloropropane	5	µg/L	3	ND	ND	ND	Feb. 2017	-	Apr. 2018
1,3-Dichloropropene (Total)	0.5	µg/L	3	ND	ND	ND	Feb. 2017	-	Apr. 2018
1,4-Dichlorobenzene	5	µg/L	3	ND	ND	ND	Feb. 2017	-	Apr. 2018
Benzene	1	µg/L	3	ND	ND	ND	Feb. 2017	-	Apr. 2018
Carbon Tetrachloride	0.5	µg/L	3	ND	ND	ND	Feb. 2017	-	Apr. 2018
Cis-1,2-Dichloroethylene	6	µg/L	3	ND	ND	ND	Feb. 2017	-	Apr. 2018
Dichloromethane	5	µg/L	3	ND	ND	ND	Feb. 2017	-	Apr. 2018
Ethylbenzene	300	µg/L	3	ND	ND	ND	Feb. 2017	-	Apr. 2018
Methyl tert-Butyl Ether	13	µg/L	3	ND	ND	ND	Feb. 2017	-	Apr. 2018
Monochlorobenzene	70	µg/L	3	ND	ND	ND	Feb. 2017	-	Apr. 2018
Styrene	100	µg/L	3	ND	ND	ND	Feb. 2017	-	Apr. 2018
Tetrachloroethylene	5	µg/L	3	ND	ND	ND	Feb. 2017	-	Apr. 2018
Toluene	150	µg/L	3	ND	ND	ND	Feb. 2017	-	Apr. 2018
Trans-1,2-Dichloroethylene	10	µg/L	3	ND	ND	ND	Feb. 2017	-	Apr. 2018
Trichloroethylene	5	µg/L	3	ND	ND	ND	Feb. 2017	-	Apr. 2018
Trichlorofluoroethane (Freon 113)	1200	µg/L	3	ND	ND	ND	Feb. 2017	-	Apr. 2018
Trichlorofluoromethane	150	µg/L	3	ND	ND	ND	Feb. 2017	-	Apr. 2018
Vinyl Chloride	0.5	µg/L	3	ND	ND	ND	Feb. 2017	-	Apr. 2018
Xylenes	1750	µg/L	3	ND	ND	ND	Feb. 2017	-	Apr. 2018

SECONDARY STANDARDS			SHEEP RANCH WATER TREATMENT PLANT TREATED WATER						
Constituent	**MCL**	**Units**	**Samples**	**Average**	**Min**	**Max**	**Date**		
Aluminum	200	µg/L	5	ND	ND	ND	Feb. 2017	-	Apr. 2020
Chloride	250	mg/L	5	4.08	3.6	5	Feb. 2017	-	Apr. 2020
Color	15	Units	12	ND	ND	ND	Feb. 2016	-	Apr. 2020
Copper	1000	µg/L	5	ND	ND	ND	Feb. 2017	-	Apr. 2020
Iron	300	µg/L	5	ND	ND	ND	Feb. 2017	-	Apr. 2020
Manganese	50	µg/L	5	ND	ND	ND	Feb. 2017	-	Apr. 2020
MBAS	0.5	mg/L	5	ND	ND	ND	Feb. 2017	-	Apr. 2020
Methyl tert-Butyl Ether	5	µg/L	3	ND	ND	ND	Feb. 2017	-	Apr. 2018
Odor	3	TON	12	0.08	ND	1	Feb. 2016	-	Apr. 2020
Silver	100	µg/L	5	ND	ND	ND	Feb. 2017	-	Apr. 2020
Specific Conductance	900	µS/cm	5	61.8	52	75	Feb. 2017	-	Apr. 2020
Sulfate	250	mg/L	5	1.05	0.8	1.5	Feb. 2017	-	Apr. 2020
Total Dissolved Solids	500	mg/L	5	46	40	50	Feb. 2017	-	Apr. 2020
Turbidity	5	NTU	5	0.15	ND	0.2	Feb. 2017	-	Apr. 2020
Zinc	5000	µg/L	5	28.2	ND	85	Feb. 2017	-	Apr. 2020

MONITORING ASSOCIATED WITH SECONDARY STANDARDS			SHEEP RANCH WATER TREATMENT PLANT TREATED WATER						
Constituent	**MCL**	**Units**	**Samples**	**Average**	**Min**	**Max**	**Date**		
Bicarbonate Alkalinity	-	mg/L	34	34.9	20	50	Feb. 2017	-	Dec. 2020
Calcium	-	mg/L	5	4.82	4	6	Feb. 2017	-	Apr. 2020
Carbonate Alkalinity	-	mg/L	34	ND	ND	ND	Feb. 2017	-	Dec. 2020
Hydroxide Alkalinity	-	mg/L	34	ND	ND	ND	Feb. 2017	-	Dec. 2020
Magnesium	-	mg/L	5	1.44	1	2	Feb. 2017	-	Apr. 2020
pH	-	-	5	7.70	7.5	8.0	Feb. 2017	-	Apr. 2020
Sodium	-	mg/L	5	5.6	4	10	Feb. 2017	-	Apr. 2020
Total Alkalinity	-	mg/L	43	29.1	10	40	Feb. 2016	-	Dec. 2020
Total Hardness	-	mg/L	5	17.9	14.1	23.2	Feb. 2017	-	Apr. 2020

Table B-3: Title 22 Analysis of Raw Water for the Jenny Lind Water Treatment Plant

INORGANICS			JENNY LIND WATER TREATMENT PLANT - RAW WATER						
Constituent	**MCL**	**Units**	**Samples**	**Average**	**Min**	**Max**	**Date**		
Aluminum	1000	µg/L	5	128.8	ND	250	Apr. 2016	-	Apr. 2020
Antimony	6	µg/L	5	ND	ND	ND	Apr. 2016	-	Apr. 2020
Arsenic	10	µg/L	5	ND	ND	ND	Apr. 2016	-	Apr. 2020
Barium	1000	µg/L	5	ND	ND	ND	Apr. 2016	-	Apr. 2020
Beryllium	4	µg/L	5	ND	ND	ND	Apr. 2016	-	Apr. 2020
Cadmium	5	µg/L	5	ND	ND	ND	Apr. 2016	-	Apr. 2020
Fluoride (Source)	2	mg/L	5	ND	ND	ND	Apr. 2016	-	Apr. 2020
Mercury	2	µg/L	5	ND	ND	ND	Apr. 2016	-	Apr. 2020
Nickel	100	µg/L	5	ND	ND	ND	Apr. 2016	-	Apr. 2020
Nitrate (As N)	10	mg/L	5	0.094	ND	0.47	Apr. 2016	-	Apr. 2020
Nitrate + Nitrite (As N)	10000	µg/L	4	0.125	ND	0.3	Apr. 2017	-	Apr. 2020
Nitrite (As N)	1000	µg/L	5	ND	ND	ND	Apr. 2016	-	Apr. 2020
Perchlorate	6	µg/L	5	ND	ND	ND	Jun. 2016	-	Jun. 2020
Selenium	50	µg/L	5	ND	ND	ND	Apr. 2016	-	Apr. 2020
Thallium	2	µg/L	5	ND	ND	ND	Apr. 2016	-	Apr. 2020
Total Chromium	50	µg/L	5	ND	ND	ND	Apr. 2016	-	Apr. 2020

VOLATILE ORGANIC CHEMICALS (VOCs)			JENNY LIND WATER TREATMENT PLANT - RAW WATER						
Constituent	**MCL**	**Units**	**Samples**	**Average**	**Min**	**Max**	**Date**		
1,1,1-Trichloroethane	200	µg/L	3	ND	ND	ND	Apr. 2018	-	Apr. 2020
1,1,2,2-Tetrachloroethane	1	µg/L	3	ND	ND	ND	Apr. 2018	-	Apr. 2020
1,1,2-Trichloroethane	5	µg/L	3	ND	ND	ND	Apr. 2018	-	Apr. 2020
1,1-Dichloroethane	5	µg/L	3	ND	ND	ND	Apr. 2018	-	Apr. 2020
1,1-Dichloroethylene	6	µg/L	3	ND	ND	ND	Apr. 2018	-	Apr. 2020
1,2,3-Trichlorobenzene	0.005	µg/L	3	ND	ND	ND	Apr. 2018	-	Apr. 2020
1,2,4-Trichlorobenzene	5	µg/L	3	ND	ND	ND	Apr. 2018	-	Apr. 2020
1,2-Dichlorobenzene	600	µg/L	3	ND	ND	ND	Apr. 2018	-	Apr. 2020
1,2-Dichloroethane	0.5	µg/L	3	ND	ND	ND	Apr. 2018	-	Apr. 2020
1,2-Dichloropropane	5	µg/L	3	ND	ND	ND	Apr. 2018	-	Apr. 2020
1,3-Dichloropropene (Total)	0.5	µg/L	3	ND	ND	ND	Apr. 2018	-	Apr. 2020
1,4-Dichlorobenzene	5	µg/L	3	ND	ND	ND	Apr. 2018	-	Apr. 2020
Benzene	1	µg/L	3	ND	ND	ND	Apr. 2018	-	Apr. 2020
Carbon Tetrachloride	0.5	µg/L	3	ND	ND	ND	Apr. 2018	-	Apr. 2020
Cis-1,2-Dichloroethylene	6	µg/L	3	ND	ND	ND	Apr. 2018	-	Apr. 2020
Dichloromethane	5	µg/L	3	ND	ND	ND	Apr. 2018	-	Apr. 2020
Ethylbenzene	300	µg/L	3	ND	ND	ND	Apr. 2018	-	Apr. 2020
Methyl tert-Butyl Ether	13	µg/L	3	ND	ND	ND	Apr. 2018	-	Apr. 2020
Monochlorobenzene	70	µg/L	3	ND	ND	ND	Apr. 2018	-	Apr. 2020
Styrene	100	µg/L	3	ND	ND	ND	Apr. 2018	-	Apr. 2020
Tetrachloroethylene	5	µg/L	3	ND	ND	ND	Apr. 2018	-	Apr. 2020
Toluene	150	µg/L	3	ND	ND	ND	Apr. 2018	-	Apr. 2020
Trans-1,2-Dichloroethylene	10	µg/L	3	ND	ND	ND	Apr. 2018	-	Apr. 2020
Trichloroethylene	5	µg/L	3	ND	ND	ND	Apr. 2018	-	Apr. 2020
Trichlorofluoroethane (Freon 113)	1200	µg/L	3	ND	ND	ND	Apr. 2018	-	Apr. 2020
Trichlorofluoromethane	150	µg/L	3	ND	ND	ND	Apr. 2018	-	Apr. 2020
Vinyl Chloride	0.5	µg/L	3	ND	ND	ND	Apr. 2018	-	Apr. 2020
Xylenes	1750	µg/L	3	ND	ND	ND	Apr. 2018	-	Apr. 2020

NON-VOLATILE SYNTHETIC ORGANIC CHEMICALS (SOCs)			JENNY LIND WATER TREATMENT PLANT - RAW WATER						
Constituent	**MCL**	**Units**	**Samples**	**Average**	**Min**	**Max**	**Date**		
1,2,3-Trichloropropane	0.005	µg/L	4	ND	ND	ND	Jan. 2018	-	Oct. 2018
Glyphosate	700	µg/L	4	ND	ND	ND	Mar. 2018	-	Jun. 2019

SECONDARY STANDARDS			JENNY LIND WATER TREATMENT PLANT - RAW WATER						
Constituent	**MCL**	**Units**	**Samples**	**Average**	**Min**	**Max**	**Date**		
Aluminum	200	µg/L	5	128.8	ND	250	Apr. 2016	-	Apr. 2020
Chloride	250	mg/L	5	4.54	3.4	6.1	Apr. 2016	-	Apr. 2020
Color	15	Units	76	10.9	ND	30	Jan. 2017	-	Dec. 2020
Copper	1000	µg/L	5	ND	ND	ND	Apr. 2016	-	Apr. 2020
Iron	300	µg/L	5	188	ND	380	Apr. 2016	-	Apr. 2020
Manganese	50	µg/L	212	143.1	ND	1600	Jan. 2016	-	Dec. 2020
MBAS	0.5	mg/L	5	ND	ND	ND	Apr. 2016	-	Apr. 2020
Methyl tert-Butyl Ether	5	µg/L	3	ND	ND	ND	Apr. 2018	-	Apr. 2020
Odor	3	TON	76	1.28	ND	4	Jan. 2017	-	Dec. 2020
Silver	100	µg/L	5	ND	ND	ND	Apr. 2016	-	Apr. 2020
Specific Conductance	900	µS/cm	5	189.2	170	216	Apr. 2016	-	Apr. 2020
Sulfate	250	mg/L	5	17.2	14.4	19	Apr. 2016	-	Apr. 2020
Total Dissolved Solids	500	mg/L	5	118	80	130	Apr. 2016	-	Apr. 2020
Turbidity	5	NTU	5	3.38	1.8	5.1	Apr. 2016	-	Apr. 2020
Zinc	5000	µg/L	5	ND	ND	ND	Apr. 2016	-	Apr. 2020

MONITORING ASSOCIATED WITH SECONDARY STANDARDS			JENNY LIND WATER TREATMENT PLANT - RAW WATER						
Constituent	**MCL**	**Units**	**Samples**	**Average**	**Min**	**Max**	**Date**		
Bicarbonate Alkalinity	-	mg/L	40	79.9	70	94	Feb. 2016	-	Dec. 2020
Calcium	-	mg/L	5	19.2	18	21	Apr. 2016	-	Apr. 2020
Carbonate Alkalinity	-	mg/L	40	ND	ND	ND	Feb. 2016	-	Dec. 2020
Hydroxide Alkalinity	-	mg/L	40	ND	ND	ND	Feb. 2016	-	Dec. 2020
Magnesium	-	mg/L	5	7.6	7.0	9.0	Apr. 2016	-	Apr. 2020
pH	-	-	11	7.78	7.6	8.0	Feb. 2016	-	Apr. 2020
Sodium	-	mg/L	5	6.16	5.0	8.0	Apr. 2016	-	Apr. 2020
Total Alkalinity	-	mg/L	57	64.8	47	79	Jan. 2016	-	Dec. 2020
Total Hardness	-	mg/L	5	79.2	73.7	89.4	Apr. 2016	-	Apr. 2020

Table B-4: Title 22 Analysis of Treated Water for the Jenny Lind Water Treatment Plant

INORGANICS			JENNY LIND WATER TREATMENT PLANT - TREATED WATER						
Constituent	**MCL**	**Units**	**Samples**	**Average**	**Min**	**Max**	**Date**		
Aluminum	1000	µg/L	5	ND	ND	ND	Apr. 2016	-	Apr. 2020
Antimony	6	µg/L	5	ND	ND	ND	Apr. 2016	-	Apr. 2020
Arsenic	10	µg/L	5	ND	ND	ND	Apr. 2016	-	Apr. 2020
Barium	1000	µg/L	5	ND	ND	ND	Apr. 2016	-	Apr. 2020
Beryllium	4	µg/L	5	ND	ND	ND	Apr. 2016	-	Apr. 2020
Bromate	10	µg/L	56	ND	ND	ND	Jan. 2016	-	Dec. 2020
Cadmium	5	µg/L	5	ND	ND	ND	Apr. 2016	-	Apr. 2020
Fluoride (Source)	2	mg/L	5	ND	ND	ND	Apr. 2016	-	Apr. 2020
Mercury	2	µg/L	5	ND	ND	ND	Apr. 2016	-	Apr. 2020
Nickel	100	µg/L	5	ND	ND	ND	Apr. 2016	-	Apr. 2020
Nitrate (As N)	10	mg/L	5	0.10	ND	0.49	Apr. 2016	-	Apr. 2020
Nitrate + Nitrite (As N)	10000	µg/L	4	0.13	ND	0.30	Apr. 2017	-	Apr. 2020
Nitrite (As N)	1000	µg/L	5	ND	ND	ND	Apr. 2016	-	Apr. 2020
Selenium	50	µg/L	5	ND	ND	ND	Apr. 2016	-	Apr. 2020
Thallium	2	µg/L	5	ND	ND	ND	Apr. 2016	-	Apr. 2020
Total Chromium	50	µg/L	5	ND	ND	ND	Apr. 2016	-	Apr. 2020

VOLATILE ORGANIC CHEMICALS (VOCs			JENNY LIND WATER TREATMENT PLANT - TREATED WATER						
Constituent	**MCL**	**Units**	**Samples**	**Average**	**Min**	**Max**	**Date**		
1,1,1-Trichloroethane	200	µg/L	3	ND	ND	ND	Apr. 2016	-	Apr. 2018
1,1,2,2-Tetrachloroethane	1	µg/L	3	ND	ND	ND	Apr. 2016	-	Apr. 2018
1,1,2-Trichloroethane	5	µg/L	3	ND	ND	ND	Apr. 2016	-	Apr. 2018
1,1-Dichloroethane	5	µg/L	3	ND	ND	ND	Apr. 2016	-	Apr. 2018
1,1-Dichloroethylene	6	µg/L	3	ND	ND	ND	Apr. 2016	-	Apr. 2018
1,2,3-Trichlorobenzene	0.005	µg/L	3	ND	ND	ND	Apr. 2016	-	Apr. 2018
1,2,4-Trichlorobenzene	5	µg/L	3	ND	ND	ND	Apr. 2016	-	Apr. 2018
1,2-Dichlorobenzene	600	µg/L	3	ND	ND	ND	Apr. 2016	-	Apr. 2018
1,2-Dichloroethane	0.5	µg/L	3	ND	ND	ND	Apr. 2016	-	Apr. 2018
1,2-Dichloropropane	5	µg/L	3	ND	ND	ND	Apr. 2016	-	Apr. 2018
1,3-Dichloropropene (Total)	0.5	µg/L	3	ND	ND	ND	Apr. 2016	-	Apr. 2018
1,4-Dichlorobenzene	5	µg/L	3	ND	ND	ND	Apr. 2016	-	Apr. 2018
Benzene	1	µg/L	3	ND	ND	ND	Apr. 2016	-	Apr. 2018
Carbon Tetrachloride	0.5	µg/L	3	ND	ND	ND	Apr. 2016	-	Apr. 2018
Cis-1,2-Dichloroethylene	6	µg/L	3	ND	ND	ND	Apr. 2016	-	Apr. 2018
Dichloromethane	5	µg/L	3	ND	ND	ND	Apr. 2016	-	Apr. 2018
Ethylbenzene	300	µg/L	3	ND	ND	ND	Apr. 2016	-	Apr. 2018
Methyl tert-Butyl Ether	13	µg/L	3	ND	ND	ND	Apr. 2016	-	Apr. 2018
Monochlorobenzene	70	µg/L	3	ND	ND	ND	Apr. 2016	-	Apr. 2018
Styrene	100	µg/L	3	ND	ND	ND	Apr. 2016	-	Apr. 2018
Tetrachloroethylene	5	µg/L	3	ND	ND	ND	Apr. 2016	-	Apr. 2018
Toluene	150	µg/L	3	ND	ND	ND	Apr. 2016	-	Apr. 2018
Trans-1,2-Dichloroethylene	10	µg/L	3	ND	ND	ND	Apr. 2016	-	Apr. 2018
Trichloroethylene	5	µg/L	3	ND	ND	ND	Apr. 2016	-	Apr. 2018
Trichlorofluoroethane (Freon 113)	1200	µg/L	3	ND	ND	ND	Apr. 2016	-	Apr. 2018
Trichlorofluoromethane	150	µg/L	3	ND	ND	ND	Apr. 2016	-	Apr. 2018
Vinyl Chloride	0.5	µg/L	3	ND	ND	ND	Apr. 2016	-	Apr. 2018
Xylenes	1750	µg/L	3	ND	ND	ND	Apr. 2016	-	Apr. 2018

SECONDARY STANDARDS			JENNY LIND WATER TREATMENT PLANT - TREATED WATER						
Constituent	**MCL**	**Units**	**Samples**	**Average**	**Min**	**Max**	**Date**		
Aluminum	200	µg/L	5	ND	ND	ND	Apr. 2016	-	Apr. 2020
Chloride	250	mg/L	5	5.68	3.2	8.3	Apr. 2016	-	Apr. 2020
Color	15	Units	4	ND	ND	ND	Jan. 2016	-	Apr. 2020
Copper	1000	µg/L	5	ND	ND	ND	Apr. 2016	-	Apr. 2020
Iron	300	µg/L	5	ND	ND	ND	Apr. 2016	-	Apr. 2020
Manganese	50	µg/L	130	0.15	ND	20	Jan. 2016	-	Dec. 2020
MBAS	0.5	mg/L	5	ND	ND	ND	Apr. 2016	-	Apr. 2020
Methyl tert-Butyl Ether	5	µg/L	3	ND	ND	ND	Apr. 2016	-	Apr. 2018
Odor	3	TON	3	0.33	ND	1	Apr. 2017	-	Apr. 2020
Silver	100	µg/L	5	ND	ND	ND	Apr. 2016	-	Apr. 2020
Specific Conductance	900	µS/cm	5	195.8	175	224	Apr. 2016	-	Apr. 2020
Sulfate	250	mg/L	5	17.0	13.8	19	Apr. 2016	-	Apr. 2020
Total Dissolved Solids	500	mg/L	5	124	80	140	Apr. 2016	-	Apr. 2020
Turbidity	5	NTU	5	0.084	ND	0.2	Apr. 2016	-	Apr. 2020
Zinc	5000	µg/L	5	10.6	ND	53	Apr. 2016	-	Apr. 2020
MONITORING ASSOCIATED WITH SECONDARY STANDARDS			**JENNY LIND WATER TREATMENT PLANT - TREATED WATER**						
Constituent	**MCL**	**Units**	**Samples**	**Average**	**Min**	**Max**	**Date**		
Bicarbonate Alkalinity	-	mg/L	40	80.3	70	93	Feb. 2016	-	Dec. 2020
Calcium	-	mg/L	5	19	17	21	Apr. 2016	-	Apr. 2020
Carbonate Alkalinity	-	mg/L	40	ND	ND	ND	Feb. 2016	-	Dec. 2020
Hydroxide Alkalinity	-	mg/L	40	ND	ND	ND	Feb. 2016	-	Dec. 2020
Magnesium	-	mg/L	5	7.6	6.8	9.0	Apr. 2016	-	Apr. 2020
pH	-	-	11	7.80	7.5	8.0	Feb. 2016	-	Apr. 2020
Sodium	-	mg/L	5	7.66	5.0	9.4	Apr. 2016	-	Apr. 2020
Total Alkalinity	-	mg/L	58	64.2	32	79	Jan. 2016	-	Dec. 2020
Total Hardness	-	mg/L	5	78.5	70	89.4	Apr. 2016	-	Apr. 2020

Table B-5: Title 22 Analysis of Raw Water (Calaveras Source Water) for the Joe Waidhofer Water Treatment Plant

INORGANICS			DR. JOE WAIDHOFER WTP - RAW WATER CALAVERAS RIVER SOURCE						
Constituent	**MCL**	**Units**	**Samples**	**Average**	**Min**	**Max**	**Date**		
Aluminum	1000	µg/L	5	12	ND	60	Jun. 2016	-	Jun. 2020
Antimony	6	µg/L	5	ND	ND	ND	Jun. 2016	-	Jun. 2020
Arsenic	10	µg/L	5	ND	ND	ND	Jun. 2016	-	Jun. 2020
Barium	1000	µg/L	5	5.8	ND	29	Jun. 2016	-	Jun. 2020
Beryllium	4	µg/L	5	ND	ND	ND	Jun. 2016	-	Jun. 2020
Cadmium	5	µg/L	5	ND	ND	ND	Jun. 2016	-	Jun. 2020
Fluoride (Source)	2	mg/L	5	ND	ND	ND	Jun. 2016	-	Jun. 2020
Mercury	2	µg/L	5	ND	ND	ND	Jun. 2016	-	Jun. 2020
Nickel	100	µg/L	5	0.2	ND	1	Jun. 2016	-	Jun. 2020
Nitrate (As N)	10	mg/L	5	0.04	ND	0.2	Jun. 2016	-	Jun. 2020
Nitrate + Nitrite (As N)	10000	µg/L	5	0.08	ND	0.2	Jun. 2016	-	Jun. 2020
Nitrite (As N)	1000	µg/L	5	ND	ND	ND	Jun. 2016	-	Jun. 2020
Perchlorate	6	µg/L	5	ND	ND	ND	Jun. 2016	-	Jul. 2020
Selenium	50	µg/L	5	ND	ND	ND	Jun. 2016	-	Jun. 2020
Thallium	2	µg/L	5	ND	ND	ND	Jun. 2016	-	Jun. 2020
Total Chromium	50	µg/L	5	ND	ND	ND	Jun. 2016	-	Jun. 2020
RADIOACTIVITY			**DR. JOE WAIDHOFER WTP - RAW WATER CALAVERAS RIVER SOURCE**						
Constituent	**MCL**	**Units**	**Samples**	**Average**	**Min**	**Max**	**Date**		
Gross Alpha	15	pCi/L	1	0.687	0.687	0.687	Oct. 2019		

VOLATILE ORGANIC CHEMICALS (V0Cs)			DR. JOE WAIDHOFER WTP - RAW WATER CALAVERAS RIVER SOURCE						
Constituent	**MCL**	**Units**	**Samples**	**Average**	**Min**	**Max**	**Date**		
1,1,1-Trichloroethane	200	µg/L	5	ND	ND	ND	Aug. 2016	-	Aug. 2020
1,1,2,2-Tetrachloroethane	1	µg/L	5	ND	ND	ND	Aug. 2016	-	Aug. 2020
1,1,2-Trichloroethane	5	µg/L	5	ND	ND	ND	Aug. 2016	-	Aug. 2020
1,1-Dichloroethane	5	µg/L	5	ND	ND	ND	Aug. 2016	-	Aug. 2020
1,1-Dichloroethylene	6	µg/L	5	ND	ND	ND	Aug. 2016	-	Aug. 2020
1,2,3-Trichlorobenzene	0.005	µg/L	5	ND	ND	ND	Aug. 2016	-	Aug. 2020
1,2,4-Trichlorobenzene	5	µg/L	5	ND	ND	ND	Aug. 2016	-	Aug. 2020
1,2-Dichlorobenzene	600	µg/L	5	ND	ND	ND	Aug. 2016	-	Aug. 2020
1,2-Dichloroethane	0.5	µg/L	5	ND	ND	ND	Aug. 2016	-	Aug. 2020
1,2-Dichloropropane	5	µg/L	5	ND	ND	ND	Aug. 2016	-	Aug. 2020
1,3-Dichloropropene (Total)	0.5	µg/L	5	ND	ND	ND	Aug. 2016	-	Aug. 2020
1,4-Dichlorobenzene	5	µg/L	5	ND	ND	ND	Aug. 2016	-	Aug. 2020
Benzene	1	µg/L	5	ND	ND	ND	Aug. 2016	-	Aug. 2020
Carbon Tetrachloride	0.5	µg/L	5	ND	ND	ND	Aug. 2016	-	Aug. 2020
Cis-1,2-Dichloroethylene	6	µg/L	5	ND	ND	ND	Aug. 2016	-	Aug. 2020
Dichloromethane	5	µg/L	5	ND	ND	ND	Aug. 2016	-	Aug. 2020
Methyl tert-Butyl Ether	13	µg/L	5	ND	ND	ND	Aug. 2016	-	Aug. 2020
Monochlorobenzene	70	µg/L	5	ND	ND	ND	Aug. 2016	-	Aug. 2020
Styrene	100	µg/L	5	ND	ND	ND	Aug. 2016	-	Aug. 2020
Tetrachloroethylene	5	µg/L	5	ND	ND	ND	Aug. 2016	-	Aug. 2020
Toluene	150	µg/L	5	ND	ND	ND	Aug. 2016	-	Aug. 2020
Trans-1,2-Dichloroethylene	10	µg/L	5	ND	ND	ND	Aug. 2016	-	Aug. 2020
Trichloroethylene	5	µg/L	5	ND	ND	ND	Aug. 2016	-	Aug. 2020
Trichlorofluoroethane (Freon 113)	1200	µg/L	5	ND	ND	ND	Aug. 2016	-	Aug. 2020
Vinyl Chloride	0.5	µg/L	5	ND	ND	ND	Aug. 2016	-	Aug. 2020
Xylenes	1750	µg/L	5	ND	ND	ND	Aug. 2016	-	Aug. 2020
Ethylbenzene	300	µg/L	5	ND	ND	ND	Aug. 2016	-	Aug. 2020
Trichlorofluoromethane	150	µg/L	5	ND	ND	ND	Aug. 2016	-	Aug. 2020

NON-VOLATILE SYNTHETIC ORGANIC CHEMICALS (SOCS)			DR. JOE WAIDHOFER WTP - RAW WATER CALAVERAS RIVER SOURCE						
Constituent	**MCL**	**Units**	**Samples**	**Average**	**Min**	**Max**	**Date**		
1,2,3-Trichloropropane	0.005	µg/L	4	ND	ND	ND	Jan. 2018	-	Oct. 2018
2,4,5-TP (Silvex)	50	µg/L	1	ND	ND	ND	Aug. 2018		
2,4-D	70	µg/L	1	ND	ND	ND	Aug. 2018		
Bentazon	18	µg/L	1	ND	ND	ND	Aug. 2018		
Carbofuran	18	µg/L	1	ND	ND	ND	Aug. 2018		
Dalapon	200	µg/L	1	ND	ND	ND	Aug. 2018		
Dibromochloropropane (DBCP)	0.2	µg/L	1	ND	ND	ND	Aug. 2018		
Dinoseb	7	µg/L	1	ND	ND	ND	Aug. 2018		
Diquat	20	µg/L	1	ND	ND	ND	Aug. 2018		
Endothall	100	µg/L	1	ND	ND	ND	Aug. 2018		
Ethylene Dibromide	0.05	µg/L	1	ND	ND	ND	Aug. 2018		
Glyphosate	700	µg/L	1	ND	ND	ND	Aug. 2018		
Oxamyl	50	µg/L	1	ND	ND	ND	Aug. 2018		
Pentachlorophenol	1	µg/L	1	ND	ND	ND	Aug. 2018		
Picloram	500	µg/L	1	ND	ND	ND	Aug. 2018		

SECONDARY STANDARDS			DR. JOE WAIDHOFER WTP - RAW WATER CALAVERAS RIVER SOURCE						
Constituent	**MCL**	**Units**	**Samples**	**Average**	**Min**	**Max**	**Date**		
Aluminum	200	µg/L	5	12	ND	60	Jun. 2016	-	Jun. 2020
Chloride	250	mg/L	5	3.6	3	4	Jun. 2016	-	Jun. 2020
Color	15	Units	5	16	10	30	Jun. 2016	-	Jun. 2020
Copper	1000	µg/L	5	ND	ND	ND	Jun. 2016	-	Jun. 2020
Iron	300	µg/L	5	28	ND	140	Jun. 2016	-	Jun. 2020
Manganese	50	µg/L	5	12	ND	20	Jun. 2016	-	Jun. 2020
Methyl tert-Butyl Ether	5	µg/L	5	ND	ND	ND	Aug. 2016	-	Aug. 2020
MBAS	0.5	mg/L	5	ND	ND	ND	Jun. 2016	-	Jun. 2020
Odor	3	TON	5	2.8	2	4	Jun. 2016	-	Jun. 2020
Silver	100	µg/L	5	ND	ND	ND	Jun. 2016	-	Jun. 2020
Specific Conductance	900	µS/cm	5	165.8	137	186	Jun. 2016	-	Jun. 2020
Sulfate	250	mg/L	5	11.1	9.8	14	Jun. 2016	-	Jun. 2020
Total Dissolved Solids	500	mg/L	5	94	60	110	Jun. 2016	-	Jun. 2020
Turbidity	5	NTU	5	1.34	0.7	2.1	Jun. 2016	-	Jun. 2020
Zinc	5000	µg/L	5	ND	ND	ND	Jun. 2016	-	Jun. 2020
MONITORING ASSOCIATED WITH SECONDARY STANDARDS			**DR. JOE WAIDHOFER WTP - RAW WATER CALAVERAS RIVER SOURCE**						
Constituent	**MCL**	**Units**	**Samples**	**Average**	**Min**	**Max**	**Date**		
Bicarbonate Alkalinity	-	mg/L	5	74	60	80	Jun. 2016	-	Jun. 2020
Calcium	-	mg/L	5	16.4	14	18	Jun. 2016	-	Jun. 2020
Carbonate Alkalinity	-	mg/L	5	ND	ND	ND	Jun. 2016	-	Jun. 2020
Hydroxide Alkalinity	-	mg/L	5	ND	ND	ND	Jun. 2016	-	Jun. 2020
Magnesium	-	mg/L	5	6.2	5	7	Jun. 2016	-	Jun. 2020
pH	-	-	5	7.66	6.4	8.3	Jun. 2016	-	Jun. 2020
Sodium	-	mg/L	5	5.4	5	6	Jun. 2016	-	Jun. 2020
Total Alkalinity	-	mg/L	5	58	50	70	Jun. 2016	-	Jun. 2020
Total Hardness	-	mg/L	5	66.42	55.5	73.7	Jun. 2016	-	Jun. 2020

Table B-6: Title 22 Analysis of Treated Water for the Joe Waidhofer Water Treatment Plant

INORGANICS			DR. JOE WAIDHOFER WTP - TREATED WATER						
Name	**MCL**	**Units**	**Samples**	**Average**	**Min**	**Max**	**Date**		
Aluminum	1000	µg/L	5	4	ND	20	Jun. 2016	-	Jun. 2020
Antimony	6	µg/L	5	ND	ND	ND	Jun. 2016	-	Jun. 2020
Arsenic	10	µg/L	5	ND	ND	ND	Jun. 2016	-	Jun. 2020
Barium	1000	µg/L	5	8.3	ND	41.5	Jun. 2016	-	Jun. 2020
Beryllium	4	µg/L	5	ND	ND	ND	Jun. 2016	-	Jun. 2020
Cadmium	5	µg/L	5	ND	ND	ND	Jun. 2016	-	Jun. 2020
Fluoride (Source)	2	mg/L	5	ND	ND	ND	Jun. 2016	-	Jun. 2020
Mercury	2	µg/L	5	ND	ND	ND	Jun. 2016	-	Jun. 2020
Nickel	100	µg/L	5	ND	ND	ND	Jun. 2016	-	Jun. 2020
Nitrate (As N)	10	mg/L	5	ND	ND	ND	Jun. 2016	-	Jun. 2020
Nitrate + Nitrite (As N)	10000	µg/L	5	ND	ND	ND	Jun. 2016	-	Jun. 2020
Nitrite (As N)	1000	µg/L	5	ND	ND	ND	Jun. 2016	-	Jun. 2020
Selenium	50	µg/L	5	ND	ND	ND	Jun. 2016	-	Jun. 2020
Thallium	2	µg/L	5	ND	ND	ND	Jun. 2016	-	Jun. 2020
Total Chromium	50	µg/L	5	ND	ND	ND	Jun. 2016	-	Jun. 2020

SECONDARY STANDARDS			DR. JOE WAIDHOFER WTP - TREATED WATER						
Name	**MCL**	**Units**	**Samples**	**Average**	**Min**	**Max**	**Date**		
Aluminum	200	µg/L	5	4	ND	20	Jun. 2016	-	Jun. 2020
Chloride	250	mg/L	5	3.2	3	4	Jun. 2016	-	Jun. 2020
Color	15	Units	5	ND	ND	ND	Jun. 2016	-	Jun. 2020
Copper	1000	µg/L	5	ND	ND	ND	Jun. 2016	-	Jun. 2020
Iron	300	µg/L	5	ND	ND	ND	Jun. 2016	-	Jun. 2020
Manganese	50	µg/L	5	ND	ND	ND	Jun. 2016	-	Jun. 2020
MBAS	0.5	mg/L	5	ND	ND	ND	Jun. 2016	-	Jun. 2020
Odor	3	TON	8	1.6	ND	4	Jun. 2016	-	Dec. 2020
Silver	100	µg/L	5	ND	ND	ND	Jun. 2016	-	Jun. 2020
Specific Conductance	900	µS/cm	5	97.8	81	120	Jun. 2016	-	Jun. 2020
Sulfate	250	mg/L	5	12.0	9.4	15	Jun. 2016	-	Jun. 2020
Total Dissolved Solids	500	mg/L	5	66	50	80	Jun. 2016	-	Jun. 2020
Turbidity	5	NTU	5	0.12	ND	0.4	Jun. 2016	-	Jun. 2020
Zinc	5000	µg/L	5	ND	ND	ND	Jun. 2016	-	Jun. 2020

MONITORING ASSOCIATED WITH SECONDARY STANDARDS			DR. JOE WAIDHOFER WTP - TREATED WATER						
Name	**MCL**	**Units**	**Samples**	**Average**	**Min**	**Max**	**Date**		
Bicarbonate Alkalinity	-	mg/L	5	32	30	40	Jun. 2016	-	Jun. 2020
Calcium	-	mg/L	5	6.6	5	8	Jun. 2016	-	Jun. 2020
Carbonate Alkalinity	-	mg/L	5	ND	ND	ND	Jun. 2016	-	Jun. 2020
Hydroxide Alkalinity	-	mg/L	5	ND	ND	ND	Jun. 2016	-	Jun. 2020
Magnesium	-	mg/L	5	2.6	2	3	Jun. 2016	-	Jun. 2020
pH	-	-	5	7.80	6.80	8.10	Jun. 2016	-	Jun. 2020
Sodium	-	mg/L	5	7.4	6	9	Jun. 2016	-	Jun. 2020
Total Alkalinity	-	mg/L	5	26	20	30	Jun. 2016	-	Jun. 2020
Total Hardness	-	mg/L	5	27.16	20.7	32.3	Jun. 2016	-	Jun. 2020