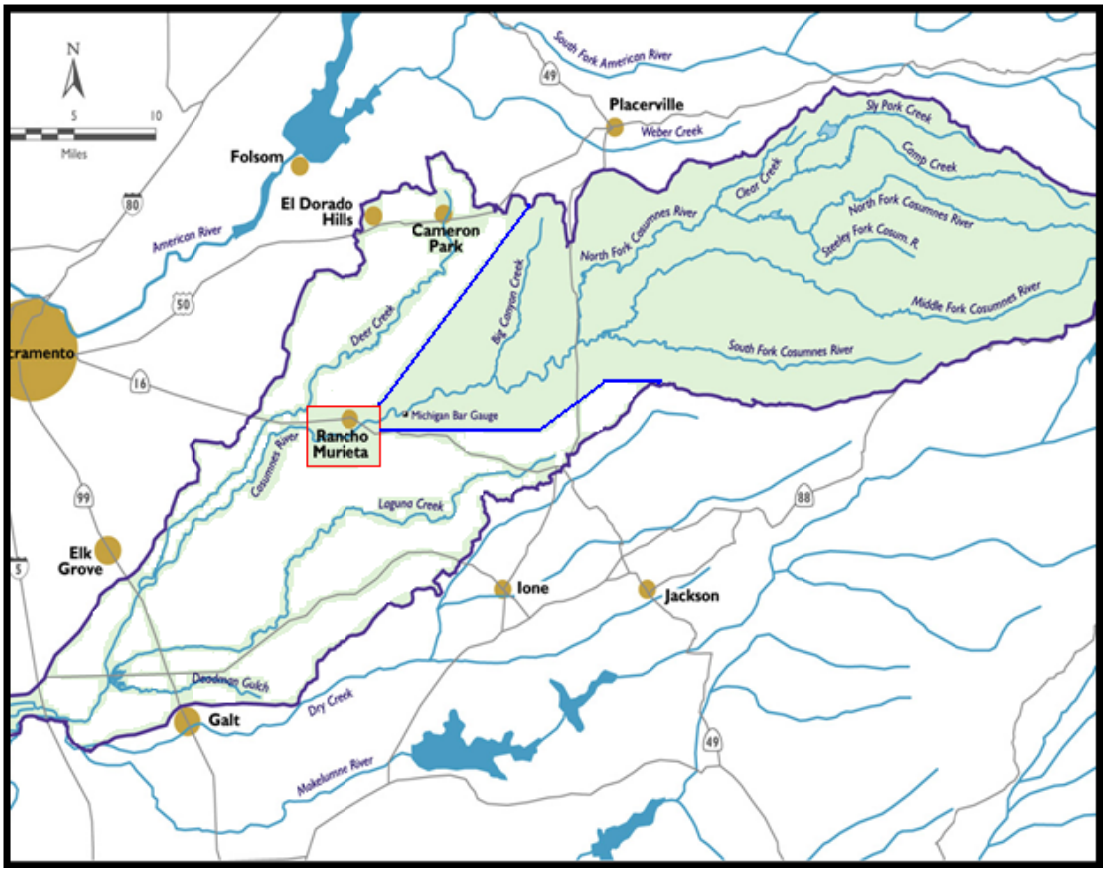
RANCHO MURIETA
COMMUNITY SERVICES DISTRICT

Cosumnes River Watershed Sanitary Survey



December 2016

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REPORT ORGANIZATION

This report contains six chapters in the format recommended by the guidance manual prepared by the California/Nevada Section of the American Water Works Association.

EXECUTIVE SUMMARY

Rancho Murieta Community Services District (District) serves the community of Rancho Murieta, on Highway 16 in southeastern Sacramento County, providing water, sewer, drainage, solid waste, and security services. This Watershed Sanitary Survey meets the requirements of the State of California Surface Water Treatment Regulations (SWTR), in Title 22, Article 7, Section 64655 of the State Code of Regulations.

It has been five (5) years since the last update of the Watershed Sanitary Survey was completed in December 2011. Since that time, the District has experienced minimal growth increasing its water service since 2011 by 11 connections to a total of 2,635 active water connections and serving a population of approximately 5,500. The District's primary water right, Application Number 23416, has not been perfected as the community is only approximately at half build out as per its original master plan. This water right allows for seasonal diversions from the Cosumnes River at its Granlees Diversion Dam each year, between November 1 and May 31, when flows are greater than 70 feet^3/second measured at the Michigan Bar gauging station here: http://cdec.water.ca.gov/cgi-progs/queryF?mhb

There have been no significant activities or changes within the watershed that could adversely affected the water quality delivered to the point of diversion from the Cosumnes River by the District. There has been minimal growth and activity outside of the District along the watershed. Logging, wineries and recreation are the primary businesses along the watershed, which are closely monitored by State and County regulatory agencies. Additional growth is planned around the District's three main reservoirs, which will require the District to be actively involved in the planning process for this project to ensure that the water supply is fully protected.

This Watershed Sanitary Survey is to comply with the Title 22 requirements of the State of California Surface Water Treatment Regulations. Also, areas of concern can be found and addressed to improve the quality of the surface water before it is treated at the water plant. The Watershed Sanitary Survey meets the State of California Surface Water Treatment Regulations requirements by:

1. Surveying and assessing the potential contaminants of the District's surface water supply source, the Cosumnes River;

2. Identifying management practices that are both economically and legally implementable by the District.

The Cosumnes River watershed is one of the major watersheds of El Dorado, Amador and Sacramento counties. The watershed begins at the western slopes of the Sierra Nevada Mountains at an elevation of 7600 feet near the common El Dorado and Amador county lines. Flowing westerly, the Cosumnes River drops in elevation to 130 feet as it passes Rancho Murieta. The Cosumnes River is virtually a wild river with only four percent (4%) of its

approximately 536 square mile watershed upstream from Rancho Murieta controlled by dams or reservoirs. As a result, the vast majority of the runoff flows through the watershed uncontrolled.

Annual yield of the Cosumnes River is highly variable and significantly influenced by the amount of the winter snow pack in the watershed. Due to its low elevation, the watershed does not receive as heavy a snow pack as the other mountain regions located further to the east, north, and south. Springtime snow melts account for the majority of the river's annual yield. Mean annual precipitation of the watershed is 38 inches.

The U.S.G.S. stream gauge at Michigan Bar has recorded the annual yield of the river since 1907. This gauging station is located two miles upstream of Rancho Murieta at an elevation of 168.09 feet. The minimum annual yield recorded, since 1908, was 15,670 acre-feet (AF) occurring in 1977. The maximum annual yield was 1,221,000 AF, which occurred in 1983. The mean annual yield is 274,000 AF.

MANAGEMENT PRACTICES

Our management practices for diverting from the river will remain the same as they have always been. In order to divert the best quality water that we can, we adjust our diversion out of the river by not diverting right after a rain event. We also allow the flush from the first couple of storms to pass the diversion structure before we start to divert. We accomplish a number of things by doing the following:

1. We do not divert the more turbid water that is running off from the lower elevations.
2. We allow runoff contaminated with anything that had settled on the soil surface in the watershed during the previous year to pass by the diversion structure.
3. The majority of organic matter that enters the river system from fall plant die-off also is allowed to pass the diversion structure.
4. The water we divert is then made up mainly of snowmelt from the upper elevations of the watershed where there is little human activity.

We will continue to monitor the watershed throughout the year for any activity that may affect the quality or quantity of water that reaches our diversion structure.

CHAPTER 1
PURPOSE OF THE STUDY

The purposes of this study report are to present the findings of the Sanitary Watershed Survey for Rancho Murieta Community Services District, as required by State Regulations.

PURPOSE AND OBJECTIVES

"Sanitary survey" means an on-site review of a public water system for the purpose of evaluating the adequacy of the water source, facilities, equipment, operation and maintenance for producing and distributing safe drinking water. The purpose of this Watershed Sanitary Survey is to comply with the requirements of the State of California Surface Water Treatment Regulations (SWTR), Title 22, Article 7, Section 64655 of the State Code of Regulations. These regulations require every public water system using surface water to conduct a comprehensive sanitary survey of its watershed every five years. The last sanitary survey was completed by the Rancho Murieta Community Services District (District) in December 2011. This sanitary survey meets the five (5) year update for SWTR requirements by:

1. Surveying and assessing the actual and potential contaminants of the District's surface water supply source, the Cosumnes River; or, identifying any other watershed-related factor, which might adversely affect the quality of water used for domestic drinking water;
2. Identifying management practices that are both economically and legally implementable by the District in order to protect the quality of the surface waters entering the reservoirs; and
3. Evaluating the adequacy of the infrastructure in place to comply with the requirements of SWTR.

Information contained in this report was obtained in the following manner:

1. Collection of available published data on the watershed;
2. Identification of natural and man-made possible source of contaminants through personal contacts with individuals knowledgeable of the areas of concern;
3. Identification of activities, both past and present that may pose a threat of contamination.
4. Collection of information relative the Cosumnes River watershed.
5. Evaluation of water quality data.

REGULATORY REQUIREMENT

Title 22 §64665. Watershed Requirements.

(a) All suppliers shall have a sanitary survey of their watershed(s) completed at least every five (5) years. The first survey shall be completed by January 1, 1996.

(b) A report of the survey shall be submitted to the Department not later than 60 days following completion of the survey.

(c) The survey and report shall include physical and hydrogeological description of the watershed, a summary of source water quality monitoring data, a description of activities and sources of contamination, a description of any significant changes that have occurred since the last survey which could affect the quality of the source water, a description of watershed control and management practices, an evaluation of the system's ability to meet requirements of this chapter, and recommendations for corrective actions.

The Drinking Water Source Assessment and Protection Program (DWSAP) was prepared in response to the 1996 reauthorization of the federal Safe Drinking Water Act, which included an amendment requiring states to develop a program to assess sources of drinking water and encouraging states to establish protection programs. The drinking water source assessment is the first step in the development of a complete drinking water source protection program. The assessment includes a delineation of the area around a drinking water source through which contaminants might move and reach that drinking water supply. In addition, it includes an inventory of activities that might lead to the release of microbiological or chemical contaminants within the delineated area. This enables a determination to be made as to whether the drinking water source might be vulnerable to contamination.

Additional information about safety and standards can be found here:

<table>
<tr><td>State Water Resources Control Board
1001 I Street
PO Box 100
Sacramento, CA 95812-0100

http://www.waterboards.ca.gov/drinking_water/programs/index.shtml
Headquarters Office (916) 449-5600</td><td>Safe Drinking Water Hotline
(800) 426-4791
http://www.epa.gov/safewater/
(General drinking water information)</td></tr>
<tr><td rowspan="2">U.S. Environmental Protection Agency
Office of Ground and Drinking Water (4601)
Ariel Rios Building
1200 Pennsylvania Avenue, NW
Washington, DC 20460-0003</td><td>http://www.epa.gov/safewater/standard/index.html
(Information on how drinking water standards are established)</td></tr>
</table>

CHAPTER 2

WATERSHED AND WATER SUPPLY SYSTEM

INTRODUCTION

This section describes the physical and hydrogeological aspects of the watershed in terms of soils, vegetation, climate, major features, water quality and special hydrologic elements. The overall watershed flowing past the District is comprised of four (4) individual watersheds:

- North Fork Cosumnes River (North Fork)
- Middle Fork Cosumnes River (Middle Fork)
- South Fork Cosumnes River (South Fork)
- Lower Cosumnes River (Lower River)

Information presented in this section was obtained from published reports from federal, state, county and local administrative and planning agencies, as well as previous studies of the watersheds and the internet.

GENERAL DESCRIPTION OF THE WATERSHED

The Cosumnes River watershed is one of the major watersheds of El Dorado, Amador and Sacramento counties. The watershed begins at the western slopes of the central Sierra Nevada Mountains. The watershed begins at elevation 7,600 feet near the common El Dorado and Amador County lines. It has been modified by human development for over 150 years by logging, fires, mining, grazing and diversion of water for agricultural use. Flowing westerly, the Cosumnes River drops to an elevation of 150 feet at the District's point of diversion and 130 feet as it runs through Rancho Murieta. The Cosumnes River is virtually a wild river with only 4% of its approximately 536 square mile watershed upstream from Rancho Murieta controlled by dams or reservoirs. As a result, the vast majority of the runoff flows through the watershed uncontrolled.

Precious metal lode mines are located in the northern fork watershed, at elevations below the normal snow line. All of the mines have not operated for many, many years. Historically these lode mines used mercury and arsenic to separate the gold and other precious metals from the quartz. Acid drainage, mercury and arsenic contamination potential exists, although no known contamination has been identified. Because of their location, size and long-term inactivity, these mines pose very little, if any, threat to the District's drinking water.

Over the past fifteen years, two modifications to the District's diversion facility have been constructed. The fish ladder, at the South Granlees Dam, was improved in 2002 and the North Granlees Dam fish passage improvement project was completed in 2011. A photo of the improvements is presented in Figure 1.

Figure 1 - Granlees North Fish Ladder

HYDROLOGIC DATA

Annual yield of the Cosumnes River is highly variable and significantly influenced by the amount of the winter snow pack in the watershed. Due to its low elevation, the watershed does not receive as heavy a snow pack runoff as the other mountain regions located further to the east. Spring snow melt accounts for the majority of the river's annual yield. Mean annual precipitation of the watershed is 38 inches.

The U.S.G.S. stream gauge at Michigan Bar has recorded the annual yield of the river since the 1908, with 2014 as the last full year of validated data available. This gauging station is located two miles upstream of Rancho Murieta. The picture on the cover of the report illustrates the location of this gauge in proximity to the District. The minimum annual yield recorded was 15,670 acre-feet (AF) occurring in 1977. The maximum annual yield recorded was 1.2 million AF, occurring in 1983.

Over the last several years, the State of California has experienced severe drought conditions, at levels not experienced since the mid to late 1970s. The three graphs in Appendix A present daily flow data in cubic feet per second, with the first for the period since 1970, the second since 2010, and the third since 2015. A table of annual average from 1908 to 2014 is also included in Appendix A.

GEOLOGY/GEOGRAPHY

The Cosumnes River is derived from three forks, North, Middle, and South, all which feed into the Lower River, prior to the point of diversion for the District. Below is a description of each.

NORTH FORK WATERSHED

Geography

The general location of the North Fork watershed is west of Highway 49 and east of Silver Reservoir. Iron Mountain Ridge Road traverses the watershed in a west to east direction along the divide between the Cosumnes River and the American River watersheds. Rural communities of Grizzly Flat and Somerset are located in the watershed. Jenkinson Reservoir (Sly Park) is also in the watershed on Camp Creek. Camp Creek, the major tributary, is controlled by Jenkinson Reservoir and ultimately meets the North Fork near Somerset. The North Fork watershed, including Camp Creek, contains approximately 204 square miles.

Topography
The watershed ranges in elevation from over 7,600 feet at Leek Springs to about 1,800 feet at the confluence with the Middle Fork. The gradient is steep in the upper reaches of Camp Creek and the North Fork.

Geology
Geology of the watershed is comprised of two types of geologic formations: Tertiary Andesitic Volcanic rock and Pilliken Granitic and Ledmont Andesitic soils. Primary soils in the watershed consist of the McCarthy and Waca series which are generally gravely sandy loam with subsoils of very brown gravely and cobbly loam. Water holding capacity of these soils is characterized as low with moderately rapid permeability.

Vegetation
Tree growth consists of stands of hardwood and conifer. At the highest elevations, conifers exist in scattered stands. Undergrowth consists mainly of brush. As elevations drop, oak tends to dominate tree stands and the brush is replaced with grass rangeland. Erosion potential is reduced in the lower elevations by the presence of grass range lands and flatter terrain.

MIDDLE FORK WATERSHED

Geography
The Middle Fork watershed traces its beginning at near Leek Springs south of Plumber Ridge. Major creek tributaries to the Middle Fork include the Sopiago and Dogtown Creeks. Mt. Aukum, Outingdale and Omo Ranch are rural communities in the watershed. This watershed totals about 134 square miles.

Topography
Elevations range from approximately 1,800 feet at the westerly confluence with the North Fork to approximately 7,600 feet at Leek Springs.

Geology
The Middle Fork watershed is very similar to the North Fork watershed. Both watersheds begin in their upper reaches in the Merhten formations comprised of Andesitic Conglomerate, Sandstone and Breccia. Flowing west the river and its tributaries traverse Pazeolic rocks and near the confluence enter Mesozoic Granitic rock formations.

Soil attributes consist mainly of Cohasset, McCarthy, Ledmont and Choix series. As in the North Fork, the Middle Fork contains the McCarthy and Ledmont soils which are characterized by low water absorption and rapid permeability. The Cohasset series soil is dark grayish brown, cobbly sandy loams. Surface runoff is medium to rapid and the erosion potential is medium to high.

Similarly, the Choix soils are well drained and underlain by weathered granitic rock. The surface layer is comprised of dark grayish sandy coarse loams. In steeper slope areas, the soil has a very

high erosion potential whereas in the more moderate slopes the soil has medium to rapid runoff with high erosion potential.

Vegetation
Conifers and hardwoods are the primary tree growth. Undergrowth is comprised of brush and grass. As the elevation drops, conifers are replaced with more oak stands and the grass rangelands become more dominant. Erosion potential is reduced as the elevation drops and the grass rangeland area is increased.

SOUTH FORK WATERSHED
Geography
This watershed begins its upper reaches near Cooks Station. The watershed encompasses the communities of River Pines and Indian Diggings. The South Fork merges with the North Fork near Briarcliff Mines. At 64 square miles, the South Fork is the smallest watershed of the four watersheds.

Topography
The upper reaches beginning at Cooks Station begin at elevation 5,500 feet then drop rapidly to about 3,500 feet below Farnham Ridge. The remaining downstream sections are moderately flat with steep sections, dropping to about 1,800 feet at the confluence with the Middle Fork.

Geology
In the upper reaches the South Fork match the morphology of the other forks with the Merhten type formations being present. Traversing west, the South Fork enters a more complex mix of geologic formations of undifferentiated Paleozoic, Calaveras Complex Volcanic and Calaveras Metasedimentary rock formations. As the elevation drops along the El Dorado and Amador county line, the watershed is predominately comprised of Mariposa-Josephine and Auburn-Exchequer formations. The upper Mariposa-Josephine series is characterized by reddish brown to yellow-red loam. These soils are well drained with moderate permeability. Erosion potential is moderate to very severe depending on the slopes of the surrounding terrain. The Auburn-Exchequer series is dark brown, grayish brown or reddish brown very rocky silty loam. These soils too are well drained with moderate permeability. Similarly this soil has a moderate to severe erosion potential.

Vegetation
The upper reaches of the watershed are comprised of hardwood timbers and conifers interspersed with grass and brush. This tends to prevent surface erosion if left undisturbed and in areas of slopes less than 50 percent. As the watershed traverses west, the Exchequer soils tend to dominate allowing brush, grass and rangeland to form the backbone vegetative balance. Hardwood, of the oak variety, is the dominate tree. Erosion potential is moderate in the shallower land slopes, in the 3-30 percent range.

LOWER RIVER WATERSHED

Geography

This watershed has its eastern most boundary about 5 miles east of Fiddletown and continues west to Rancho Murieta. Its northern most limits are at Shingle Springs. Included in the watershed are the communities of Fiddletown, Plymouth, and Latrobe. Highway 49 bisects the watershed at its northeast limit, and continues south through Plymouth. Shenandoah Valley, among the best known local areas for vineyards, is near the eastern edge of the watershed. The watershed comprises approximately 135 square miles.

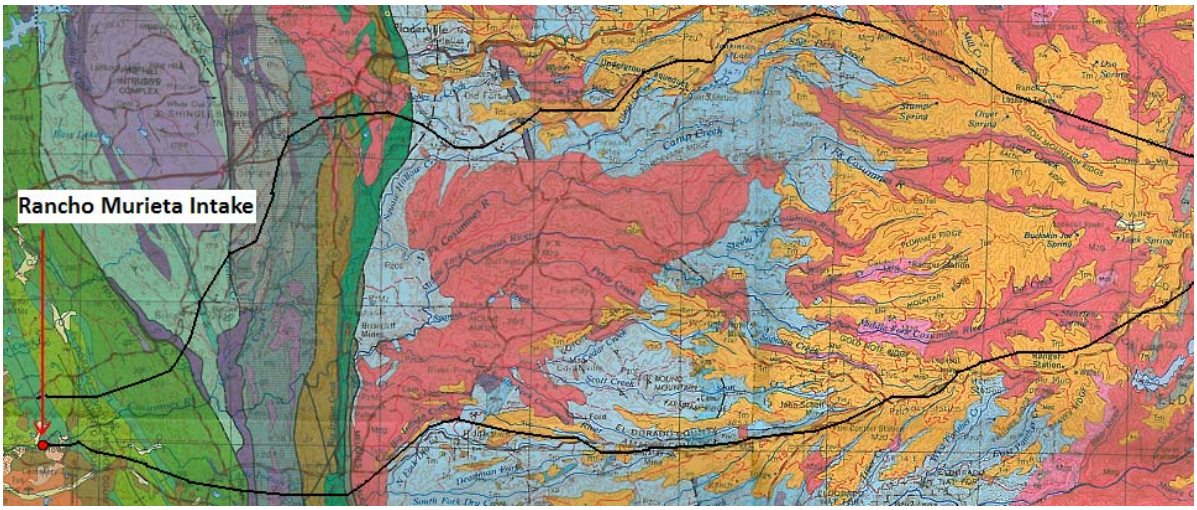
Topography

At is easternmost edge the watershed begins at an elevation 2,800 feet and drops to an elevation of about 130 feet as it reaches Rancho Murieta. Shingle Springs at its northern most limit is at elevation 1,200 feet.

Geology

Since this watershed encompasses such a wide range, its geologic morphology is quite diverse. At its eastern limits it is comprised of a combination of the Merhten, Mesozoic granitic rock, and Calaveras Complex rock formations. As it slopes west, it passes through bands of volcanic and metavolcanic rock formations, Copper Hill Vocanics, Gopher Ridge Volcanics, and Jurassic metavolcanic rocks. Soils of the watershed are predominately Auburn-Argonaut and Serpentine-Delpiedra associations. These soils are characterized as well to excessively drained silt and gravely loams derived from weathered basic and metasedimentary rocks.

A Geologic Map of the Sacramento Quadrangle showing Cosumnes River watershed upstream from District intake at Granlees North Dam is shown as Figure 2, with a legend for the Geologic Map with watershed formations outlined in red.



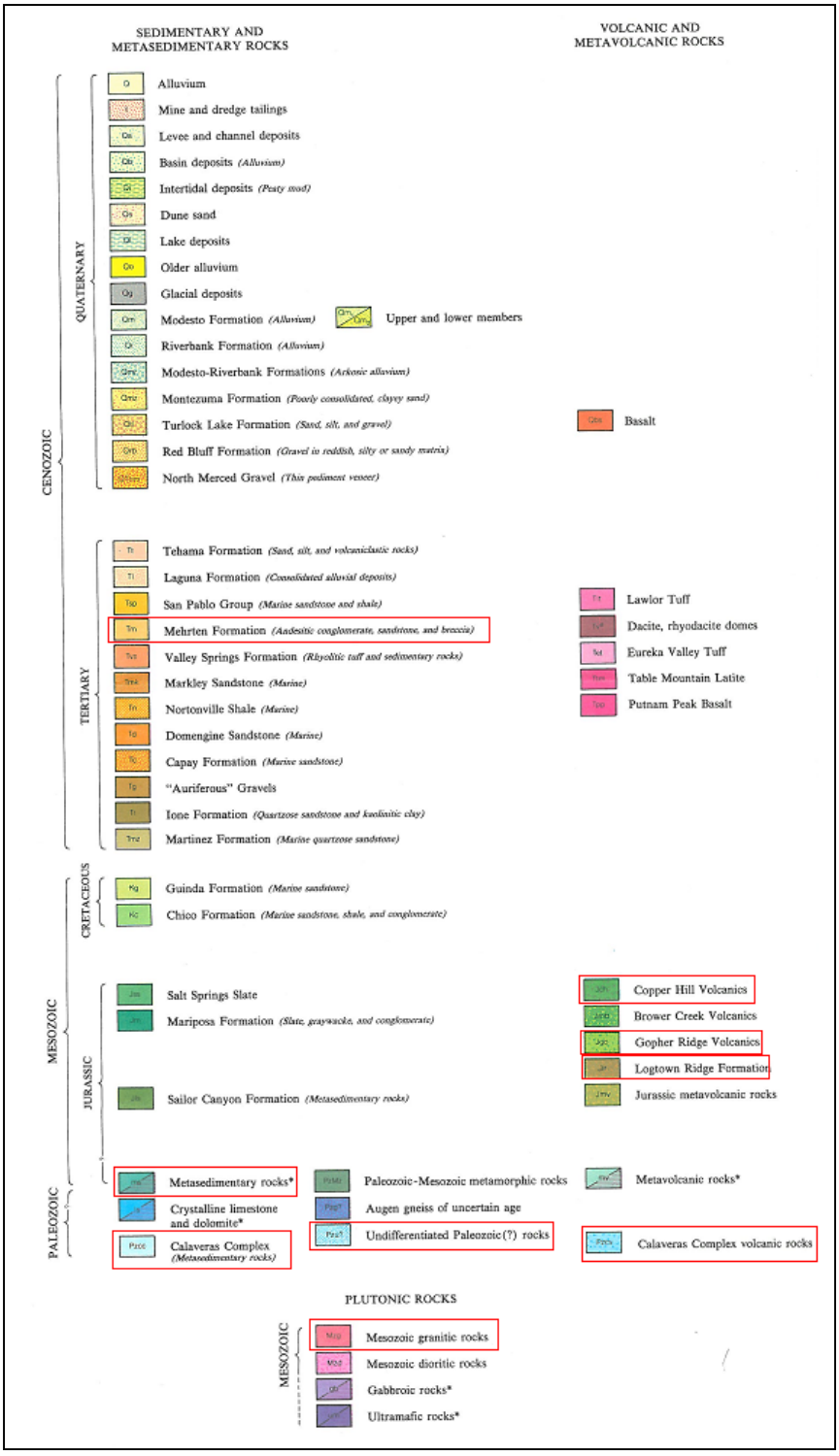


Figure 2 - Geologic Map of Cosumnes Watershed Upstream from Rancho Murieta

WATER SYSTEM

The District's Water system consists of supply, treatment, and storage. These components are discussed in detail below.

WATER RIGHTS

The District's water supply consists of seasonal diversions from the Cosumnes River that are normally diverted to three storage reservoirs (Calero, Chesbro and Clementia). The District's main water rights permit, 16762, states the following:

- Between the dates of the allowable diversion period (November 1 and May 31), surface water can be diverted from the Cosumnes River at Granlees Dam into the District's water storage reservoirs.
- Diversions are limited as follows:
  1. No water may be diverted when river flows are less than 70 cubic feet per second (cfs) at Michigan Bar gauging station.
  2. For river flows between 70 and 175 cfs, a maximum diversion rate of 6 cfs is allowed provided this diversion does not reduce downstream flow below 70 cfs.
  3. When river flows exceed 175 cfs, diversion of up to 46 cfs is allowed for direct use plus an additional 3,900 acre-ft for storage as follows:
     a. 1,250 acre-ft to Chesbro Reservoir.
     b. 2,610 acre-ft to Calero Reservoir.
     c. 850 acre-ft to Clementia Reservoir.
     d. 40 acre-ft to South Course Reservoir 10.
  4. The combined amount of items b, c, and d above cannot exceed 2,650 acre-ft./year
  5. The maximum allowable diversion rate to storage is 46 cfs.
  6. If at least 400 acre-ft has not been diverted by February 1st, up to 46 cfs may be diverted during February if the river flow is above 70 cfs.
  7. If on March 1st at least 2,000 acre-ft has not been diverted; up to 46 cfs may be diverted during the month of March if the river flow is above 70 cfs.
  8. If on April 1st at least 4,400 acre-ft has not been diverted; up to 46 cfs may be diverted for the rest of the season if the river flow is above 70 cfs.
  9. The equivalent of the continuous flow allowance by direct diversion for any 7-day period may be diverted in a shorter time if there is no interference with vested rights.
  10. No water shall be diverted during the allowable period (November 1-May 31) except during such time as there is visible surface flow in the bed of the Cosumnes River from point of diversion to the McConnell gauging station at Highway 99.
  11. The total amount of water taken from the river cannot exceed 6,368 acre-ft per year from October 1 to September 30.

Water right permit 16762 was issued in 1969 and amended in 1980. In 2001, the permit was renewed and extended with no new permit requirements through 2020 in consideration that the community was not at full build-out. It now appears likely that in 2020, the community will not have reached full build-out and the permit will need to be extended again at least through 2030.

WATER DIVERSION AND STORAGE

The Granlees North Dam has a diversion structure utilize to convey river water through slotted screens into a collection well where a pump station diverts flow into the District's reservoirs. The pump Station is equipped with two 125 HP pumps (minor capacity) and three 500 HP pumps (major capacity). Maximum diversion capacity is 6 cfs (2,693 gpm) for each 125 HP pump and 15 cfs (6,885 gpm) for the 500 HP units. Typical diversions utilize the minor capacity pumps to avoid high power costs. However, if the river flows have not been sufficient until later in the diversion season and the District needs to divert its allocation of water, the major capacity pumps are used.

The forebay diverts Cosumnes River water through a collection system of 12 screening elements consisting of 3/32" mesh intake screens, cleaned annually by staff prior to its diversion season, as well as being backflushed by an air-purge system when in operation. Although the electrical power facilities are sized to operate the three 500 HP units at once, hydraulic capacities do not allow operation of all five pumps simultaneously. A maximum of three major capacity pumps can be used at one time per the maximum allowed per the water right for diversion. Flow rates diverted by the pump station are recorded by a totalizer on the discharge piping.

A 33" diameter pipeline conveys water from Granlees pump station to Calero reservoir, which is the highest altitude reservoir. From the 33" pipeline, a 20" branch tee pipeline and valve can also divert water directly into Reservoir Chesbro. A separate 21" pipeline runs from the Granlees Pump Station to the Clementia reservoir with 131' of head. This line maintains the reservoir elevation independent of the elevation of reservoirs Calero or Chesbro.

A 30" siphon line allows transfer of stored water from Calero into Chesbro the intermediate level reservoir. Reservoir Chesbro supplies water directly to the treatment plant. Air diffusers are used in Chesbro, near the inlet to the pump station, to precipitate iron and manganese before transfer to the treatment plant. A pump station on Clementia with two 60 HP pumps with a capacity of 2,250 gpm total can also feed water to the treatment plant at Chesbro.

Figure 3 below presents a map of Calero, Chesbro, and Clementia Reservoirs and all raw water conveyance pumping and pipeline infrastructure.

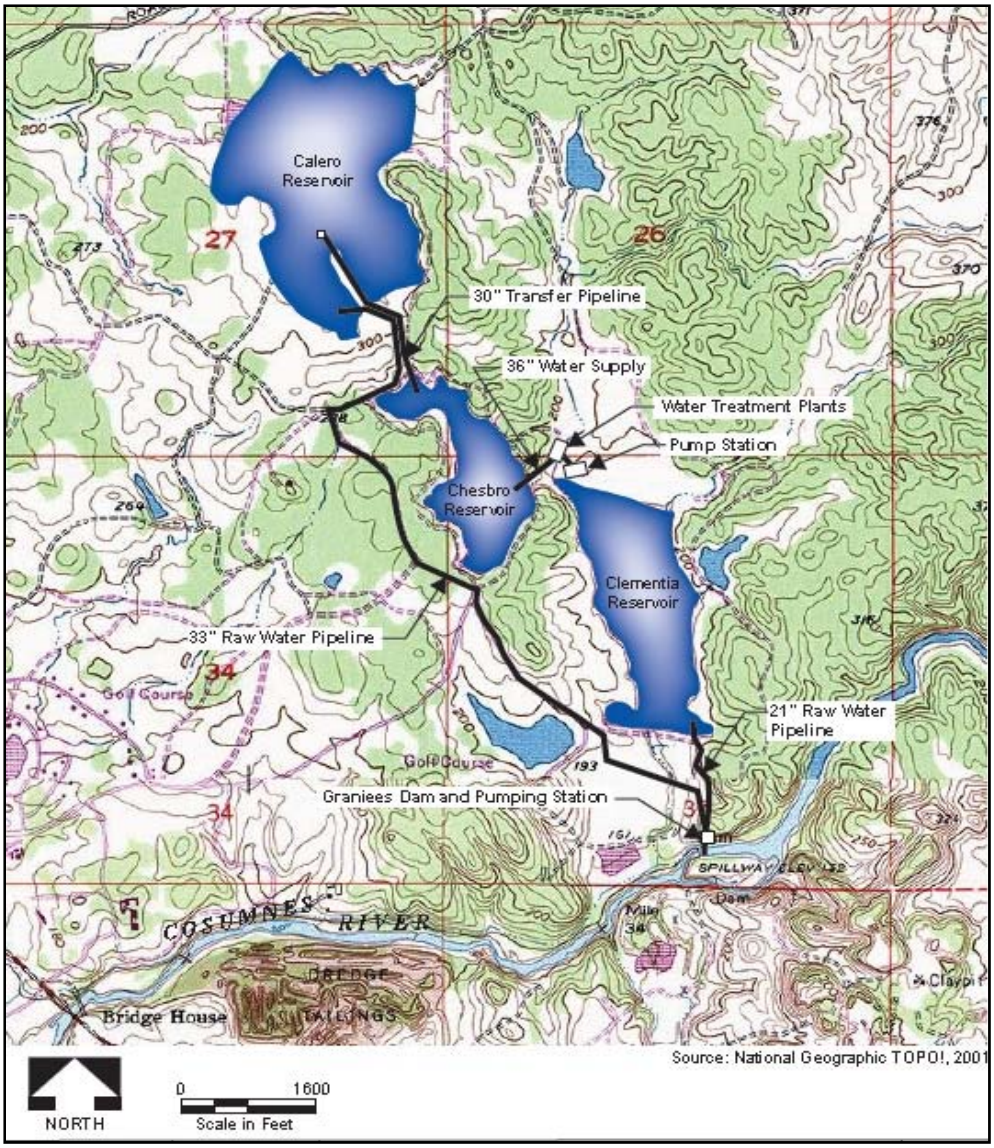


Figure 3 – Raw Water Infrastructure

Per the 2010 Integrated Water Master Plan Update (Brown & Caldwell, October 2010), the usable storage volume for the three reservoirs is as follows:

- Calero: 2,572 acre-feet
- Chesbro: 1,194 acre-feet
- Clementia: 957 acre-feet

The Department of Water Resources Division of Safety of Dams has granted the District Certificates of Approval for the use of flashboards between April 15 and October 1 of each year. Flashboards can be installed at the spillways of all the reservoirs adding approximately two feet of elevation to the reservoir levels. The increased volume of about 400 acre feet replaces water lost through evaporation and seepage.

All three (3) reservoirs are used for recreation, with Calero and Chesbro for non-body contact uses only. Swimming is permitted at only Clementia because this reservoir is not used as a direct supply for the treatment plant at this time. Gasoline powered boats are not permitted on any of the reservoirs. Clementia may be used for a water source in years when full replenishment of one season's consumption is not possible from the river, once permitted by DDW. To use water from Clementia on a regular basis may require changes to the plant operations due to higher suspended solids concentrations in Reservoir Clementia caused by shallow reservoir depths and recreational activities.

Treatment Process

Most of the water diverted to the reservoirs is of high water quality. Winter only diversions, in addition to first flow bypasses, insure that essentially "snow melt" water is diverted and stored. The relative long storage in the reservoirs, up to almost two years, may also serves to improve the water quality by allowing settling of solids of the water entering the treatment plant. Water from Chesbro to the plant typically has the following constituent analysis, based on data from 2012 through 2016:

Parameter	Units	Average Value
Acidity	pH	7.6
Total solids	NTU	0.66
Hardness	mg/l	46
Total Coliform Bacteria	MPN	36

Treatment Plant Facilities

The first two phases of the water treatment plant, Plant 1 and Plant 2 respectively, were constructed in several stages. They were both updated in 1994 to meet newer surface water treatment rules and were converted from single media to dual media filtration. Both were conventional filtration beds consisting of sand and anthracite coal. The original phase had a capacity of 2.0 mgd but was de-rated to 1.5 mgd with the 1994 update, while the second phase has a rated capacity of 2.0 mgd.

In 2016, the District completed an expansion of the water treatment plant 1. The original phase was eliminated and replaced with an ultrafiltration membrane system, consisting of three trains that treat 4 MGD each, with one of the three trains as a redundant system, and the second phase (Plant 2) left in place. The expansion is termed Phase 3 and has a current rated capacity of 4.0 mgd.

Below is a description of the treatment facilities. Some facilities are shared between Phase 2 and Phase 3. These shared facilities are described twice for ease of the reader.

- Raw water is aerated in Chesbro Reservoir around the intake to oxidize iron and manganese and to "freshen up" the raw water.

- An algae control program is maintained in the Chesbro reservoir to prevent the development of taste and odor compounds from certain types of algae as well as to lower total organic carbon.

- Flow into plant 2 is screened by a 3/8" mesh self-cleaning rotating drum screen. This screening is primarily used to remove any solids such as aquatic life and vegetation from entering the treatment process.

- Potassium permanganate is fed at the entrance of raw water for pre-oxidation, along with the chemicals alum & polymer at the flash mix chamber containing a high energy turbine mixer.

- The reaction of particulates in the water with alum and polymer form larger settleable flocs, which require longer, less turbulent reaction times. The flow from the rapid mix enters two or three larger chambers equipped with low speed, low energy mixers where the floc is formed.

- The "flocculated" water enters a sedimentation chamber where the floc slowly settles to the bottom of the basin. Settled floc is then swept, counter current to the flow, back into a sludge collection sump from where it is discharged to drying beds. The clarified flow overflows over surface weirs into the filtration room.

- Final solids removal after sedimentation is provided by gravity through conventional filtration beds consisting of sand and anthracite. These plants are known as "traveling bridge" type filters because of their backwash equipment design and operation. Total area of each filter is approximately 700 square feet. Each filter bed is divided into 81 cells, each about 8 inches wide and their length of 12 feet is equal to the bed width. Normal filtration takes place through every cell over the entire area of the bed. The sand and anthracite filter bed depth in Phase 2 is 14 and 10 inches, respectively.

- As solids build up in the filters causing the flow of water to backup, a backwash is automatically initiated performed on each cell independently. The traveling bridge is centered over a cell where a pump forces water up through the cell to dislodge accumulated solids. A second pump removes the backwash water which is then discharged into the wash water recover basin. Backwash cycle time is automatically controlled by the pressure drop through the filter, real time clock, daily set schedule, or water level set points.

- As a final step in the treatment process, the final filtered water is chlorinated at the end of the filter gallery before discharge into the chlorine contact chamber. Chlorine dosage is set to maintain residual levels so that by the time the water is distributed to the system from the storage reservoirs, the DDW minimum

residual is maintained at all points in the distribution system. Also, zinc-orthophosphate is added for corrosion control.

Below is a description of the Phase 3 facilities. Some facilities are shared between Phase 2 and Phase 3. These facilities are described twice for ease of the reader.

- Raw water is aerated in Chesbro Reservoir around the intake to oxidize iron and manganese and to "freshen up" the raw water. Potassium permanganate may be fed at the entrance of raw water for pre-oxidation.

- In-line, automatic, motorized self-cleaning strainer screens are installed upstream of the membrane units. This type of screen uses rigid scraper bars to remove solids from the surface of the screen when the screens are rotated. A solids collecting sump is included. The drain from this sump is piped to drain back to Clementia Reservoir. For the membrane system the screen is specified for a maximum of 500 microns. This facility utilizes screens with a mesh size of 1/64 inch (400 microns) perforated opening diameter. Two ACME Engineering Automatic Strainers are in place each with a hydraulic capacity of 4,500 gpm (gallons per minute).

- Raw water from Chesbro and clarified water from the inclined plate settler, along with alum & polymer are injected ahead of the flash mix chamber containing a high energy turbine mixer.

- Alum, ACH or polymer is added at the influent flash mixer to coagulate any materials present to form larger particulates to assist in filterability and aid in total organic carbon removal.

- The flow from the rapid mix enters two or three larger chambers equipped with low speed, low energy mixers to further facilitate where the floc is formed.

- The "flocculated" water enters an influent flow channel that diverts water to one of three GE Zeeweed V4 1000 membrane filter trains. Each membrane train consists of two cassettes; within those cassettes, there are 87 modules. The water is pulled through via vacuum and extracted via dedicated permeate pumps through a 10-inch header on the top of each membrane train.

- The membranes are backpulsed from one of two backpulse (or backwash) pumps to periodically remove sediment and other solids. The reject water is sent to backwash basins for equalization. Submersible pumps in the backwash waste basins pump the reject water to a plate settler where a small amount of coagulant may be added and the bulk of solids will be removed. The supernatant of the treated reclaimed water will be returned to the influent line to ahead of the rapid mix system. Solids removed in the plate settler will flow by gravity to the drying beds.

- The membranes also require a clean-in-place process, less frequently than backwashing. Filtered water is also used to fill the clean-in-place (CIP) tank used for backwash, maintenance, and recovery cleans for the membranes. The neutralized reject and waste from the CIP tank is pumped to the Neutralized CIP Waste Storage Tank from which it is pumped to the sanitary sewer. Acid and caustic CIP cleans are operator set per the maintenance needs of the membranes.

- As a final step in the treatment process, the final filtered water is chlorinated after filtration before discharge into the chlorine contact chamber. Chlorine dosage is set to maintain residual levels so that by the time the water is distributed to the system from the storage reservoirs, the DDW minimum residual is maintained at all points in the distribution system. Also, zinc-orthophosphate is added for corrosion control and sodiumhydroxide for pH adjustment as needed.

Other common facilities shared between Phases 2 and 3 include:

- Sludge disposal performed by sludge drying beds.
- Standby power, provided by an diesel fired engine generator set to automatically operate in the event of a power outage. It is sized to run the entire facility at full demand. It was installed with the third phase facilities.
- Laboratory facilities were constructed with the second phase. Inlet and outlet turbidity and outlet chlorine residual are measured continuously for each plant. Only Plant #1 has continuous online pH monitoring of its effluent. Other parameters, i.e. coliform, nitrate, Disinfection byproduct (DBP) monitoring, etc. are measured on samples taken at regular intervals. Periodic analyses are also made and reported as required by the DDW.
- Plant control and electrical switchgear including Programmable Logic Controllers (PLCs), indicators, and SCADA control and historical monitoring systems located in the control room. Operators can set the functions of each plant from the SCADA system to operate either or both plants automatically. In normal operation, each plant is operated in *auto* and start/stop is determined by the level of the storage reservoirs.
- A central chemical feed room, with supply tanks and mixers, serves both plants. In this building, the polymer and PAC are stored and fed. Chemical metering pumps feed solutions of alum, polymer, ACH, caustic into the untreated water as needed. An isolated building contains the bulk tanks which store zinc orthophosphate and alum. Another separate room, next to the chemical feed room, contains the chlorine equipment used for mixing gaseous chlorine and water while providing flow paced metering at an operator set feed rate. and Potassium permanganate is fed as needed into the raw water line at a station set up at the Chesbro reservoir to allow a longer reaction time after addition.

- If needed, additional chlorine can be added to the Van Vleck reservoir utilizing a sodium hypochlorite feed system adjacent to the tank.

Distribution

Treated water is pumped from clear wells at the treatment plants to two above grade finished water tanks. The tanks are sized to meet the maximum daily domestic demands, reserves, and fire flows at full build out. A welded steel, 1.2 million gallon tank (Rio Oso tank or Reservoir 1) serves about 670 residents in the north side of the community in development units 3, 3B, and 4 in a pressurized zone; while an above ground, pre-stressed 3.0 million gallon concrete tank (Van Vleck tank or Reservoir #2) serves the remainder of the District via gravity feed. Reservoir 2 is located east, outside the District. This 3.0 million gallon tank, constructed in 1991, was sized to meet the gravity systems demand at buildout.

Treated water is distributed throughout the system in mains sized for peak domestic usage and to maintain fire flows. Two finished water tanks, one for the gravity side (Van Vleck) and the second for the pressure side (Rio Oso) of the distribution system are used to maintain minimum supply for domestic and fire flows.

Water mains are sized primarily for fire flows and domestic requirements. The system is primarily looped to insure minimum flow and pressure is maintained throughout the system. District staff systematically flushes portions of the system annually to ensure water quality as wells as functionality of distribution valves. All residential and commercial customers are metered.

EMERGENCY PLANS

The District maintains emergency response plans for the system. These plans are reviewed by staff upon hire and annually to insure personnel are current on emergency procedures. Contact names and phone numbers of the operators are part of the plans.

A general list of District Emergency, Operations, and Management Plans are as follows:

- Emergency Response Program for Chlorine Releases
- Risk Management Plan
- Process Safety Management Plan
- Hazardous Materials Plans
- Consolidated Contingency Plans
- Spill Prevention, Control and Countermeasure Plans
- Sanitary Sewer Overflow Prevention and Response Plan
- Sewer System Management Plan (SSMP)
- Best Management Practices for Sanitary Sewer Overflow (SSO) Reduction Strategies
- Power Outage Response Plan
- Respiratory Protection Plan

- Storm Water Management Program (Phase II MS4)
- Wastewater Reclamation Plant Operations Manual
- Water Plant Operations Manual
- Bacteriological Sample Site Plan
- Reservoir Management Plan
- Vulnerability Assessment
- Code Red – reverse auto-dialer notification system
- Crisis Communication Plan
    - Crisis Communications Overview
    - Critical Emergency Communications – First Response
    - Critical Information Log
    - Command Center Team
    - District Emergency Phone List
    - CDPH Water Quality Emergency Notification Plan
    - Sacramento County Emergency Operations Phone List
    - Emergency Notification Plan
    - Unsafe Water Alert
    - Boil Water Order
    - Emergency Disinfection Plan
    - Cancellation of Boil Water Order
    - Division of Safety of Dams Emergency Procedures
    - Non-Critical Emergency Communications – First Response
    - Media Contacts
    - Media Interview
    - District Background

Facility alarms are automatically forwarded to the District's South Gate security guard station, where the on duty gate officer calls the on-call operations or utility operator.

INTEGRATED WATER MASTER PLAN

The District updated its 2006 Integrated Water Master Plan (IWMP) October 2010, outlining an evaluation of the District's existing and future water supply, potable water, treated effluent, and recycled water assets, as well as updating the 2006 water balance. It also provided an expanded the analysis to assess more options for maximizing the beneficial use of all of District's water resources by evaluating more alternatives for drought augmentation as well as:

- Update the water supply and potable/recycled water needs based on three growth scenarios and projected reductions in potable water demand due to the recent legislation. A comprehensive background on SB7 and District plans to address these new water conservation requirements are presented in the 2020 Compliance Plan (Brown and Caldwell, July 2010).
- Analyze potential higher water supply potential shortfalls in times of drought due to the observed and forecasted changes in water supply availability due to

climate change. (This requires evaluating shifts in runoff hydrology due to climate change impacts on the natural variability of flows on the Cosumnes River. These shifts may affect the District's raw water pumping to the reservoirs in the future due to more limited withdrawals from the Cosumnes River based on climate change hydrology scenarios provided by University of California, Davis.)

- Amend the policy recommendations from 2006 IWMP prepared by HDR, as a comprehensive plan for maximizing the use of District water resources while simultaneously addressing the community's needs during drought conditions and with reservoir draw downs.
- Explain the potential impacts of state requirements for greenhouse gas emissions regulations (e.g., California Assembly Bill (AB) 32) on utility operations.

Based off of District Policy 90-2 regarding water supply, the District has sufficient raw water capacity for present and future uses.

CHAPTER 3

ACTIVITIES DETRIMENTAL TO WATER QUALITY

INTRODUCTION

The purpose of this chapter is to identify, evaluate, and discuss activities that are detrimental to water quality in the Cosumnes River watershed. UC Davis Center for Watershed Sciences has identified the watershed boundaries (http://hydra.ucdavis.edu/watershed/cosumnes). A map of the watershed boundaries is presented as Figure 4.

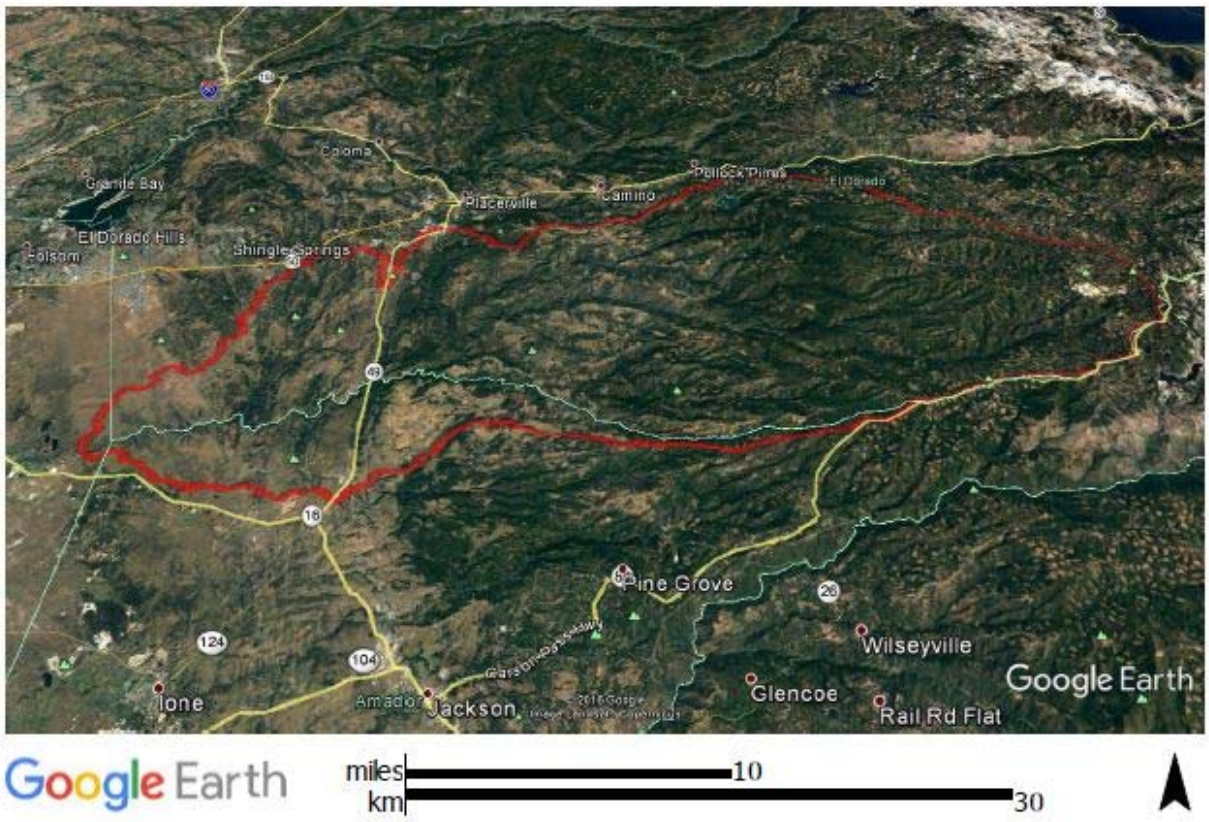


Figure 4 – General Watershed Boundaries

As discussed in Chapter 2, the watershed generally lies within El Dorado, Amador and Sacramento counties, with most of the watershed within El Dorado County. In general, the watershed is sparsely populated. There are a number of unincorporated communities within the watershed, but only one incorporated city (City of Plymouth) within the watershed.

Natural watershed characteristics and human activities detrimental to the water quality are reviewed below.

NATURAL CHARACTERISTICS

Most common among natural characteristics affecting the watershed is erosion which adds sediments. Causes of naturally occurring erosion include fires and high intensity storm events. Sediment laden runoff caused by erosion increases turbidity which hampers the treatment process by reducing the plant's ability to detect and chlorinate organisms. While erosion may be a problem at other water plants, first flow bypass operations by the District allow high turbidity water to flow past the diversion works. District staff monitors the turbidity of the river and diverts only at times of low turbidity. High rate pumping capacity allows the diversion flexibility to divert when snow melt runoff dominates river flows.

HUMAN ACTIVITIES

By far, human activities pose a greater problem to water quality than natural watershed characteristics due to the chemicals used and the waste produced. As the population in the watershed continues to grow, the greater the potential is for detrimental activities. Detrimental activities to the watershed are reviewed and listed below.

Wastewater Collection and Treatment

Several small private or semi-private sewage collection systems are within the watersheds. These include the Gold Ridge Forest community leach field, Gold Beach Park, and the Leoni Meadows Retreat Camp. Characteristics of the systems are provided in the following table:

System	Est. Daily flow	Treatment Process	Discharge
Gold Ridge	9,000 gpd	Septic tank	Leach field
Gold Beach	4,000 gpd	Septic tank and evaporation pond	Leach field
Leoni Meadows	18,000 gpd	Septic tanks	Leach field

River Pines and Plymouth are two (2) communities served by municipal type systems. These systems include gravity collection to pump stations, secondary treatment via aerated lagoons and pond systems, and spray irrigation disposal systems. Both systems meet water quality discharge requirements.

The City of Plymouth operates a Wastewater Treatment facility located on Old Sacramento Road approximately two miles west of Plymouth (Waste Discharge Requirement (WDR) Order Number R5-2011-0092). The facility treats and disposes of wastewater from residential and commercial units in the City of Plymouth, Far Horizons 49er Village RV Resort, and Amador County Fairgrounds. The WWTF consists of a collection system, two aerated ponds (Ponds 1 and 3), one unaerated pond (Pond 2), chlorination facilities, a storage reservoir, and the land application areas (LAAs). All of the ponds and the reservoir are unlined.

Little Indian Creek is located topographically down gradient from the LAAs and an unnamed tributary passes through the LAAs. Sludge is hauled off site to a permitted landfill. Wastewater is applied to approximately 85 acres of the 125-acre site. The LAAs are divided into six fields designated Field 1 through 6. They have installed earthen berms in Fields 2, 3 and 6 along a

portion of Little Indian Creek and the unnamed tributary to contain tail water and storm water. To prevent tail water and stormwater runoff from the LAAs entering surface water courses, only these three (3) fields with berms can be used for year-round land application. Fields 1, 4 and 5 currently do not have berms, thus application of wastewater is limited to the period of 1 April to 1 November. However, if they build berms or ditches around these fields, upon approval by the Regional Board Executive Officer, the land application on Fields 1, 4 and 5 may occur throughout the wet season.

According to the Amador County LAFCo Municipal Services Review (May 22, 2014 by Policy Consulting Associates LLC, http://www.co.amador.ca.us/Home/ShowDocument?id=19666), River Pines Public Utility District provides sewer service to 215 residential and four commercial customers.

The District's WWTP has a facility design flow capacity of 0.035 mgd (ADWF), and can accommodate peak flows of 0.088 mgd. The average treatment plant daily flow in 2012 was 0.022 mgd and peak wet weather flow 0.03 mgd. The treatment system consists of a bar screen, two 1.25-acre foot aerated ponds, a secondary clarification pond and a storage reservoir, and a 17-acre spray field. Treated effluent is disinfected prior to disposal. The disposal system consists of eight sprinkler circuits. Solids accumulate in the ponds are removed occasionally; sludge is hauled off-site to a landfill for disposal.

The wastewater collection system consists of an unknown number of miles of gravity sewer and approximately 1.5 miles of force main. There are three major pumping stations: East Side, Horseshoe Lane and Slate Creek. In addition, there are seven small "grinder" pump stations, which are located along the Cosumnes River; these pump wastewater through a force main up to the gravity collection system.

Based on research, the remaining communities are served by individual septic tank/leach field systems operated by individual homeowners, which are regulated by the environmental health department of each county.

The El Dorado County Operated Union Mine wastewater treatment plant currently processes septic tank waste (septage), portable toilet waste and liquid waste from the landfill (leachate). The landfill has three leachate collection systems and the landfill gas collection system. The WWTF consists of aerobic digesters, a sludge centrifuge, a disinfection system, an effluent storage tank, and spray fields. More information about this facility is listed in the landfill section below.

A sanitary sewer overflow (SSO) is any overflow, spill, release, discharge or diversion of untreated or partially treated wastewater from a sanitary sewer system. SSOs often contain high levels of pollutants and may threaten public health, adversely affect aquatic life, and impair the recreational use of surface waters. Figure 5 identifies the reported spills within the watershed, from October 2011 through October 2016.

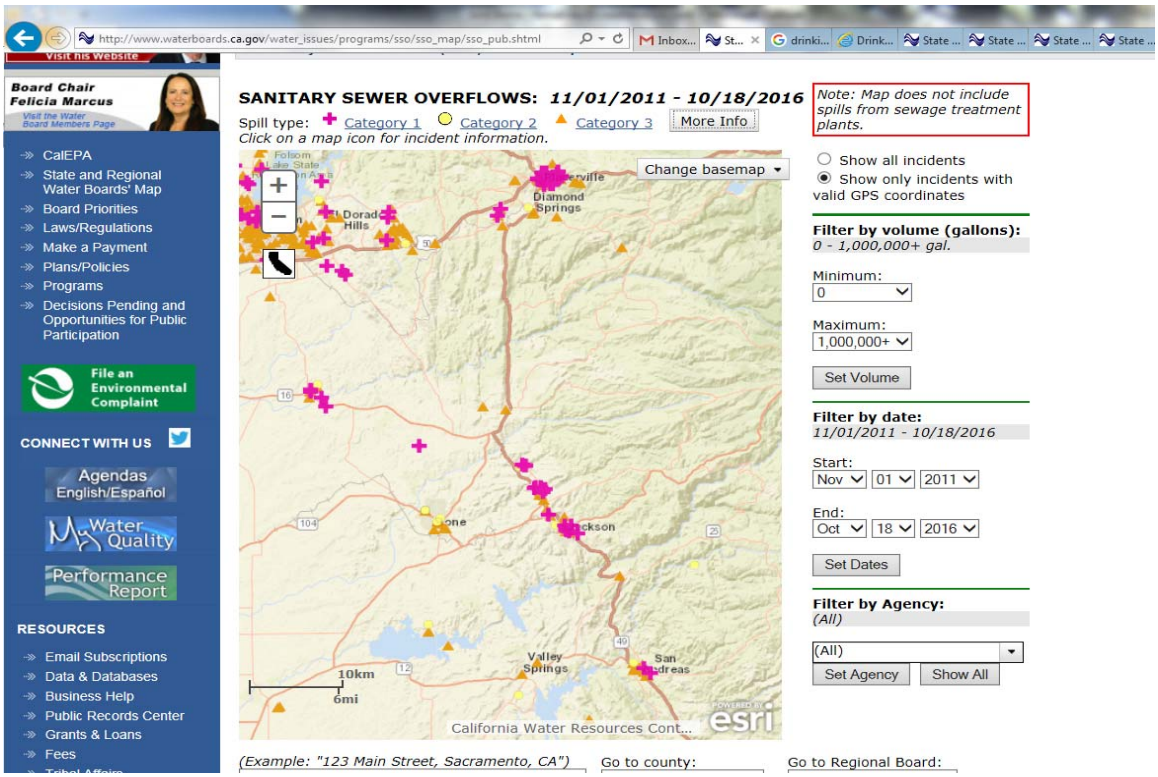


Figure 5 – Screenshot from Regional Water Quality Control Board CIWQS Spill Mapper

The data displayed in this map represents SSO reports for individual locations where sewage was discharged from a sanitary sewer system enrolled under the Statewide General Waste Discharge Requirements for Sanitary Sewer Systems Order, WQO No. 2006-0003-DWQ (the Statewide Sanitary Sewer Order). SSO incidents from a sanitary sewer system may result in discharges from multiple locations and have more than one SSO report in the database.

The data used to display the SSO reports on these maps is based on the latest information for SSO reports from individual agencies enrolled under the Statewide Sanitary Sewer Order. The State Water Resources Control Boards provide a hosting service of all SSO reports and have "view only" access to this information. For specific questions related to SSO incidents or SSO reports, the appropriate indicated reporting agency or responsible party may be contacted.

Between the period of November 1, 2011 and November 1, 2016, there were a total of eleven identified spills within the watershed, of which four reached surface waters. The reporting agencies identified that the volume was minimal in each case.

Landfills

Refuse collection within the watershed is provided by private companies who haul to landfills outside the watershed. However, one formally active landfill, the Union Mine Landfill, exists off of the North Fork of the Cosumnes in the watershed. It was closed in 2007 by Eldorado County. This former landfill is regulated by the CVRWQCB by a Waste Discharge Requirement (WDR) ORDER NO. R5-2006-0020 for the Landfill and has another WDR ORDER NO. R5-2006-0019 for its septage and leachate facility. The County's Union Mine landfill has installed 18 groundwater

monitoring wells around the site which must be tested periodically for potential contamination. Run-off around and adjacent to the Union Mine landfill including Martinez Creek is also monitored and tested periodically for chemical contamination and biological and fisheries impact. The original portion of the landfill has undergone final closure. The remaining active area receives only sludge cake from the on-site wastewater treatment plant.

Recreational use

Recreation uses in the watersheds include hunting, fishing, hiking, camping and off road vehicles. Off road vehicles include 4-wheel drive vehicle trailing on unimproved roads and trails in the El Dorado National Forest (ENF). Typically these uses are in undeveloped and remote areas in the basins' watersheds. Boating and camping is allowed at Jenkinson Reservoir at Sly Park.

Jenkinson Reservoir at Sly Park was constructed by the U. S. Bureau of Reclamation in 1955 and is operated and managed by El Dorado Irrigation District. It feeds the North fork of the Cosumnes River. Sly Park, located 17 miles East of Placerville in the Sierra foothills, offers many recreational opportunities including water sports, hiking, camping and boating. Water is supplied to the reservoir from Hazel Creek, Park Creek, and Camp Creek. Camping facilities include eleven campgrounds containing 205 camp sites and group sites for 500 people. Forty eight (48) concrete pit toilets serve the camping and day use facilities. One equestrian campground is located outside the watershed.

A boating plan is in place to enhance the overall safety of the reservoir. This plan also minimizes turbidity of the reservoir waters by reducing wave action induced at the shoreline. Sly Park's Jenkinson Reservoir also supplies drinking water to El Dorado County. The reservoir was formed by Sly Park Dam, and has a storage capacity of 41,000 acre-feet with a surface area of 650 acres.

Improved USFS campgrounds at Pipi Valley, Middle Fork, and Capps Crossing campground area include 51, 40, and 19 campsites, respectively. These areas have pit toilets and running water but do not have dump stations. In the Upper North Fork, dispersed off road vehicle camping is allowed. This type of camping is at its most basic level with no facilities or campsites available. Where camping of this sort has occurred unrestricted for years, many areas need restoration work. However, currently there are no controls on the use or the number of campers in the area. The ENF approach to limit camping is to place rocks or barriers across roads and near creek crossings. The intent is to prevent access to desirable locations, although creative campers find alternative access routes or find new camping areas nearby. In areas damaged by camping or vehicle travel, ENF uses subsoiling to decrease compaction and mulching and planting to reduce erosion potential.

Traffic accidents and spills

Environmental health for Amador and El Dorado Counties, Hazardous Material and Public Works Departments in addition to California Highway Patrol office, indicate there has been no known traffic and/or hazardous material spills that reached waters of the watershed. The

watersheds are crossed by several highways and major roads. Highway 16 is aligned generally west to east from Rancho Murieta and Highway 49 is located generally north to south from Placerville. Highway 88 parallels the South Fork in the higher elevations of the watershed beginning at Cooks Station. Iron Mountain Road crosses the Camp Creek watershed while Latrobe Road lies in the North Fork watershed. Many other minor roads connect the rural residential areas. Figure 6 presents a photo of a major road crossing (Latrobe Road) over the Cosumnes River.

Figure 6 – Photo of Latrobe Road Crossing Cosumnes River at the Amador and El Dorado County Lines

Unauthorized activities

Local environmental health, hazardous material and public works departments in addition to Regional Water Quality Control Board and ENF offices indicate there have been no known unauthorized activities, such as illegal dump sites or other incidents that have resulted in water quality degradation to the watershed. However, there are very few areas that are strictly off limits even in the remotest portions of the watersheds. These areas are difficult to patrol although no evidence of illegal activities is apparent. As development increases throughout the watersheds, opportunities for unauthorized activities increase as visitors, tourists and campers using recreational facilities increase also.

Fires

California Department of Forestry (CDF) maintains records of fires on private lands. Records readily available back to 1984 were reviewed to determine the extent, location and cause of fires. Based on the previous Sanitary Survey, since 1984, over 6400 acres were burned by wildfires. Vegetation fire acres reported from California Department of Fire staff noted that from 2011 to 2014 located in the Cosumnes watersheds above Rancho Murieta have totaled 488 acres in 2012, 325 acres in 2013, and 102,388 acres in 2014. There was no specific data available for the Cosumnes watershed for 2015 and 2016 available at the time of preparing this report. Most of the fires were manmade and were located near population centers

traditionally along roads or near recreation areas. From 2011-2014 there was one major fire within the watershed.

Surface Geology

The geologic formations in the watersheds are relatively stable. In recent research and data collection, no known mudslides or other geologic induced events caused deleterious effects to the watersheds. "The geology of the Western Slope of Eldorado County is principally hard crystalline or metamorphic rock that forms the land surface, or underlies a thin soil or isolated alluvial cover. (DWR 1989, 1990; USGS 1983)" Soils are reported as principally "shallow to very deep, coarse- to fine textured soils, formed from granitic, sedimentary, and volcanic rocks." In regards to sediment production from the watershed at Michigan Burns and Cornwell (2002) monitored and assessed the variability of suspended watershed at the Michigan Bar gage station. The purpose of examining the suspended load was to help characterize both the erosion and deposition mechanisms acting within the sediment delivery system. The average annual discharge at the Michigan Bar stream gage station was between 200 and 400 cfs and approximately 1–3 tons of suspended sediment moves past the Michigan Bar."

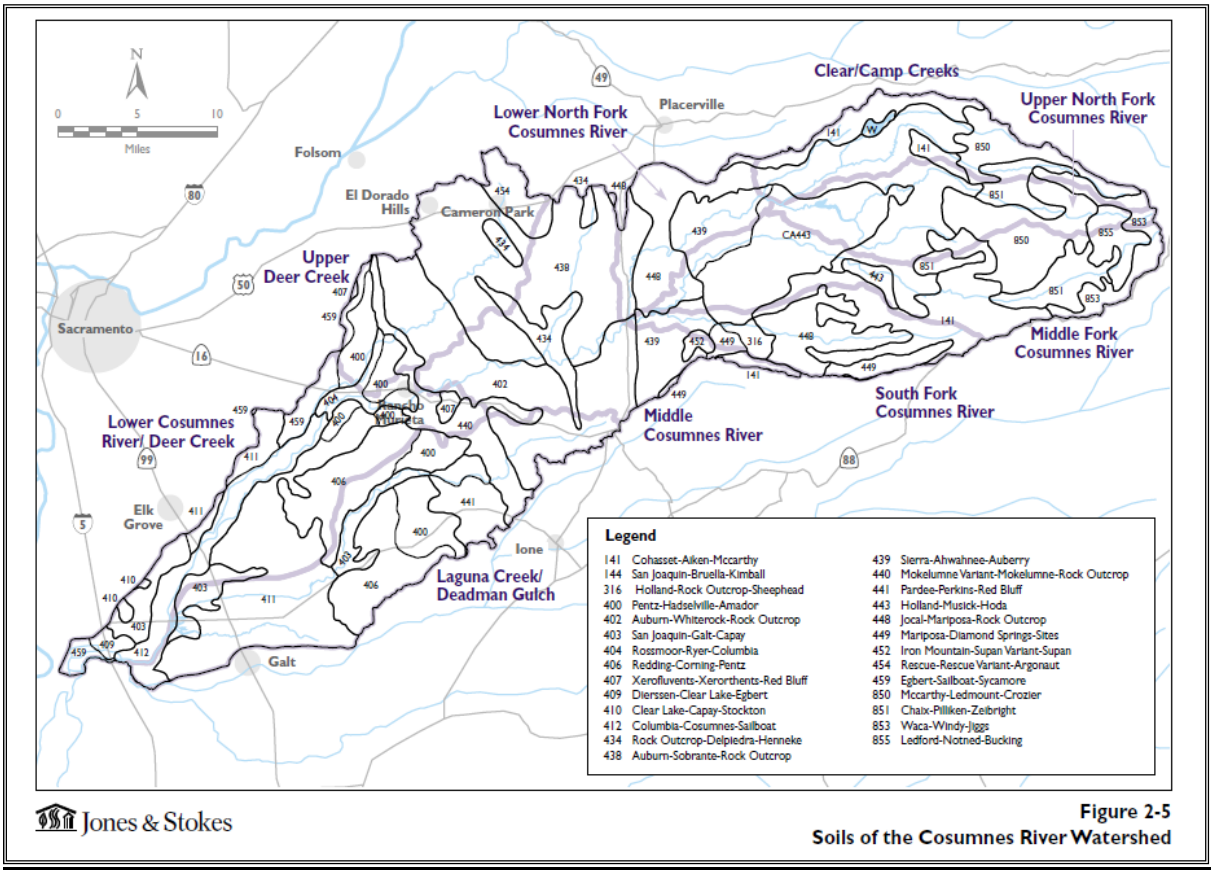


Figure 7 – Soils Map from Cosumnes River Watershed Inventory and Assessment Phase II Final Report (September 2003)

Logging (Timber Harvesting)

Logging is prevalent on the Eldorado National Forest (ENF) lands as well as on private lands on the watershed. On National Forest lands, the Forest service and harvesting companies are responsible for erosion control and watershed management practices and monitoring of watershed water quality. Guidelines and management practices used by the Forest Service are identified in the *El Dorado National Forest Land and Resource Management Plan* developed in 1988. This plan will be updated every 15 years or earlier if necessary.

On private lands, the California Department of Forestry & Fire Protection is the responsible agency for timber harvesting and erosion control during and after timber harvesting as required in its *California Forest Practice Rules.* This manual identifies specific guidelines and practice to prevent erosion. The intent of these rules is to lessen the harvesting impacts through implementation of mitigation efforts identified in a *Timber Harvest Plan* (THP) prepared by the harvesting contractor. The focus of each Timber Harvest Plan, as it relates to watershed integrity, involves a lot of detail which is the functional equivalent of a CEQA review including sediment transport, road construction, harvesting elements, erosion control, and required buffers to minimize erosion contamination into the watershed. Each plan is subject to multi-agency review such as by Cal-Fire, Department of Fish & Game, Central Valley Regional Water Quality Control Board, US Fish & Wildlife Services and local agencies. Approved timber harvest plans (THPs) are on file at CDF offices and available on their website.

The major private timber harvester in the watershed is Sierra-Pacific Industries (SPI), which bought lands from Georgia-Pacific, with approximately 8,400 acres available for logging in our watershed.

From Sierra Pacific's Website: Minimizing Soil Erosion

Forested lands are important links in California's water supply network because their large expanses of soil and leaf litter are relatively undisturbed, allowing them to serve as natural water filters. Approximately 75 percent of California's water comes from forested watersheds. That's why Sierra Pacific takes its responsibility to protect water quality so seriously.

One of Sierra Pacific's primary goals is to keep soil where it is needed to grow trees – and away from spots where it is detrimental to water quality or fish habitat. Although erosion is a natural process that can't be totally eliminated, SPI's foresters take precautions to keep management-related erosion to a minimum. Proper planning, careful installation of roadbeds and preventative maintenance are key factors. SPI employs registered professional foresters to determine the ability of the soil to grow trees and estimate the soil's susceptibility to erosion.

The State Water Resources Control Board enforces the Clean Water Act through the issuance of Orders such as the one below, to protect the water shed from erosion due to timber harvesting activities in our area.

STATE WATER RESOURCES CONTROL BOARD
DIVISION OF WATER QUALITY
ORDER WQ 2011-0014-DWQ
MODIFYING ORDER NO. R5-2010-0022

MODIFICATION OF CONDITIONAL WAIVER OF WASTE DISCHARGE REQUIREMENTS FOR DISCHARGES RELATED TO TIMBER HARVEST ACTIVITIES
IN THE CENTRAL VALLEY REGION

The California Regional Water Quality Control Board, Central Valley Region (Central Valley Water Board), issued a conditional waiver of waste discharge requirements for discharges related to timber harvest activities in the Central Valley Region on January 30, 2003 (Waiver), and renewed the Waiver on January 27, 2005 and April 28, 2005. On March 18, 2010, the Central Valley Water Board issued Order R5-2010-0022, which renewed the Waiver until March 31, 2015. On December 4, 2014 the Central Valley Water Board issued Order R5-2014-0144, which renewed the Waiver until March 31, 2018.

Water Code section 13269 further provides that any such waiver of waste discharge requirements shall be conditional, may not exceed five years in duration, and may be terminated at any time by the board.

3. Water Code section 13269 includes the following provisions:

. The waiver shall include the performance of individual, group, or watershed-based monitoring, unless the board determines that the discharges do not pose a significant threat to water quality.
. Monitoring requirements shall be designed to support the development and implementation of the waiver program, including, but not limited to, verifying the adequacy and effectiveness of the waiver's conditions. In establishing monitoring requirements, the board may consider the volume, duration, frequency, and constituents of the discharge; the extent and type of existing monitoring activities, including, but not limited to, existing watershed-based, compliance, and effectiveness monitoring efforts; the size of the project area; and other relevant factors.
. Monitoring results must be made available to the public.

Pesticide and Herbicide Use

Agriculture provides the greatest potential for pesticide and herbicide contamination other than from private uses. Agriculture in the water shed is mainly limited to wineries. Over the past ten years, the number of vineyards within the watershed has increased exponentially. Unless specifically noted as organic, vineyards typically use various pesticides and herbicides to increase crop yield. Fungicides include wetable sulfur, *Rubigan* and *Rally*. Herbicide use is

typically limited to *Roundup* while soil sterilants are *Simazinone* and *Karmex*. These are normally administered in the dry season which minimizes the potential to reach water courses.

The El Dorado County Agriculture Department oversees the use of pesticides in El Dorado County and the Amador County Agriculture Department in Amador. They both noted that rather than have individual discharge permits for pesticide use, most of the wineries have joined a watershed coalition which formed after 2003 when the Central Valley Regional Water Quality Control Board adopted a "Conditional Waiver" for irrigated lands. The waiver contains the water quality requirements for agriculturists to help protect the watersheds from farm water runoffs (called wastewater discharges) that might pollute the surface water supply. As a part of the regulations, periodic sampling and testing of the watersheds is required. The Regional Board MRP can be found on the web here:

Monitoring and Reporting Program, Order Nos. R5-2003-0826, R5-2005-0833, and R5-2008-0005 for Coalition Groups Under Resolution No. R5-2003-0105, Conditional Waiver of Waste Discharge Requirements for Discharges From Irrigated Lands Within the Central Valley Region

ENF in the past used strychnine to control gophers although this practice was discontinued in the early '90s. Use of herbicides in young tree plantations includes glyphosphate, triclophyr and hexazinone. ENF felt the risk to receiving waters associated with the use these herbicides was low.

Mine Runoff

Precious metal lode mines are located in the North Fork watershed, but all of the mines have not operated for many, many years. Historically, these lode mines used mercury and arsenic to separate the gold and other precious metals from the quartz. Acid drainage, mercury and arsenic contamination potentially exists although no known contamination or leaching has been identified.

The County of El Dorado owns 271.44 acres at the Union Mine Disposal Site. The groundwater monitoring program at Union Mine is exceptionally complex because of the approx. 20,000 ft. of mine shafts dug during the 1800's under and adjacent to the landfill site--the Union Mine area was historically one of the more active gold mine sites in the County. The mine workings about the Union Mine property have historically discharged mine wastewater which contains naturally occurring arsenic from the arsenic pyrite within the gold bearing quartz. The County has recently "plugged" the on-site mines to reduce and stop the uncontrolled discharges of groundwater passing through the mine openings. As noted in the Landfill section the Regional Board required El Dorado County to provide onsite treatment and reclamation of the mine discharge under a no discharge permit. The site maintains an operating permit with the Eldorado Irrigation District so that secondary treated effluent can be sent to the EID force main sewer line located near the town of El Dorado.

One rock quarry mine operates in the North Fork watershed and does not adversely affect water quality. Storm runoff is retained on site in settling ponds before discharge.

Grazing Animals

Cattle grazing occurs on private lands and in El Dorado National Forest and Bureau of Land Management (BLM) lands. While the amount of grazing on private land is very difficult to establish, the ENF and BLM established allotments for specific areas for grazing. The BLM allows grazing on approximately 900 acres in the North Fork watershed near Somerset. ENF has allotments for nearly 5,700 acres to allow for limited seasonal cattle grazing of between 200 and 600 head. Grazing is generally located in three broad areas as follows: approximately 2,800 acres along the upper North Fork and Camp Creek; approximately 1,200 acres in the Grizzly Flat area; and approximately 1,700 acres in the Middle Fork along Scott and Sopiago creeks.

On private lands most of the large scale grazing is located near to Crawford Ditch area and in the Clear Creek watershed. These grazing areas support between 300 and 400 head of cattle.

Figure 8 – Michigan Bar Gauging Station

Figure 9 – Cattle Ranch Adjacent to Michigan Bar Gauging Station

Wild Animals

Wild animals in the watershed include bear, deer, gophers, opossums, raccoons, skunks, rabbits, mountain lions, coyotes, bobcats, and beavers. Information obtained from staff at ENF and F&G indicate there are no regular counts of any animals in the watersheds. In the past, F&G monitored the deer kill in areas that overlapped the watersheds. However due to resource constraints this practice was discontinued.

F&G revealed that deer herds tend to winter at elevations between 3,000-4,500 feet while they summer at elevations of 6,000 feet and above. Several resident herds live year round in the riparian oak woodlands in the foothill portions of the north and middle fork watersheds.

Anticipated Growth in the Watershed

The eastern portion of the watershed is predominately under federal ownership and thus not available for development. The central portion of the watersheds, generally west from

Somerset, is zoned rural residential, low density residential, or timber reserve. County general plans have heretofore allowed development to occur in the context of lower density development consistent with a rural atmosphere. Current county general plans will continue with that development scenario. In general the smaller communities, both in El Dorado and Amador counties, have no plans for accelerated growth or plans to allow more growth than is already currently approved. Attached are copies of current General Plan Land Use Maps for both Amador and El Dorado Counties.

In general, the Amador County land use map indicates that all lands within the watershed are zoned agricultural general, which allows one unit every 40 acres. Along the southerly boundary of the watershed, land designation changes to Mineral Resource Zone, which is intended to manage any extraction of mineral resources.

In general, the El Dorado County land use map indicates that a majority of the lands within the watershed are zoned agricultural lands or rural residential. Some areas are zoned low density residential.

In general, the Sacramento County land use map indicates that a majority of the lands within the watershed are zoned agricultural, except for the lands within Rancho Murieta. Several projects are proposed for development around the Calero, Chesbro, and Clementia Reservoirs. The District will need to be actively involved in the planning process for these projects. This is further discussed in Chapter 6.

Copies of the land use maps are included as Appendix B. Copies of the draft tentative map for the Rancho North Project are included as Appendix C.

CHAPTER 4

WATERSHED CONTROL AND MANAGEMENT PRACTICES

INTRODUCTION

Rancho Murieta Community Services District comprises approximately 3,500 acres of the 536 square mile watershed. The CSD diverts water at the lowest point of the watershed as the Cosumnes River flows past the community. As such, the CSD has no control of upstream water quality management practices. In fact, while researching this watershed study, the vast majority of the agencies and people contacted had no idea the Cosumnes River was the sole source of water for Rancho Murieta.

However, agencies involved in controlling operations in their respective sphere of influence recognize the almost pristine nature of the river. In light of this, those agencies have undertaken plans to protect the quality of the water shed.

The following agencies have specific water quality management plans for portions of the watershed as the river or tributary creeks pass through their spheres of influence.

USFS-El Dorado National Forest

As part of the ENF's Land and Resource Management Plan, much attention is given to enhancing the existing water quality and preventing further degradation of the watershed. Specific best management practices are outlined in the plan covering such topics as logging, road clearing and erosion protection, pesticide and herbicide use and recreational activities. All these activities focus on erosion as the major source of detrimental activity to the watershed.

In addition, every five (5) years, each creek watershed is evaluated for water quality impacts and degradation. Specific recommendations resulting from these surveys are included in the Forest Management Plan.

California Department of Forestry & Fire Protection

California Department of Forestry (CDF) focuses on two (2) sources for water quality impacts: logging and fires. As part of their logging contracts, CDF requires each logging contractor to prepare a Timber Harvesting Plan (THP) for each area to be logged. This THP stipulates the methods the contractor will use to log, build roads, prevent erosion and ultimately revegetate the area as needed.

CDF uses control burns to remove understory growth, which when dry is tinder for the larger fires. By removing understory growth, the fire potential for an area is significantly reduced. In addition, if a fire were to occur in an area where a controlled burn was conducted, the ensuing fire would be less severe. CDF attempts to follow after fires and revegetate to prevent additional erosion and runoff of ash laden soils.

El Dorado County
The County Department of Public Works enacted a *Grading, Erosion and Sediment Control Ordinance* to regulate the grading on private property within the unincorporated area of the county. This ordinance sets forth the regulations to control excavation, grading, and earthwork construction for single parcel improvements.

The County Environmental Health Department is responsible for the approval and inspection of all septic tank and leach field installations. Likewise, the County has detailed permitting and inspection requirements for the use of septic tank systems.

Amador County
Similar to El Dorado County, Amador County has grading and septic talk system ordinances and permitting regulations. These regulations likewise strive to protect water quality of natural water courses throughout the county.

Sacramento County
Sacramento County is very concerned about sediment transport and erosion as evidenced by its NPDES permit requirements and Storm Water Best Management Practices guidelines for construction activities. In addition, the County has a strongly enforced grading ordinance in place. The Environmental Health Department in conjunction with the building department is responsible for the inspection and approvals of septic tank systems.

Central Valley Regional Water Quality Control Board
National Pollution Discharge Elimination System (NPDES) permits are issued by the Regional Board to the owner or operator of any facility or activity that discharges waste which may affect groundwater or reach surface waters. Waste discharge requirements are included as part of the NPDES permit. These discharge requirements define the required level of treatment, type of discharge allowed, if any, and the monitoring and reporting requirement of the facility. In addition, specific pollutant limits are set as a condition of approval of the permit.

Rancho Murieta CSD
The District is currently in process for submission of an application for coverage under the Statewide National Pollutant Discharge Elimination System (NPDES) Permit for Residual Aquatic Pesticide Discharges to Waters of the United States from Algae and Aquatic Weed Control Applications Water Quality Order No. 2016-0073-EXEC. The District will need to be diligent in the use of algaecides and aquatic herbicides within Calero, Chesbro, and Clementia Reservoirs only when necessary and following recommended application guidelines.

CHAPTER 5

WATER QUALITY

INTRODUCTION

The Surface Water Treatment Rule sets treatment requirements to control microbiological contaminants in municipal and public water systems. EPA, in defining the rule, set the minimum of 3-log removal of *Giardia lamblia cyst* and a 4-log virus removal/inactivation for all surface waters, as well as a host of other water quality requirements.

MONITORING PROGRAM

The District monitors the raw water as required by DDW. The raw water sampling and testing is from the influent line from Reservoir Chesbro. Table 1 presents the sampling and testing program currently in place at the District.

Table 1 – Raw Water Sampling Program

Secondary	
Bicarbonate Alkalinity	Every 6 Years
Calcium	Every 6 Years
Carbonate Alkalinity	Every 6 Years
Chloride	Every 6 Years
Color	Every 6 Years
Copper	Every 6 Years
Foaming Agents	Every 6 Years
Hardness	Every 6 Years
Hydroxide Alkalinity	Every 6 Years
Iron	Every Year
Magnesium	Every 6 Years
Manganese	Every Year
Odor	Every 6 Years
pH	Every 6 Years
Silver	Every 6 Years
Sodium	Every 6 Years
Specific Conductance	Every 6 Years
Sulfate	Every 6 Years
TDS	Every 6 Years
Turbidity	Every 6 Years
Zinc	Every 6 Years

Inorganic	
Aluminum	Every 3 Years
Antimony	Every 3 Years
Arsenic	Every 3 Years
Asbestos	Every 9 Years
Barium	Every 3 Years
Beryllium	Every 3 Years
Cadmium	Every 3 Years
Chromium (Total)	Every 3 Years
Chromium (Hexavalent)	Every Year
Fluoride	Every 3 Years
Mercury	Every 3 Years
Nickel	Every 3 Years
Selenium	Every 3 Years
Thallium	Every 3 Years

Nitrate/Nitrite	
Nitrate	Every Year
Nitrite	Every 3 Years

Radiological	Every 9 Years
Regulated VOCs	Every 3 Years

Details for the Drinking Water Monitoring Schedule and results for the District, System Number: 3410005, is up to date and available on the web: https://sdwis.waterboards.ca.gov/PDWW/JSP/MonitoringSchedules.jsp?tinwsys_is_number=3613&tinwsys_st_code=CA&counter=0.

ABILITY TO MEET THE SWTR RULE

The District met the Long Term 2 Enhanced Surface Water Treatment rule sampling requirements. The District samples for, and continues to sample for, E. Coli and total coliforms instead of Cryptosporidium, showing that our source in not vulnerable to contamination and does not require additional treatment.

The District's water also meets the requirements of the Stage 2 Disinfection Byproduct Rule (DBPR) as Total Trihalomethane (TTHM) & HAA5 (Haloacetic acid) levels are below the required levels, and have submitted their compliance and monitoring plan to the DDW, as presented in Tables 2 and 3.

Table 2 – Quarterly TTHM Report for Disinfection Byproducts Compliance Based on Flow-Weighted Averages (in µg/L or ppb)

System Name:	Rancho Murietta Community Services District								System No.:	34-10005			Year:	2015			Quarter:	4th		
	Year	2011				2012				2013				2014				2015			
	Quarter	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.
Sample Date (month/date)		1/14	4/14	7/14	10/14	1/14	4/14	7/14	10/14	1/14	4/14	7/14	10/14	1/14	4/14	7/14	10/14	1/14	4/14	7/14	10/14
Facility 1	Cantova	29.0	41.0	58.0	54.0	30.0	37.0	55.0	52.0	45.0	43.0	52.0	39.0	30.0	52.0	71.0	53.0	39.0	35.0	74.0	58.0
	CSD Warehouse	34.0	43.0	60.0	52.0	33.0	37.0	63.0	47.0	53.0	29.0	54.0	40.0	35.0	57.0	87.0	58.0	41.0	36.0	77.0	55.0
	Site 3																				
	Site 4																				
	Quarterly Average	31.5	42.0	59.0	53.0	31.5	37.0	59.0	49.5	49.0	36.0	53.0	39.5	32.5	54.5	79.0	55.5	40.0	35.5	75.5	56.5
Running Annual Ave.		50.9	45.4	47.1	46.4	46.4	45.1	45.1	44.3	48.6	48.4	46.9	44.4	40.3	44.9	51.4	55.4	57.3	52.5	51.6	51.9
Meets Standard ?*		Yes ☑	Yes ☑	Yes ☑	Yes ☑	Yes ☑	Yes ☑	Yes ☑	Yes ☑	Yes ☑	Yes ☑	Yes ☑	Yes ☑	Yes ☑	Yes ☑	Yes ☑	Yes ☑	Yes ☑	Yes ☑	Yes ☑	Yes ☑
(Check Box)		No ☐	No ☐	No ☐	No ☐	No ☐	No ☐	No ☐	No ☐	No ☐	No ☐	No ☐	No ☐	No ☐	No ☐	No ☐	No ☐	No ☐	No ☐	No ☐	No ☐
Number of Samples Taken		2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2

Table 3 – Quarterly HAA5 Report for Disinfection Byproducts Compliance Based on Flow-Weighted Averages (in µg/L or ppb)

System Name:	Rancho Murietta Community Services District								System No.:	34-10005			Year:	2015			Quarter:	4th		
	Year	2011				2012				2013				2014				2015			
	Quarter	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.
Sample Date (month/date)		1/14	4/14	7/14	10/14	1/14	4/14	7/14	10/14	1/14	4/14	7/14	10/14	1/14	4/14	7/14	10/14	1/14	4/14	7/14	10/14
Facility 1	Cantova	40.5	43.2	37.2	36.8	28.0	35.9	38.0	42.8	36.8	40.7	45.6	37.6	35.8	41.2	56.3	39.7	30.1	32.3	42.0	46.0
	CSD Warehouse	40.3	44.8	38.8	33.1	30.7	37.5	42.1	40.5	40.8	31.0	47.8	38.1	36.0	39.0	63.7	39.5	30.9	33.0	47.0	48.0
	Site 3																				
	Site 4																				
	Quarterly Average	40.4	44.0	38.0	35.0	29.4	36.7	40.1	41.7	38.8	35.9	46.7	37.9	35.9	40.1	60.0	39.6	30.5	32.7	44.5	47.0
Running Annual Ave.		44.1	43.1	41.0	39.3	36.6	34.8	35.3	36.9	39.3	39.1	40.8	39.8	39.1	40.1	43.5	43.9	42.6	40.7	36.8	38.7
Meets Standard ?*		Yes ☑	Yes ☑	Yes ☑	Yes ☑	Yes ☑	Yes ☑	Yes ☑	Yes ☑	Yes ☑	Yes ☑	Yes ☑	Yes ☑	Yes ☑	Yes ☑	Yes ☑	Yes ☑	Yes ☑	Yes ☑	Yes ☑	Yes ☑
(Check Box)		No ☐	No ☐	No ☐	No ☐	No ☐	No ☐	No ☐	No ☐	No ☐	No ☐	No ☐	No ☐	No ☐	No ☐	No ☐	No ☐	No ☐	No ☐	No ☐	No ☐
Number of Samples Taken		2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2

RECOMMENDED WATER QUALITY MONITORING PROGRAM

It is recommended the District continue to follow and to meet the monitoring requirements set forth by the DDW as well as implement an algae control program in its raw water supply reservoirs.

CHAPTER 6

CONCLUSIONS AND RECOMMENDATIONS

CONCLUSIONS

The following conclusions were inferred from the preparation of this sanitary survey:

- Erosion is a major source of contaminant and will continue to be a problem. Erosion will increase turbidity thereby making the treatment process more difficult to meet SWTR rules.

- Growth in the watershed, while slow at present, will continue to increase as the rural lifestyle attraction increases human activities detrimental to the watershed. However, the responsible agencies acknowledge the apparent trend and have instituted programs to mitigate impacts.

RECOMMENDATIONS

The following conclusions were inferred from the preparation of this sanitary survey:

- The District should contact all the responsible agencies in the watershed and be listed with each agency for emergency notification of any activity that may potentially impact water quality of the Cosumnes River.

- To continue to monitor the activities detrimental to the watershed and document changes to the water quality. The District should implement a Cosumnes River raw water sampling and monitoring program before diverting into the District's storage reservoirs.

- It is recommended the District continue to follow and to meet the monitoring requirements set forth by the DDW as well as implement an algae control program in its water supply reservoirs.

- To continue to be involved in the planning process for all subdivisions within the District's service area, especially those that border Calero, Chesbro, and Clementia Reservoirs.

- Apply algaecides and aquatic herbicides within Calero, Chesbro, and Clementia Reservoirs only when necessary and following recommended application guidelines.